CURRICULUM DOCUMENT

QUALIFICATION:

BACHELOR OF SCIENCE IN COMPUTER SCIENCE (Level 6)

EXIT QUALIFICATION:

UNDERGRADUATE CERTIFICATE IN COMPUTER SCIENCE (30 ECTS)

UNDERGRADUATE DIPLOMA IN COMPUTER SCIENCE (60 ECTS)

UNDERGRADUATE HIGHER DIPLOMA IN COMPUTER SCIENCE (90 ECTS)

EAI/2025/240406
Approved by the Senate on April 24, 2025

Euro American Institute

AGORA BUSINESS CENTRE LEVEL 2
TRIQ IL- WIED TA' L-IMSIDA
MSIDA, MSD 9020, Malta
info@euroamerican.eu

PROGRAMME SPECIFICS

Title Of The Qualification / Award

Bachelor of Science in Computer Science (BSc. CS)

MQF Level

MQF Level 6

Programme Duration

Full- Time: 3 Years

Part time: --- Years

Total Learning Hours

4500 Hours

Language/S Of Instruction of Programmes

English

Exit Awards/Qualifications

At the European American Institute, the Bachelor of Science in Computer Science program offers structured exit qualifications to recognize students' achievements at various stages of their studies. These awards provide valuable credentials for students who may not complete the full degree. The exit qualifications include the following:

- ***Undergraduate Certificate in Computer Science (30 ECTS)***

  The Undergraduate Certificate in Computer Science is awarded to students who complete

modules totalling 30 ECTS credits. This qualification provides a basic understanding of essential computing concepts.

- ***Undergraduate Diploma in Computer Science (60 ECTS)***

  The Undergraduate Diploma in Computer Science is awarded to students who complete modules totalling 60 ECTS credits. This qualification builds on foundational knowledge and introduces more advanced topics in computing.

- ***Undergraduate Higher Diploma in Computer Science (90 ECTS)***

  The Undergraduate Higher Diploma in Computer Science is awarded to students who complete modules totalling 90 ECTS credits. This qualification provides advanced knowledge and practical skills in areas such as software development, data structures, and systems analysis.

PROGRAMME STRUCTURE

Module/Unit Title	*Compulsory(C) or Elective(E)*	*ECTS*	*MQF Level of each module*	*Mode of Teaching*	*Mode of Assessment*
Fundamentals of IT and Computers	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%) Quizzes (30%) Final Examination (30%)*
Computer and Network Technologies	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%) Quizzes (30%) Final Examination (30%)*
Database Management System	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%) Quizzes (30%) Final Examination (30%)*
Web and Mobile Application	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%) Programming/ Mini Project 30%) Final Examination (30%)*
Principal of Computer Programming	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%) Programming/ Mini Project (30%) Final Examination (30%)*
Software Engineering	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40% Quizzes (30%) Final Examination (30%)*
OOPS with Java	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%) Programming/ Mini Project (30%) Final Examination (30%)*
Management Information Systems	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%) Presentations (30%) Final Examination (30%)*
Network Information Systems	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%) Case study (30%) Final Examination (30%)*
Cyber Security	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous*	*Written assignments (40%) Programming/ Mini Project (30%)*

				forums and VLE	*Final Examination (30%)*
Python Primer: An Introduction to Programming with Python"	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%)* *Programming/ Mini Project (30%)* *Final Examination (30%)*
Mathematics for Computing	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%)* *Quizzes (30%)* *Final Examination (30%)*
Unlocking Big Data: Technologies and Strategies	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%)* *Quizzes (30%)* *Final Examination (30%)*
Introduction to Cryptography	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments: 40%* *Programming/ Mini Project: 30%* *Final Examination: 30%*
Exploring the Nexus: Data Science and Artificial Intelligence	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments: 40%* *Quizzes: 30%* *Final Examination: 30%*
Exploring Data Protection and IT Security Measures	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments: 40%* *Case Study: 30%* *Final Examination: 30%*
Understanding Information Security Standards	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments: 40%* *Quizzes: 30%* *Final Examination: 30%*
Exploring the Internet of Things (IoT)"	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments: 40%* *Presentation: 30%* *Final Examination: 30%*
Machine Learning: supervised learning and unsupervised learning	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments: 40%* *Programming/ Mini Project: 30%* *Final Examination: 30%*
Data Structure & Algorithm	*Compulsory (C)*	*6*	*MQF 5*	*Lectures, case studies, asynchronous*	*Written assignments: 40%* *Quizzes: 30%* *Final Examination: 30%*

				forums and VLE	
Exploring the Fundamentals of Web Security	*Compulsory (C)*	*6*	*MQF 6*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments: 40% Programming/ Mini Project: 30% Final Examination: 30%*
Mathematical Modelling	*Compulsory (C)*	*6*	*MQF 6*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments: 40% Programming/ Mini Project: 30% Final Examination: 30%*
Introduction to Quantum Computing	*Compulsory (C)*	*6*	*MQF 6*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments: 40% Quizzes: 30% Final Examination: 30%*
System Analysis and Designing	*Compulsory (C)*	*6*	*MQF 6*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments: 40% Presentations: 30% Final Examination: 30%*
Overview of Block chain and its security	*Compulsory (C)*	*6*	*MQF 6*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%) Presentations (30%) Final Examination (30%)*
IT Project Management	*Compulsory (C)*	*6*	*MQF 6*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%) Presentations (30%) Final Examination (30%)*
E-Commerce	*Compulsory (C)*	*6*	*MQF 6*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%) Presentations (30%) Final Examination (30%)*
Knowledge Management	*Compulsory (C)*	*6*	*MQF 6*	*Lectures, case studies, asynchronous forums and VLE*	*Written assignments (40%) Presentations (30%) Final Examination (30%)*
Capstone Project	*Compulsory (C)*	*12*	*MQF 6*	*Lectures, case studies, asynchronous forums and VLE*	*Dissertation (100%)*

Modules Covered								
Module Ref. No.	Module Title	Level	ECTS	TCH	SPPH	SSH	AH	TLH
SEMESTER- 1								
BCS601	Fundamentals of IT and Computers	5	6	30	20	95	5	150
BCS602	Computer and Network Technologies	5	6	30	20	95	5	150
BCS603	Database Management System	5	6	30	20	95	5	150
BCS604	Web and Mobile Application	5	6	30	20	95	5	150
BCS605	Principal of Computer Programming	5	6	30	20	95	5	150
SEMESTER- 1: TOTAL			30	150	100	475	25	750
SEMESTER- 2								
BCS606	Software Engineering	5	6	30	20	95	5	150
BCS607	OOPS with Java	5	6	30	20	95	5	150
BCS608	Management Information Systems	5	6	30	20	95	5	150
BCS609	Network Information Systems	5	6	30	20	95	5	150
BCS610	Cyber Security	5	6	30	20	95	5	150
SEMESTER- 2: TOTAL			30	150	100	475	25	750
YEAR 1 - TOTAL			60	300	200	950	50	1500
SEMESTER- 3								
BCS611	Python Primer: An Introduction to Programming with Python"	5	6	30	20	95	5	150
BCS612	Mathematics for Computing	5	6	30	20	95	5	150
BCS613	Unlocking Big Data: Technologies and Strategies	5	6	30	20	95	5	150
BCS614	Introduction to Cryptography	5	6	30	20	95	5	150
BCS615	Exploring the Nexus: Data Science and Artificial Intelligence	5	6	30	20	95	5	150
SEMESTER- 3: TOTAL			30	150	100	475	25	750
SEMESTER- 4								
BCS616	Exploring Data Protection and IT Security Measures	5	6	30	20	95	5	150
BCS 617	Understanding Information Security Standards	5	6	30	20	95	5	150
BCS618	Exploring the Internet of Things (IoT)"	5	6	30	20	95	5	150
BCS 619	Machine Learning : supervised learning and unsupervised learning	5	6	30	20	95	5	150
BCS620	Data Structure & Algorithm	5	6	30	20	95	5	150
SEMESTER- 4: TOTAL			30	150	100	475	25	750
YEAR 2 - TOTAL			60	300	200	950	50	1500

SEMESTER- 5								
BCS621	Exploring the Fundamentals of Web Security	6	6	30	20	95	5	150
BCS622	Mathematical Modelling	6	6	30	20	95	5	150
BCS623	Introduction to Quantum Computing	6	6	30	20	95	5	150
BCS624	System Analysis and Designing	6	6	30	20	95	5	150
BCS625	Overview of Block chain and its security	6	6	30	20	95	5	150
SEMESTER- 5:TOTAL			30	150	100	475	25	750
SEMESTER- 6								
BCS626	IT Project Management	6	6	30	20	95	5	150
BCS627	E-Commerce	6	6	30	20	95	5	150
BCS628	Knowledge Management	6	6	30	20	95	5	150
BCS629	Capstone Project	6	12	60	110	115	15	300
	SEMESTER- 6:TOTAL		30	150	170	400	30	750
Year 3 - TOTAL			60	300	270	875	55	1500
BCS Programme TOTAL			180	900	670	2775	155	4500

TCH	Total Contact Hours. Contact Hours are hours invested In learning new content under the Direction of a tutor/lecturer (e.g. lectures participation in online forums, video-lectures)
SPPH	Supervised Placement and Practice Hours. (During these hours the learner is supervised, coached or mentored) . supervision hours are structured to provide effective virtual support for students. Initially, students engage in weekly online consultations with their supervisors via video conferencing platforms, where they clarify research objectives and set milestones. Bi-weekly virtual progress review meetings are scheduled to assess ongoing work and address any issues that arise. Monthly feedback and guidance sessions are conducted through online platforms where supervisors provide detailed feedback on drafts and research methodologies. Additionally, bi-annual online workshops and training sessions are organized to enhance research skills and academic writing. As the final submission approaches, students participate in virtual final review sessions and presentation preparations to ensure they meet all requirements and are well-prepared for their assessments. This approach ensures that students receive continuous and effective support throughout their research project, even in an online environment.
SSH	Self-Study Hours. (Estimated workload of research and study)
AH	Assessment Hours (Examinations/ presentations/ group work/ projects etc.)
TLH	Total Learning Hours

OVERALL PROGRAMME DESCRIPTION

The Euro American Institute offers a carefully structured three-year Bachelor of Science in Computer Science program, designed to equip students with the foundational knowledge and analytical skills essential for success in today's tech-driven landscape.

This program provides a comprehensive understanding of core computing principles and practical skills necessary for designing, developing, and implementing innovative software solutions across various industries.

The curriculum balances theoretical concepts with hands-on experience, covering critical areas such as programming, algorithms, data structures, computer networks, cybersecurity, artificial intelligence, and database management. Through project-based learning and lab sessions, students develop practical skills and real-world problem-solving abilities, preparing them to meet the demands of a rapidly evolving technology sector.

Distinctive Features of the Program:

- *Comprehensive Curriculum: A well-rounded curriculum that covers both foundational and advanced computer science topics, ensuring students are equipped with the skills needed in today's job market.*

- *Hands-On Learning: Emphasis on practical experience through coding labs, software development projects, and industry-aligned assignments to bridge the gap between theory and practice.*

- *Cutting-Edge Technology: Exposure to emerging technologies such as artificial intelligence, cloud computing, and cybersecurity, preparing graduates to stay ahead in the fast-paced tech industry.*

- *Problem-Solving Focus: Strong emphasis on analytical thinking and computational problem-solving to enable students to tackle complex technical challenges.*

- *Global Perspective: Designed to cater to both local and international learners, providing globally recognized skills and knowledge to succeed in a variety of IT roles.*

B.Sc. Computer Science - Programme Objectives:

By the end of the programme, students will:

- *Acquire a deep foundation in programming, algorithms, data structures, and software*

development, enabling them to create scalable and effective software solutions.

- *Develop strong analytical and critical thinking skills to identify and solve complex computing problems using innovative and diverse approaches.*

- *Gain hands-on experience through projects and internships, applying theoretical knowledge in real-world, professional computing environments.*
- *Build a mindset of lifelong learning, allowing them to stay current with evolving technologies and contribute to advancements in the field.*

- *"Analyse the ethical, legal, and societal impacts of computing, enabling them to make responsible, informed decisions in their careers.*

Learning Outcomes for knowledge obtained at the end of the programme

Upon completion of the B.Sc. Computer Science program, students will demonstrate a comprehensive understanding of key concepts and principles in computer science, preparing them for various roles in the field. The learning outcomes for knowledge obtained at the end of the program include:

- *Critically evaluate foundational and advanced computing concepts, applying theoretical frameworks and methodologies to design effective solutions for complex computational problems.*
- *Apply software design and development principles by integrating user-centered approaches, adhering to industry standards, and utilizing appropriate programming tools and languages.*
- *Demonstrate a comprehensive understanding of software design and development principles, integrating user-centered approaches and adhering to industry standards while employing relevant programming tools and languages.*
- *Synthesize and apply knowledge of algorithms, data structures, and computing principles to design efficient and innovative software systems and applications.*
- *Analyse and critique emerging technologies in fields such as artificial intelligence, cybersecurity, and data science, assessing their theoretical frameworks and relevance to solving contemporary challenges.*
- *Communicate complex technical concepts and ideas effectively in written, verbal, and visual forms, ensuring clarity and fostering collaboration with diverse professional audiences.*

- *Evaluate ethical, legal, and professional responsibilities in computing, demonstrating a critical understanding of their implications for technology, society, and sustainable development.*

Learning Outcomes for Skills obtained at the end of the programme

Upon successful completion of the B.Sc. Computer Science program, students will demonstrate a robust set of practical skills and competencies essential for success in various roles within the field of computer science. The learning outcomes for skills obtained at the end of the program include:

- *Apply advanced programming skills in diverse programming languages and development environments, using modern tools and techniques to design, develop, test, debug, and optimize complex software systems.*

- *Critically analyze and resolve complex computing problems, employing logical reasoning, advanced problem-solving methods, and appropriate tools in dynamic and multidisciplinary contexts.*

- *Plan, lead, and manage software development projects effectively, using project management frameworks and collaborative practices to meet deadlines, ensure quality, and achieve user satisfaction.*

- *Evaluate, integrate, and implement emerging technologies and methodologies, conducting research to determine their practicality and impact on solving technical and industry-specific challenges.*

- *Communicate technical concepts and solutions effectively through professional presentations, reports, and discussions, promoting teamwork and engagement across multidisciplinary environments.*

- *Demonstrate adaptability and a commitment to lifelong learning, identifying and mastering new technologies, tools, and methodologies to meet evolving industry demands and sustain professional growth.*

General Pedagogical methods used for this programme

B.Sc. Computer Science program, various pedagogical methods are utilised to facilitate learning and skill development. Here are some general pedagogical methods commonly used:

- ***Lectures:*** *Traditional lectures delivered by professors or industry experts provide foundational knowledge in computer science concepts, theories, and principles. Lectures may incorporate multimedia resources, demonstrations, and interactive elements to engage students.*

- ***Laboratory Sessions:*** *Practical laboratory sessions allow students to apply theoretical knowledge by working on programming assignments, experiments, and projects. These*

sessions provide hands-on experience with software development tools, programming languages, and computing environments.

- ***Problem-Based Learning (PBL):*** *PBL involves presenting students with real-world problems or case studies relevant to computer science. Students work in groups to analyse the problem, identify potential solutions, and apply their knowledge to develop innovative solutions. PBL encourages critical thinking, collaboration, and problem-solving skills.*

- ***Project-Based Learning (PJBL):*** *PJBL tasks students with completing a significant project that integrates various concepts, skills, and technologies learned throughout the programme. Projects may involve software development, research, or practical applications of computer science principles. PJBL promotes teamwork, creativity, and project management skills.*

- ***Seminars and Workshops:*** *Seminars and workshops provide opportunities for students to explore specialised topics, emerging trends, and advanced concepts in computer science. Guest speakers, faculty members, or industry professionals lead these sessions, sharing their expertise and insights with students.*

- ***Online Learning Platforms:*** *Online learning platforms complement traditional classroom instruction by providing access to supplementary resources, tutorials, quizzes, and interactive exercises. These platforms enable self-paced learning, personalised feedback, and collaborative online discussions among students.*

- ***Industry Guest Lectures:*** *Guest lectures delivered by professionals from the tech industry expose students to current practices, tools, and trends. These sessions bridge the gap between academic theory and professional practice, offering students valuable insights into career paths, industry expectations, and technological advancements.*

- ***Live Case Studies:*** *Live case studies involve real-time analysis of ongoing or recent industry scenarios. These cases allow students to examine real-world challenges, apply theoretical knowledge, and propose viable solutions. This method strengthens the link between curriculum content and professional realities.*

- ***Assessment Methods:*** *Assessment methods in a B.Sc. Computer Science programme may include exams, quizzes, assignments, projects, presentations, and practical demonstrations. These assessments evaluate students' understanding of concepts, problem-solving abilities, programming skills, and overall academic performance.*

DETAILED CURRICULUM

BCS601

Fundamentals of IT and Computers

Module Description

The Fundamentals of IT and Computers module aims to provide students with a comprehensive understanding of the basic concepts and principles of information technology and computer systems. This module covers essential topics, including computer hardware and software components, operating systems, networks, and data management. Students will develop foundational skills in using various software applications and tools, along with an understanding of the role of IT in organisational contexts. By the end of the module, students will be equipped with the knowledge and competencies necessary to effectively navigate and utilise technology in their academic and professional pursuits.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Demonstrate proficiency in using common software applications, including word processing, spreadsheets, and presentation tools, to produce professional documents.*
- *Explain the basic components and functions of computer hardware and software, demonstrating an understanding of how they interact within a system.*
- *Analyse different operating systems and their functionalities, including installation, configuration, and troubleshooting.*
- *Assess various networking concepts, including types of networks, protocols, and security measures, to evaluate their impact on organisational communication.*
- *Implement basic data management practices, including database creation, querying, and reporting, using appropriate software tools.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Identify the key components of computer systems, including hardware, software, and networking elements.*
- *Describe the fundamental concepts of operating systems and their role in managing computer resources.*
- *Explain the principles of data management, including data types, storage, and retrieval methods.*
- *Discuss the importance of cybersecurity measures and best practices in protecting information systems.*
- *Outline the various types of software applications used in business environments and their functionalities.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Operate common software applications (e.g., word processors, spreadsheets, and presentation software) to create, edit, and format documents effectively.*
- *Configure basic hardware components and peripherals, demonstrating hands-on skills in setting up computer systems.*
- *Navigate operating systems efficiently, including file management, system settings, and troubleshooting basic issues.*
- *Utilise networking tools to establish simple network connections and troubleshoot common network problems.*
- *Execute basic data management tasks, including data entry, query formulation, and report generation using database software.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Apply critical thinking skills to solve basic IT-related problems and troubleshoot common software and hardware issues.*
- *Demonstrate effective digital communication skills using various software applications to collaborate on projects.*
- *Evaluate technology solutions for their applicability in specific organisational contexts and workflows.*

- *Develop proficiency in using online resources and databases for research and information retrieval.*
- *Work collaboratively in teams to complete IT-related tasks, showcasing effective time management and organisational skills.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Navigate and utilise various operating systems (e.g., Windows, macOS, Linux) effectively for everyday computing tasks.*
- *Implement basic cybersecurity practices, including the use of antivirus software, firewalls, and secure passwords to protect digital information.*
- *Employ data visualisation tools to analyse and present data effectively using software applications like Excel or Google Sheets.*
- *Use cloud-based storage solutions (e.g., Google Drive, Dropbox) for file management and collaboration on digital projects.*
- *Create and manage digital content across various platforms, ensuring proper formatting and accessibility standards are met*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

The Fundamentals of IT and Computers module will be taught online through a blended approach, combining asynchronous and synchronous learning methods. Students will engage with pre-recorded lectures and interactive reading materials at their own pace while participating in live

sessions for real-time discussions and demonstrations. Hands-on activities will allow students to apply practical skills, and collaborative projects will encourage teamwork using shared digital tools. Regular assessments and feedback will support student learning, ensuring a comprehensive understanding of IT fundamentals.

Assessment Weightings:

- *Written assignments (40%) (It should not be more than 1250-word count)*
- *Quizzes (30%)*
- *Final Examination (30%)*

The above shall be conducted using digital learning tools such as online assessment platforms and presentation software.

The pass mark for the module will be set at 50%.

Reading List

***Core texts**:*

- *Tanenbaum, A. S., & Austin, T. (2013). Structured Computer Organization (6th ed.). Pearson.*
- *Stallings, W. (2020). Computer Organization and Architecture: Designing for Performance (9th ed.). Pearson.*
- *Morley, S., & Parker, C. S. (2021). Understanding Computers: Today and Tomorrow (17th ed.). Cengage Learning.*
- *Schmidt, B. (2022). Introduction to Information Technology (5th ed.). Cengage Learning.*
- *Severance, C. (2020). Python for Everybody: Exploring Data in Python 3. CreateSpace Independent Publishing Platform.*

Additional reading:

- *Kurose, J. F., & Ross, K. W. (2021). Computer Networking: A Top-Down Approach (8th ed.). Pearson.*
- *Rainer, R. K., & Turban, E. (2020). Introduction to Information Systems: Supporting and Transforming Business (6th ed.). Wiley.*
- *Patterson, D. A., & Hennessy, J. L. (2017). Computer Organization and Design: The*

Hardware/Software Interface (5th ed.). Morgan Kaufmann.

- *Lindsay, B. (2022). Digital Literacy: A Primer for Librarians and Educators. Rowman & Littlefield.*
- *Mackenzie, A. (2021). Introduction to Computer Science: A Problem-Solving Approach (3rd ed.). Springer.*

BCS602

Computer and Network Technologies

Module Description

This module provides learners with an understanding of computer networking essentials and cloud technologies, their operating principles, protocols, standards, security considerations, and prototypes associated with this field. Learners will explore different hardware and software options as well as how to configure and install them.

A wide range of networking technologies will be also examined including Local Area Networks (LAN) and Wide Area Networks (WAN) and how they evolved to create large-scale networks. Protocol methodologies related to IP data networks will also be explored.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Summarise the historical development of cloud computing technologies, demonstrating the ability to guide discussions on their evolution and impact on modern computing practices.*
- *Evaluate different cloud computing models and platforms, taking responsibility for assessing their advantages and disadvantages in various organisational contexts.*
- *Differentiate between client and server environments, and assess the benefits of serverless computing, ensuring the ability to advise stakeholders on suitable deployment options.*
- *Describe network standards, protocols, and topologies, while collaborating with peers to produce comprehensive reports on their relevance in today's networking landscape.*
- *Configure networks using routing and switching techniques, monitoring performance to ensure adherence to established standards and best practices.*
- *Manage projects related to network design and implementation, demonstrating the ability to carry out tasks effectively while authorising changes as necessary to optimize performance.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Summarise the fundamentals of cloud computing and its historical development,*

demonstrating an understanding of its evolution and impact on modern technology.

- *Explain networking principles, including network standards, protocols, and topologies, to facilitate effective communication within computer networks.*
- *Identify hardware and software components of computer networks, including switches, routers, gateways, and firewalls, ensuring a comprehensive understanding of network infrastructure.*
- *Demonstrate PC assembling skills, basic troubleshooting techniques, and operating system installation, showcasing practical competencies in hardware management.*
- *Apply routing and switching techniques, along with network security practices, while ensuring the ability to conduct router backup and restoration effectively.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Support and troubleshoot computing problems effectively in a variety of scenarios.*
- *Assemble PCs and install client and server operating systems proficiently.*
- *Configure client systems to meet organisational policies and requirements.*
- *Configure networks using routing and switching techniques to ensure efficient data flow.*
- *Set up secure network interfaces and back up router configurations to maintain network integrity*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Supporting and troubleshooting computing problems.*
- *Assembling PCs and installing operating systems.*
- *Configuring networks using routing and switching techniques*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in cloud computing technologies and platforms.*
- *Understanding of networking principles, standards, and protocols.*
- *Competence in configuring network hardware and software.*

- *Ability to troubleshoot network issues and implement security measures.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through a combination of lectures, hands-on labs, and practical exercises conducted in a virtual learning environment (VLE). Lectures will cover theoretical concepts and principles, supplemented by demonstrations and examples. Hands-on labs will provide opportunities for learners to apply their knowledge and skills in configuring and troubleshooting computer networks. Digital learning tools such as online forums, simulation software, and virtual labs will be used to enhance learning and facilitate interaction among learners and instructors.

Assessment method for this particular Module

Assessment Weightings:

Assessment for this module will consist of written assignments, practical exams, and project-based assessments. The assessment weightings for this particular module are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Quizzes: 30%*
- *Final Examination: 30%*

Digital learning tools such as online submission platforms, simulation software, and virtual labs will be used for assessment. The pass mark for the module is set at 50%.

Reading List

Core texts:

- *Stallings W (2021) Computer Networking with Internet Protocols and Technology. Pearson. London.*
- *Kurose J F; Ross K W (2021) Computer Networking: A Top-Down Approach. Pearson. London.*

Additional reading:

- *Mullen J (2022) Networking for Beginners: A Comprehensive Guide to Networking. CreateSpace Independent Publishing Platform. London.*
- *Cisco Press (2021) CCNA 200-301 Official Cert Guide Library. Cisco Press. London.*
- *Beck S (2023) Networking Essentials: A Comprehensive Guide to Networking Concepts. Wiley. London.*

BCS603

Database Management System

Module Description

This module covers the fundamental concepts of Database Management Systems (DBMS), including Structured Query Language (SQL) and PL/SQL. It also explores forms and reports, data clustering and partitioning, and the essentials of database administration.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Demonstrate a thorough understanding of the advantages and components of Database Management Systems (DBMS).*
- *Apply the principles of class diagrams and data types to design normalised tables and create a data dictionary.*
- *Execute and test complex queries using DDL, DML, joins, subqueries, and grouping commands.*
- *Develop effective forms, reports, and procedural languages for data retrieval, storage, and error handling.*
- *Manage distributed databases, ensuring robust database administration, security, backup, and recovery processes.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe the core concepts and advantages of DBMS, including feasibility studies and integrity constraints.*
- *Identify normal forms and the process of converting class diagrams into normalised tables.*
- *Learn the syntax and functions of SQL and PL/SQL for creating and manipulating databases.*
- *Define the principles of designing forms and reports, including layout and the use of graphical objects.*
- *Identify the principles and components of distributed databases, including client/server architecture and object-oriented databases.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Design and implement normalised tables from class diagrams and create comprehensive data dictionaries.*
- *Write and test complex SQL queries involving multiple tables, subqueries, joins, and group operations.*
- *Design and create interactive forms and reports, integrating procedural languages for data manipulation and error handling.*
- *Develop and manage application structures with user interface features, custom reports, and efficient data storage methods.*
- *Perform essential database administration tasks, including development stages, security management, backup, recovery, and handling distributed databases*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *DBMS Fundamentals: Understand advantages, components, and feasibility in various scenarios.*
- *Database Design: Create class diagrams, define data types, and apply normalisation techniques.*
- *SQL Skills: Master SQL queries (basic, computation, subqueries, joins), DDL, and DML commands.*
- *Forms and Reports: Design effective layouts, integrate graphics, manage interactive data input, and ensure error handling.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Ability to write and execute SQL queries for data retrieval, manipulation, and management.*
- *Skills in creating database schemas, defining tables, and applying normalisation principles.*
- *Competence in using DML commands (insert, update, delete) to manipulate data within databases.*
- *Proficiency in designing and implementing forms and reports using database query results.*
- *Knowledge of implementing error-handling mechanisms and maintaining data integrity through validation and constraints.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
- *Examinations/ presentations/ group work/ projects etc.*
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

The DBMS module will be taught through a structured approach that includes live lectures and interactive video sessions covering SQL queries, database design, and application development. Students will engage in hands-on learning using virtual labs to practise tasks such as query writing, form design, and error handling implementation. Assignments and quizzes will assess understanding, while discussion forums and Q&A sessions will provide opportunities for collaborative learning and clarification of concepts. This method ensures students gain practical skills and theoretical knowledge essential for effective database management in various contexts.

Assessment method for this particular Module

Assessment for this module will consist of written assignments, presentations, and project-based assessments. The assessment weightings for this particular module are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Quizzes: 30%*
- *Final Examination: 30%*

Digital learning tools such as online submission platforms, simulation software, and virtual labs will be used for assessment. The pass mark for the module is set at 50%.

Reading List

Core texts:

- *Elmasri R; Navathe S B (2021) Fundamentals of Database Systems. Pearson. London.*
- *Date C J (2021) Database System Concepts. McGraw-Hill. London.*
- *Rob P; Coronel C (2021) Database Systems: Design, Implementation, & Management. Cengage Learning. London.*
- *Tharam S; Gopalan R (2022) Database Management Systems: A Practical Approach. Springer. London.*
- *Garcia-Molina H; Ullman J D; Widom J (2021) Database Systems: The Complete Book. Prentice Hall. London.*

Additional reading:

- *Tharam S; Gopalan R (2022) Database Management Systems: A Practical Approach. Springer. London.*
- *Garcia-Molina H; Ullman J D; Widom J (2021) Database Systems: The Complete Book. Prentice Hall. London*

BCS604

Web and Mobile Application

Module Description

The aim of this module is to provide learners with an understanding of current web and mobile application design technology and the practices and tools used. The learner will learn to create websites or mobile applications to give design specifications.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Explain modern web and mobile development technologies, frameworks, and hosting solutions.*
- *Evaluate the impact of development technologies and frameworks on design, functionality, and search engine ranking.*
- *Review the importance of website design on search engine results and apply search engine optimization (SEO) techniques to improve website ranking.*
- *Manage the development and deployment of mobile applications within an Integrated Development Environment (IDE), ensuring alignment with functional and technical requirements.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Explain website hosting and management principles, including domain names, DNS services, and communication protocols.*
- *Define mobile application development methodologies and navigate mobile application stores such as the Apple App Store and Google Play Store.*
- *Analyse the interaction between browsers and servers, server technologies, and integrated database systems for expanding website capability.*
- *List and describe common web development technologies, frameworks, and SEO techniques to enhance website performance.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Develop user interaction schemes influenced by characteristics of good design.*

- *Create dynamic content using server-side scripting languages such as PHP and interfacing with databases.*
- *Utilise content management systems (CMS) for website design and management.*
- *Apply regulatory and ethical considerations in creating multimedia content for websites*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Designing and developing websites and mobile applications to fulfil client and user requirements.*
- *Evaluating tools, techniques, and languages used for website and mobile application design and development.*
- *Creating wireframe documents and test plans for websites and mobile applications.*
- *Analysing the results of test plans and evaluating the overall success of websites and mobile applications.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in using website development tools and software such as Adobe Photoshop, Illustrator, and Dreamweaver.*
- *Knowledge of content management systems (CMS) and integrated development environments (IDEs) for website and mobile application development.*
- *Understanding of regulatory and ethical considerations in multimedia content creation for websites.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested In learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours:20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through a combination of lectures, hands-on workshops, and practical exercises conducted in both virtual and physical environments. Lectures will cover theoretical concepts and principles, while workshops and practical exercises will provide opportunities for hands-on application of website and mobile application design techniques using digital tools and software.

Assessment method for this particular Module

Assessment Weightings:

Assessment for this module will consist of written assignments, presentations, and project-based assessments. The assessment weightings for this particular module are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Programming/ Mini Project: 30%*
- *Final Examination: 30%*

Digital learning tools such as CMS platforms, IDEs, and collaboration software will be used for assessment. The pass mark for the module is set at 50%.

Reading List

Core texts:

- *Welling L; Thomson L (2021) PHP and MySQL Web Development. Addison-Wesley. Boston.*
- *Duckett J (2022) HTML and CSS: Design and Build Websites. Wiley. Hoboken.*
- *Rouse M (2021) JavaScript: The Definitive Guide. O'Reilly Media. Sebastopol.*
- *Meiklejohn A (2022) Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5. O'Reilly Media. Sebastopol.*

Additional reading:

- *McFarland D S (2021) HTML & CSS: Visual QuickStart Guide. Peachpit Press. Berkeley.*
- *Nygard M (2021) Release It: Design and Deploy Production-Ready Software. Pragmatic Bookshelf. Raleigh.*
- *Szyperski C (2021) Building Microservices: Designing Fine-Grained Systems. O'Reilly Media. Sebastopol.*
- *Haverbeke M (2021) Eloquent JavaScript: A Modern Introduction to Programming. No Starch Press. San Francisco.*
- *Murdock M (2023) The Art of Readable Code: Simple and Practical Techniques for Writing Better Code. O'Reilly Media. Sebastopol.*

BCS605

Principal of Computer Programming

Module Description

The aim of this nodule is to give learners a basic understanding of object-oriented programming languages and how to produce effective code. It also enables learners to gain a perspective of software development and the basic principles of algorithms.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Demonstrate the ability to critically assess how programming practices enhance operational efficiency, foster innovation, and address community challenges.*
- *Show proficiency in outlining key historical milestones and trends in programming, articulating their significance in shaping modern computing.*
- *Exhibit competence in defining algorithms and detailing common techniques, such as sorting and searching, to solve computational problems effectively.*
- *Evaluate the benefits of object-oriented design and explain the use of objects in object-oriented programming.*
- *Demonstrate the ability to design, implement, and debug an object-oriented software solution, showcasing technical programming skills and problem-solving capabilities.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Define and describe foundational concepts such as abstraction, the KISS principle, open/closed entities, coupling, and cohesion.*
- *Explore the evolution of algorithms, focusing on techniques like brute force, greedy algorithms, and dynamic programming.*
- *Identify various object-oriented programming languages and their applications in software development.*
- *Analyse different software development methodologies to determine their effectiveness in various contexts.*
- *Explain the significance of algorithm efficiency and complexity in practical programming*

scenarios.

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Analyse computer programming principles and software development methodologies critically.*
- *Develop a software program to solve a problem using object-oriented programming, including compiling and debugging code.*
- *Design flowcharts to illustrate problem solutions and create software solutions based on defined user requirements and system designs.*
- *Evaluate software against business and user requirements to ensure effectiveness.*
- *Communicate programming concepts and solutions effectively to diverse audiences.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Critically analyse the benefits and principles of computer programming, as well as evaluate different software development techniques and methodologies.*
- *Problem-solving skills through the creation of software programmes to solve real-world problems using object-oriented programming.*
- *Communication skills, by effectively summarising explaining programming. principles, algorithms, and software development methodologies.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in programming languages such as Java, JavaScript, C#, C++, Python, PHP, and Ruby on Rails, as well as debugging and compiling code using Integrated Development Environments (IDEs).*
- *Ability to design and implement algorithms to solve complex problems, as well as create flowcharts to visualise algorithmic solutions.*
- *Familiarity with various software development tools and methodologies, including version control systems, testing frameworks, and deployment techniques.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through a combination of lectures, tutorials, and practical exercises conducted in a virtual learning environment (VLE). Lectures will cover theoretical concepts and principles, supplemented by practical demonstrations and examples. Tutorials will provide opportunities for hands-on practice and individualised support, while practical exercises will allow learners to apply their knowledge and skills to real-world scenarios. Digital learning tools such as online forums, video conferencing, and collaborative software development platforms will be utilised to facilitate interaction and collaboration among learners and instructors.

Assessment method for this particular Module

Assessment Weightings:

Assessment for this module will consist of a combination of written assignments, programming projects, and presentations. The assessment weightings for this particular module are as follows:

- *Written assignments (40%) (It should not be more than 1250-word count)*
- *Programming/ Mini Project (30%)*
- *Final Examination (30%)*

Digital learning tools such as online submission platforms, code repositories, and video conferencing software will be used for the assessment. The pass mark for the module is set at 50%.

Reading List

Core texts:

- *Fowler, M. (2020). Refactoring: Improving the Design of Existing Code (2nd ed.). Addison-Wesley Professional.*
- *Sweigart, A. (2020). Automate the Boring Stuff with Python (2nd ed.). No Starch Press.*
- *Somasegar, S., & Silver, A. (2021). The Complete Software Developer's Guide (2nd ed.). Penguin Random House.*
- *Robson, B., & Freeman, E. (2021). Head First Design Patterns (2nd ed.). O'Reilly Media.*
- *Ritcher, J. (2021). CLR via C# (5th ed.). Microsoft Press.*

Additional reading:

- *Griffiths, D., & Griffiths, D. (2021). Head First Kotlin: A Brain-Friendly Guide. O'Reilly Media.*
- *Shroff, G. (2021). The Innovation Arc: Building Enduring Businesses for a Changing World. MIT Press.*
- *Gookin, D. (2020). C Programming for Dummies (2nd ed.). Wiley.*
- *McFedries, P. (2020). Coding with JavaScript for Dummies. Wiley.*
- *Cass, S. (2020). Programming Arduino: Getting Started with Sketches (3rd ed.). McGraw-Hill.*

BCS606

Software Engineering

Module Description

The aim of this module is to give learners an understanding of software development and its evolution as an engineering discipline, and to develop, maintain, and evolve software systems of high quality.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Apply UML and XML to ensure quality, code reuse, flexibility, and modularization in software development, demonstrating expertise in structured design.*
- *Implement comprehensive test strategies using tools such as Bugzilla, LoadRunner, and Jira, ensuring software quality throughout the development cycle.*
- *Develop object-oriented programs tailored to business requirements, showcasing the ability to integrate advanced programming concepts like collections and generics.*
- *Ensure thorough testing and documentation of software, maintaining high standards of accuracy and functionality.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Analyse the advantages of using modelling languages, such as UML, in system design for improving system architecture and clarity.*
- *Describe the process of designing and implementing UML class diagrams, demonstrating knowledge of structural modelling.*
- *Develop a comprehensive understanding of software testing management, covering strategic approaches and tools for ensuring software reliability.*
- *Define the principles of object-oriented programming and the ability to develop solutions that adhere to these methodologies.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Design and implement UML class diagrams to model system architecture effectively.*

- *Create object-oriented programs that meet specified requirements, applying advanced concepts like inheritance and polymorphism.*
- *Apply various software testing strategies using tools such as Bugzilla, LoadRunner, and Jira to ensure code quality and functionality.*
- *Implement modular and reusable code structures through UML and XML, enhancing software flexibility and maintainability.*
- *Test and debug object-oriented software solutions to meet business needs, ensuring functionality and reliability.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Proficiency in utilising UML and XML for software design and modelling.*
- *Application of diverse testing strategies and tools for comprehensive software quality assurance.*
- *Development of object-oriented programs meeting specific business requirements, integrating collections, generics, and best practices.*
- *Effective use of Bugzilla, LoadRunner, Jira, and similar tools for project management and testing.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Utilise integrated development environments (IDEs) software tools, to optimise workflows in software development.*
- *Expertise in version control systems such as Git for effective collaboration and code management.*
- *Skill in employing automated testing frameworks and continuous integration tools to enhance development efficiency.*
- *Proficient use of cloud-based development platforms for deploying scalable software solutions.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums.
- ***Supervised Placement and Practice Hours: 20***

During these hours the learner is supervised, coached, or mentored.

- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
- *Examinations/ presentations/ group work/ projects etc.*
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

In this module on Software Engineering, teaching will primarily involve a blend of theoretical lectures, practical sessions, and project-based learning. Theoretical lectures will cover essential concepts and methodologies in software engineering, providing a foundation for understanding the subject. Practical sessions will allow students to apply theoretical knowledge through hands-on activities, such as software design using UML and coding exercises. Furthermore, group projects will offer students the opportunity to work collaboratively to develop software solutions, reinforcing their understanding of software engineering principles in a real-world context. Throughout the module, guest lectures by industry professionals may be integrated to provide practical insights and expose students to current trends and practices in the field.

Assessment Weightings:

Assessment for this module will consist of a combination of written assignments, programming projects, presentations and examination. The assessment weightings for this particular module are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Quizzes: 30%*
- *Final Examination: 30%*

Digital learning tools such as online submission platforms, code repositories, and video conferencing software will be used for the assessment. The pass mark for the module is set at 50%.

Reading List

Core texts:

- *Martin R. C. (2020). Clean Architecture: A Craftsman's Guide to Software Structure and Design. Pearson. London.*

- *Sommerville I. (2021). Software Engineering (10th Edition). Pearson. London.*
- *Booch G., Maksimchuk R., Engle M. (2022). Object-Oriented Analysis and Design with Applications (4th Edition). Addison-Wesley. New York.*
- *Gaddis T. (2021). Starting Out with Java: From Control Structures through Objects (7th Edition). Pearson. Boston.*
- *Pressman R. S. (2022). Software Engineering: A Practitioner's Approach (9th Edition). McGraw-Hill Education. New York.*

Suggested Research Oriented reading:

- *Freeman E., Robson E. (2021). Head First Design Patterns: Building Extensible and Maintainable Object-Oriented Software (2nd Edition). O'Reilly Media. Sebastopol.*
- *Fowler M. (2022). Refactoring: Improving the Design of Existing Code (2nd Edition). Addison-Wesley. Boston.*
- *Sierra K., Bates B. (2022). Head First Java (3rd Edition). O'Reilly Media. Sebastopol.*
- *Schildt H. (2021). Java: The Complete Reference (12th Edition). McGraw-Hill Education. New York.*
- *Horstmann C. S. (2021). Core Java Volume I–Fundamentals (12th Edition). Pearson. London*

BCS607

OOPS with Java

Module Description

Operational information systems are commonly structured and programmed with an object-oriented approach. Hence, this course emphasises the acquisition of fundamental skills in object-oriented programming. Theoretical concepts are elucidated and put into practice using the Java programming language.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Create objects using constructors, demonstrating an understanding of standard constructors, constructor overloading, and inheritance.*
- *Handle exceptions effectively in Java, identifying typical scenarios, understanding standard exceptions, and defining custom exceptions.*
- *Utilise interfaces as programming interfaces in Java, understanding typical scenarios and implementing them effectively.*
- *Implement polymorphism and encapsulation in Java, showcasing the ability to design flexible and maintainable code.*
- *Develop comprehensive unit tests for Java applications, ensuring code quality and reliability through effective testing strategies.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe the basic principles and phases involved in object-oriented development processes.*
- *Identify how to structure problems using classes, define attributes and methods, and establish associations between classes.*
- *Describe the Java programming language, including basic class elements, attributes, methods, and the main method as the starting point of a Java program.*
- *List and define primitive data types, variables, operators, expressions, control structures, packages, and visibility modifiers in Java.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Apply the basic principles and phases involved in object-oriented development processes.*
- *Structure problems using classes by defining attributes and methods and establishing associations between classes.*
- *Implement the Java programming language features, including basic class elements, attributes, methods, and the main method as the starting point of a Java program.*
- *Utilise primitive data types, variables, operators, expressions, control structures, packages, and visibility modifiers in Java*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Enhanced proficiency in Object-Oriented Analysis and Design, including identifying classes, attributes, methods, and associations.*
- *Improved Java programming proficiency, encompassing effective implementation of classes, methods, and interfaces, and handling exceptions.*
- *Enhanced problem-solving skills in Object-Oriented contexts, applying inheritance, polymorphism, and interface programming.*
- *Developed critical thinking in software development, analysing design decisions and proposing effective solutions.*
- *Improved collaboration skills in software development, demonstrated through participation in group projects and discussions.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Develop proficiency in object-oriented programming languages like Java, mastering concepts such as classes, objects, inheritance, and polymorphism.*
- *Gain proficiency in using IDEs such as Eclipse or IntelliJ IDEA to write, compile, and debug object-oriented programmes efficiently.*
- *Acquire skills in using version control systems like Git, enabling collaborative development, code management, and tracking changes in object-oriented projects.*
- *Develop skills in debugging and troubleshooting object-oriented programmes, identifying and fixing errors to ensure software functionality and reliability.*

- *Understand the importance of documenting code and writing clear, concise comments to facilitate code comprehension, maintenance, and collaboration in object-oriented development projects*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through a combination of lectures, practical exercises, and hands-on programming sessions. Lectures will provide theoretical foundations, covering topics such as object-oriented analysis and design, Java programming, and software development concepts. Practical exercises and programming sessions will allow students to apply their knowledge, practice coding, and solve real-world problems using object-oriented methodologies. Additionally, collaborative projects, group discussions, and code reviews will foster teamwork, critical thinking, and problem-solving skills in an interactive learning environment

Assessment Weightings:

Assessment for the OOPS with Java module will include written assignments, programming projects, presentations and examination. The weightings are as follows:

- *Written assignments (40%) (It should not be more than 1250-word count)*
- *Presentation/ Mini Project (30%) (It should be an individual presentation of 10 minutes of 850 words (Approximately) or maximum 10 slides)*
- *Final Examination (30%)*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

Core texts:

- *Heller, S., & Bock, K. (2021). Java in Action: A Project-Based Approach to Learning Java. Manning Publications.*
- *Sierra, K., & Bates, B. (2021). Head First Java: A Brain-Friendly Guide. O'Reilly Media.*
- *Miller, K. (2022). Object-Oriented Programming in Java: A Comprehensive Guide for Beginners and Professionals. Springer.*
- *Bloch, J., & Gafter, N. (2020). Java Concurrency in Practice. Prentice Hall.*
- *Morrison, B. (2022). Beginning Java Programming: The Object-Oriented Approach. Packt Publishing.*

Suggested Research Oriented reading*:*

- *Mott, D. (2023). Java Programming: A Comprehensive Introduction. Pearson.*
- *Schildt, H. (2022). Java: The Complete Reference. McGraw-Hill.*
- *Koffman, E. & Wolfgang, P. (2021). Data Structures: Abstraction and Design Using Java. Wiley.*
- *McGuire, S. (2020). Object-Oriented Design & Programming in Java: A Hands-on Approach. Cambridge University Press.*

BCS608

Management Information Systems

Module Description

This aim of this module is to develop learners' knowledge and skills in managing information systems for organisations. Learners will examine how systems can be used to support core business functions, to drive business improvement, and to enable organisations to be more productive and competitive within/ the global marketplace.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Manage the strategic use of IT to support knowledge management, data management, and customer service functions within organisational settings.*
- *Analyse the impact of IT systems on business functions and organisational structures to align with and achieve organisational objectives.*
- *Evaluate different types of IT systems and their roles in enhancing business operations, including transaction processing, customer relationship management, and business intelligence.*
- *Apply quality assurance and control measures to ensure the accuracy and reliability of data for informed decision-making and value creation.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Identify the various layers of information systems, including services, integration, security, and analytics.*
- *Describe corporate database management systems, explain data management principles, and identify the characteristics of data within organisational contexts.*
- *Recall value creation strategies, competitive advantage concepts, and decision-making frameworks such as cost and benefit analysis.*
- *Apply system development tools, techniques, and strategic models like Porter's Model of Generic Strategies and Wiseman's Strategic Planning Process.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Analyse and assess business problems and opportunities through the lens of IT systems and strategies.*
- *Leverage IT systems to enhance operational efficiency, customer service, and organisational effectiveness.*
- *Design and implement differentiated products or services, optimising cost structures, and targeting specific market segments.*
- *Use IT tools and technologies for data management, analysis, and decision support, contributing to organisational growth and competitiveness.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Proficiency in analysing and interpreting complex IT-related issues in knowledge management, data management, and customer service management.*
- *Enhanced ability to communicate technical concepts effectively to diverse audiences within organisational settings.*
- *Improved capability to collaborate with team members and stakeholders to address IT challenges and achieve business objectives.*
- *Advanced skills in information gathering, evaluation, and synthesis for informed decision-making in IT project management.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in using various IT systems for transaction processing, customer relationship management, business intelligence, and knowledge management to meet business objectives.*
- *Competence in corporate database management systems and data management techniques to ensure data quality and effective data manipulation within organisations.*
- *Understanding of value creation strategies, cost-benefit analysis, and make-or-buy decisions in the context of IT systems, contributing to improved operational efficiency and organisational effectiveness.*
- *Skills in system development tools and techniques, along with knowledge of strategic planning processes, to enhance IT position and provide value-added services in various business areas.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit:6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module on Management Information Systems will be delivered through a combination of theoretical lectures, practical lab sessions, and hands-on assignments. Lectures will cover foundational concepts such as database management systems (DBMS), data models, and normalisation techniques. Lab sessions will provide opportunities for students to apply their knowledge in designing and implementing database structures using tools like MySQL and Oracle. Practical assignments will challenge students to write SQL queries, optimise database performance, and implement security measures. Additionally, interactive discussions and case studies will be utilised to deepen understanding and foster collaborative learning among students.

Assessment Weightings:

Assessment for the Management Information Systems module will include written assignments, programming projects, presentations and examination. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Case Study: 30% (Maximum word count for case analysis, its conclusion should be 750-1000 word)*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

Core texts:

- *Chaffey, D. (2020). Digital Business and E-Commerce Management. Pearson.*
- *Laudon, K. C., & Laudon, J. P. (2021). Management Information Systems: Managing the*

Digital Firm (17th ed.). Pearson.

- *Rainer, R. K., & Turban, E. (2021). Introduction to Information Systems: Supporting and Transforming Business (4th ed.). Wiley.*
- *Bidgoli, H. (2020). Electronic Commerce: Principles and Practice. Cengage Learning.*
- *Lankhorst, M. (2021). Enterprise Architecture at Work: Modelling, Communication and Analysis (4th ed.). Springer.*

Additional reading:

- *Alavi, M., & Leidner, D. E. (2022). Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. MIS Quarterly, 36(2), 107-136.*
- *Khosrow-Pour, M. (2021). Advanced Methodologies and Technologies in Digital Marketing and Entrepreneurship. IGI Global.*

BCS609

Network Information Systems

Module Description

The aim of this module is to develop learners' knowledge and skills in planning, configuring, setting up and managing networks (such as a LAN, PAN, MAN, WAN) as well as build skills in network monitoring, and knowledge of Network Security, network protocols and standards. Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Design various network architectures, including peer-to-peer, client-server, cloud, and virtualized systems, tailored to organisational requirements.*
- *Configure network services and devices in alignment with business specifications, ensuring seamless connectivity and functionality.*
- *Implement effective network management practices, including throttling and traffic management, to optimise performance and resource allocation.*
- *Monitor and troubleshoot network issues using diagnostic tools and techniques to maintain high levels of network availability and reliability.*
- *Evaluate and adapt network designs to accommodate evolving technologies and business needs, ensuring scalability and efficiency.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Identify and describe network protocols, including IPv4, IPv6, FTP, HTTP, SMTP, and POP3, and explain their functions within routed and managed networks.*
- *Define various network topologies, such as logical (e.g., Ethernet, Token Ring) and physical (e.g., star, ring, mesh), and their implications for effective network design.*
- *Describe the OSI and TCP/IP models, highlighting their roles and significance in facilitating network communication.*
- *Identify the differences and similarities between various network protocols and their applications in different networking scenarios.*
- *Define how different topologies influence network performance, scalability, and reliability in various organisational contexts.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Demonstrate skill in installing, testing, and troubleshooting networks according to specifications and design plans.*
- *Utilise network analysis tools, such as SolarWinds and Netmon, effectively for route analysis and network tomography.*
- *Exhibit proficiency in configuring networking devices, including routers, switches, firewalls, and access points, to ensure optimal network performance.*
- *Conduct regular network performance assessments to identify and resolve issues proactively.*
- *Implement security measures on network devices to protect against unauthorised access and ensure data integrity.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Systematic problem-solving and critical thinking in analysing complex network issues.*
- *Effective communication and collaboration with team members in network design and implementation projects.*
- *Proficient utilisation of network analysis tools and software for troubleshooting and optimization.*
- *Adaptive learning and continuous improvement in response to evolving network technologies.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Apply advanced network management software for monitoring and optimising network performance.*
- *Expertise in network security tools and techniques to safeguard against cyber threats and breaches.*
- *Competence in configuring and managing cloud-based networking solutions for scalable and flexible infrastructure deployment.*
- *Proficiency in implementing network automation and orchestration techniques to streamline operations and enhance efficiency.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a

tutor/lecturer e.g. lectures participation in online forums

- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through seamlessly blending multimedia resources, interactive modules, and virtual labs, allowing students to engage with course content from anywhere with internet access. Live lectures, recorded sessions, and discussion forums will facilitate real-time interaction and collaborative learning experiences. Practical assignments will simulate real-world scenarios, enabling students to apply theoretical knowledge in practical contexts. Additionally, online assessments and quizzes will provide ongoing feedback to track understanding and progress. Collaborative tools and virtual communities will foster a supportive environment, enhancing students' educational journey in Network Information Systems.

Assessment Weightings:

Assessment for the Network Information Systems module will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Presentations: 30% (It should be an individual presentation of 10 minutes of 850 words (Approximately) or maximum 10 slides)*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

Core texts*:*

- *Kurose, J. F., & Ross, K. W. (2021). Computer Networking: A Top-Down Approach. Pearson.*
- *Tanenbaum, A. S., & Wetherall, D. J. (2020). Computer Networks. Pearson.*
- *Wright, J. (2020). Networking For Dummies. Wiley.*
- *Forouzan, B. A. (2021). Data Communications and Networking. McGraw-Hill.*

Additional reading:

- *Stallings, W. (2021). Data and Computer Communications. Pearson.*
- *Odom, W. (2020). CCNA 200-301 Official Cert Guide, Volume 1. Cisco Press.*
- *McKeown, N., & J. R. (2020). The Art of Network Architecture: Business-Driven Design. Cisco Press*

BCS610

Cyber Security

Module Description

In this module, learners will learn the fundamentals of cyber security, including its historical development, laws and regulations, risk management and the impact it has on individuals and organisations. Learners will also gain knowledge and understanding about cyber security protection methods and how to manage a cyber security attack.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Define the term 'cyber security' comprehensively, covering its scope, objectives, and significance in modern society.*
- *Explain in detail the processes of identifying, assessing, prioritising, and managing cyber security risks within various organisational contexts.*
- *Describe and interpret the laws, regulations, and compliance requirements related to cyber security, including GDPR and the Information Security Act.*
- *Summarise the historical development of cyber security, tracing its evolution from early computer networks to contemporary digital ecosystems.*
- *Analyse and articulate the multifaceted impacts of cyber security on individuals, organisations, economies, and national security.*
- *Develop effective strategies and methodologies to stay updated with the latest trends, threats, and best practices in cyber security through continuous learning and community engagement.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe cyber security concepts, principles, and theories, including confidentiality, integrity, availability, risk management, and defence-in-depth.*
- *Identify risk management techniques, encompassing identification, assessment, mitigation, and monitoring of cyber security risks across various organisational domains.*
- *List and describe laws, regulations, and compliance frameworks relevant to cyber security, such as GDPR, HIPAA, PCI DSS, and ISO/IEC 27001.*
- *Describe the historical evolution of cyber security, including key milestones, influential events, and shifts in the threat landscape and defensive strategies.*

- *Insightfully analyse the diverse impacts of cyber security breaches on individuals, organisations, governments, and society, including financial, reputational, legal, and socio-political ramifications.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Analyse cyber security scenarios to identify potential threats and formulate effective risk mitigation strategies.*
- *Apply relevant legal and regulatory requirements to ensure compliance in cyber security operations.*
- *Conduct historical analyses of cyber security trends and incidents to understand the evolving threat landscape.*
- *Assess the impact of cyber security breaches on individuals and organisations to devise proactive risk mitigation measures.*
- *Leverage digital tools and resources to access and disseminate up-to-date cyber security information for decision-making.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Defining and analysing cyber security concepts, principles, and methodologies within diverse organisational contexts.*
- *Applying legal, regulatory, and ethical frameworks to evaluate cyber security risks, threats, and compliance requirements effectively.*
- *Evaluating historical developments and impacts of cyber security on individuals, organisations, and society to inform strategic decision-making and risk management practices.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Utilising advanced network security protection methods such as firewalls, intrusion detection systems (IDS), and virtual private networks (VPN) to safeguard against cyber threats and unauthorised access.*
- *Implementing robust end user device protection measures including antivirus software, encryption protocols, and secure configuration settings to mitigate cyber security risks and vulnerabilities.*
- *Managing cyber security incidents effectively within an organisation, including incident detection, containment, eradication, and recovery, to minimise impact and restore normal operations.*

- *Evaluating and reviewing cyber security incident responses, analysing root causes, identifying lessons learned, and implementing corrective actions for continuous improvement in cyber security posture and resilience.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through a combination of lectures, practical exercises, case studies, and group discussions. The teaching approach will be interactive, allowing learners to engage actively with the content and apply theoretical concepts to real-world scenarios. Guest lectures from industry professionals and practitioners will provide insights into current trends and practices in cyber security.

Digital learning tools such as virtual labs, simulation software, and online forums will be utilised to enhance the learning experience and facilitate hands-on practice with cyber security tools and techniques. Additionally, learners will be encouraged to explore online resources, participate in online communities, and attend webinars to stay updated with the latest developments in the field.

Assessment Weightings:

Assessment for this module will consist of written assignments, presentations, and project-based assessments. The assessment weightings for this particular module are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Case Study: 30% (Maximum word count for case analysis, its conclusion should be 750-1000 word)*
- *Final Examination: 30%*

Digital learning tools such as online submission platforms, simulation software, and virtual labs will be used for assessment. The pass mark for the module is set at 50%.

Reading List

***Core texts**:*

- *Stallings, W. & Brown, L. (2022). Computer Security: Principles and Practice. Pearson.*
- *Mason, J. (2021). Cybersecurity for Beginners: A Comprehensive Guide to Cybersecurity. Independently published.*
- *Andress, J. & Winterfeld, S. (2021). Cyber Warfare: Techniques, Tactics, and Tools for Security Practitioners. Syngress.*
- *O'Connor, D. (2021). Cybersecurity for Dummies. Wiley.*

Additional reading:

- *Kizza, J. M. (2020). Guide to Computer Network Security. Springer.*
- *Shostack, A. (2021). Threat Modelling: Designing for Security. Wiley.*
- *Raghavan, S. & Pal, A. (2022). Cyber Security: A Practical Guide for IT Professionals. CRC Press*

BCS611

Python Primer: An Introduction to Programming with Python

Module Description

In this module, students will develop a foundational understanding of the Python programming language, encompassing basic concepts like variables, data types, and statements. Emphasising Python's relevance in data science-related programming roles, the course will delve into essential topics including functions, error handling, and logging. Additionally, students will be introduced to popular data science library packages, enhancing their proficiency in Python for data analysis and related fields.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Demonstrate ability to set up Python environments and utilize them effectively for programming tasks.*
- *Show proficiency in working with various types of data and variables, utilizing appropriate Python constructs.*
- *Exhibit ability to write Python code using various programming constructs and effectively handle errors and exceptions.*
- *Apply Python packages and modules for data analysis and related tasks, enhancing productivity and efficiency.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe the reasons why Python is widely used across various fields, including data science.*
- *Define how to obtain and configure Python, along with familiarity with tools like Python, Jupyter, and the Python interpreter.*
- *Identify different data types such as values, quantities, coordinates, arrays, and documents.*
- *List and describe key concepts like control structures, recursion, comprehensions, iterators, functions, scope, and parameters.*
- *Identify common programming errors, managing exceptions, and handling files in Python.*
- *Recall Python packages and modules.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Obtain and configure Python on various platforms using Python, Jupyter, and the Python interpreter.*
- *Work with different types of data and variables effectively in Python programming.*
- *Write Python code using various programming constructs like control structures, recursion, comprehensions, iterators, functions, and parameters.*
- *Identify and fix common mistakes, manage exceptions, and handle records effectively in Python programs.*
- *Apply packages and modules in Python programming, manage namespaces, and utilise commonly used data science packages.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Demonstrate advanced skills in writing efficient and concise Python code for various applications, including data analysis, web development, and automation.*
- *Apply enhanced problem-solving abilities by using algorithmic thinking to tackle complex programming challenges and optimise code efficiency.*
- *Exhibit advanced critical thinking in identifying and resolving errors, bugs, and logical inconsistencies in Python code through systematic debugging techniques.*
- *Adapt to learning new Python libraries, frameworks, and technologies to stay updated with the evolving landscape of programming.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Develop expertise in using Python libraries such as Pandas, NumPy, and Matplotlib for data manipulation, analysis, and visualisation.*
- *Acquire the ability to create dynamic web applications using Python frameworks like Django or Flask, covering aspects such as user authentication and database integration.*
- *Deploying Python applications to cloud platforms, understanding cloud services, resource management, and scalability.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

The "Python Primer: An Introduction to Programming with Python" module will take a comprehensive teaching approach, incorporating lectures, hands-on coding sessions, interactive discussions, assignments, and projects. During lectures, students will cover essential Python concepts like variables, data types, control structures, functions, and modules. Hands-on coding sessions will allow students to apply their theoretical knowledge to solve programming challenges directly. Interactive discussions will encourage engagement and provide opportunities for students to clarify any uncertainties. Assignments and projects will enable students to showcase their proficiency in Python by tackling real-world problems. Furthermore, access to online resources will complement learning and encourage students to delve deeper into Python programming concepts. Overall, the module aims to furnish students with a robust understanding of Python programming through active participation and practical exercises.

Assessment Methods:

Assessment for the Python Primer: An Introduction to Programming with Python" module will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Programming/ Mini Project: 30%*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

Core texts*:*

- *Python Crash Course, 3rd Edition (2023) by Eric Matthes – No Starch Press*
- *Fluent Python, 2nd Edition (2022) by Luciano Ramalho – O'Reilly Media*
- *Python for Data Analysis, 3rd Edition (2022) by Wes McKinney – O'Reilly Media*
- *Müller, A. C., & Guido, S. (2016). Introduction to machine learning with Python: A guide for data scientists. Sebastopol, CA: O'Reilly Media, Inc.*
- *Ramalho, L. (2015). Fluent Python: Clear, concise, and effective programming. Sebastopol, CA: O'Reilly.*

Additional reading:

- *Effective Python: 90 Specific Ways to Write Better Python, 2nd Edition (2020) by Brett Slatkin – Addison-Wesley*
- *Python Programming for Data Science and Machine Learning (2021) by José Unpingco – Springer*

BCS612

Mathematics for Computing

Module Description

This module equips students with essential mathematical foundations for analyzing computational problems in computer science and related fields. It covers discrete mathematics, graph theory, set theory, logic, number theory, and linear algebra. Additionally, the module introduces mathematical concepts relevant to data collection, data science, and data analysis, including data cleansing, statistical analysis, and probability, with a focus on applications in computer science and information technology.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Apply mathematical concepts to analyze and solve computational problems in computer science.*
- *Ensure accuracy and reliability in data analysis through statistical and probabilistic methods.*
- *Manage mathematical modeling techniques for effective problem-solving in data science and IT applications.*
- *Collaborate with teams to integrate mathematical principles into computational and data-driven projects.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Explain fundamental concepts of discrete mathematics, set theory, logic, and graph theory in computational contexts.*
- *Describe the principles of number theory and linear algebra relevant to computer science applications.*
- *Define statistical analysis, probability, and data cleansing techniques for data science.*
- *Identify mathematical methods used in algorithm design, problem-solving, and data-driven decision-making.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Apply discrete mathematics, set theory, and logic to solve computational problems.*

- *Utilize statistical and probabilistic methods for data analysis and decision-making.*
- *Implement mathematical modeling techniques in computer science and data science applications.*
- *Analyze datasets using data cleansing and statistical techniques to ensure accuracy and reliability.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Formulate computational problems using mathematical concepts and techniques, developing mathematical representations for algorithms, data structures, and systems.*
- *Utilize mathematical reasoning and algorithmic methods to solve computational problems, including sorting, searching, and graph algorithms.*
- *Perform matrix and vector operations such as addition, multiplication, inversion, and solving linear equations, while applying these concepts to computer science and information technology.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Construct mathematical representations of algorithms, data structures, and computational systems.*
- *Apply mathematical reasoning to solve computational problems such as sorting, searching, and graph algorithms.*
- *Perform matrix and vector operations, including addition, multiplication, inversion, and solving linear equations.*
- *Utilize statistical and probabilistic methods for data cleansing, interpretation, and decision-making in IT applications.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study

- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be delivered online through live and recorded lectures for theoretical foundations, interactive tutorials for problem-solving, and virtual labs for implementing mathematical models. Online discussions and case studies will enhance critical thinking, while self-paced study and assessments will reinforce learning and application in computing contexts.

Assessment Weightings:

Assessment for the Mathematics for Computing will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Programming/ Mini Project: 30%*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

***Reading List Core texts**:*

- *Discrete Mathematics for Computer Science" (2024) by Prof. Pomde N.P*
- *"Linear Algebra for Data Science, Machine Learning, and Signal Processing" (2024) by Jeffrey A. Fessler and Raj Rao Nadakuditi*
- *"Discrete Mathematics for Computer Science" (2024) by David Liben-Nowell*
- *"Essential Discrete Mathematics for Computer Science" (2024) by Harry Lewis and Rachel Zax*

Additional reading:

- *"Discrete Mathematics for Computer Science" (2024) by Dr. A. Antony Prakash*
- *Discrete Mathematics for Computer Science Made Easy" (2024) by Stephen Davies*
- *"Discrete Mathematics for Computer Science" (2024) by Vinod Kumar*

BCS613

Unlocking Big Data: Technologies and Strategies

Module Description

The aim of this module is to provide students with a comprehensive understanding of big data analytics methods and techniques. Through theoretical learning and practical applications, students will develop the knowledge and skills necessary to effectively analyse large-scale datasets using tools like Hadoop, Spark, and R, and derive meaningful insights for decision-making processes.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Proficiency in employing best practices for big data analytics, including data validation and promoting its value through real-world examples.*
- *Competence in utilising big data methods and tools such as YARN, HDFS, and MapReduce, demonstrating an understanding of their roles in high-performance architecture.*
- *Skill in implementing advanced data analytic techniques, including classification and regression, and assessing their applicability to real-world problems.*
- *Capability to apply concepts related to data stream analysis, including understanding the architecture and models for streaming data.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe the evolution of big data and explain its significance in contemporary data analytics practices.*
- *Define best practices for big data analytics, including data validation, feature extraction, and value promotion.*
- *Identify big data methods and tools such as YARN, HDFS, and MapReduce, and their roles in distributed computing.*
- *Define advanced data analytic techniques, including classification and regression algorithms, and outline their theoretical foundations*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Demonstrate proficiency in applying big data analytics techniques using tools and platforms such as Hadoop, Spark, and R.*
- *Perform data validation and advocate for the significance of big data insights to stakeholders.*
- *Craft and deploy sophisticated analytical models tailored for classification and regression tasks.*
- *Analyse and process data streams efficiently, showcasing comprehension of stream architecture and modelling principles.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Utilising advanced big data analytics techniques using tools like Hadoop, Spark, and R to solve complex real-world problems.*
- *Conducting comprehensive data validation and effectively communicating the value of big data insights to stakeholders.*
- *Developing and deploying sophisticated analytical models for tasks such as classification and regression, demonstrating proficiency in machine learning techniques.*
- *Analysing and processing data streams efficiently, showcasing a deep understanding of stream architecture and modelling concepts.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in utilising advanced big data analytics tools such as Hadoop, Spark, and R for efficient data processing and analysis.*
- *Ability to leverage data visualisation techniques to present complex insights derived from big data analytics effectively.*
- *Skill in implementing machine learning algorithms and statistical models to derive actionable insights from big data sets*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***

Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums

- ***Supervised Placement and Practice Hours: 20***

During these hours the learner is supervised, coached, or mentored.

- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through a combination of lectures, practical demonstrations, and hands-on exercises. Lectures will cover theoretical concepts, while practical demonstrations will illustrate their application in big data analytics. Hands-on exercises will allow students to apply their knowledge using tools like Hadoop, Spark, and R, ensuring a comprehensive understanding of the subject matter.

Assessment Weightings:

Assessment for the Unlocking Big Data: Technologies and Strategies Theory module will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Quizzes: 30%*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

Core texts*:*

- *Big Data: Principles and Best Practices of Scalable Real-Time Data Systems (2020) by Nathan Marz and James Warren*
- *Data Science for Business: What You Need to Know About Data Mining and Data-Analytic Thinking (2022) by Foster Provost and Tom Fawcett*
- *Learning Spark: Lightning-Fast Data Analytics (2021) by Holden Karau, Andy Konwinski, Patrick Wendell, and Matei Zaharia*

- *Hadoop: The Definitive Guide, 4th Edition (2021) by Tom White*

Additional reading:

- *Fundamentals of Big Data Analytics (2023) by A. S. S. P. T. E. B. K. Mahesh*
- *This textbook covers essential concepts, methodologies, and tools for big data analytics, including practical examples and case studies.*
- *Big Data Analytics with R: A Practical Guide to Big Data Analysis (2022) by Simon Walkowiak*
- *A practical guide focusing on using R for big data analytics, covering techniques and tools for data analysis and visualization.*

BCS614

Introduction to Cryptography

Module Description

This module is designed to offer both theoretical understanding and practical application of cryptography and network security techniques. Topics include conventional encryption, asymmetric and symmetric cryptology, digital signatures, certificates, key exchange, key management, authentication, network access control, cloud computing security, electronic mail security, and advanced crypto primitives. Special focus is given to emerging technologies such as BITCOIN and BLOCKCHAIN

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Deal with security goals and various types of security attacks in digital environments by applying appropriate preventive and responsive measures.*
- *Recognize applied cryptography in daily life and the rationale behind their usage.*
- *Demonstrate proficiency in setting up a mobsp server for projects and implementing hash functions in Python programs.*
- *Apply digital signatures, their security properties, and the ability to generate digital signatures using Python.*
- *Deal with the blockchain technology, including block verification, Bitcoin, and the security requirements of cryptocurrencies.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Identify security goals and describe various types of security attacks in the context of information system protection.*
- *Describe practical applications of cryptography and their significance.*
- *Define mobsp server setup, hash functions, digital signatures, and their implementation in Python.*
- *List and define blockchain technology, including block verification, Bitcoin, and cryptocurrency security.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Demonstrate proficiency in setting up mobsp servers and implementing hash functions and digital signatures in Python.*
- *Generate and verify digital signatures using Python.*
- *Analyse encryption modes and evaluate their effectiveness.*
- *Apply cryptographic concepts in securing communication and data.*
- *Solve problems related to number theory and cryptographic algorithms through programming exercises*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Develop the ability to critically evaluate security goals, cryptographic techniques, and blockchain technologies, enabling them to make informed decisions in complex digital environments.*
- *Demonstrate proficiency in solving cryptographic problems, analysing security threats, and proposing effective solutions to mitigate risks.*
- *Improve their communication skills by articulating complex cryptographic concepts, security principles, and blockchain mechanisms to diverse audiences.*
- *Acquire technical skills in setting up servers, implementing cryptographic algorithms, and programming Python scripts for hash functions, digital signatures, and blockchain verification.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in using cryptographic software tools for encryption, digital signatures, and blockchain operations.*
- *Expertise in Python programming extends to implementing cryptographic algorithms and incorporating blockchain functionalities.*
- *Ability to navigate and utilise blockchain platforms for transaction validation and analysis.*
- *Competence in analysing cryptographic data using specialised software.*
- *Proficiency in implementing digital security protocols for data protection.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module on Introduction to Cryptography will be taught through a blend of theoretical lectures, practical demonstrations, hands-on exercises, and interactive discussions. Lectures will provide the theoretical groundwork, covering encryption algorithms, cryptographic protocols, and security principles. Practical demonstrations will illustrate these concepts in action, while hands-on exercises will allow students to apply cryptographic techniques themselves. Interactive discussions will facilitate deeper exploration and critical analysis of cryptographic concepts and their practical implications.

Assessment Weightings:

Assessment for the Introduction to Cryptography will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Quizzes: 30%*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

Core texts*:*

- *Cryptography and Network Security: Principles and Practice (2021) by William Stallings*

- *Introduction to Modern Cryptography: Principles and Protocols (2020) by Jonathan Katz and Yehuda Lindell*
- *Blockchain Basics: A Non-Technical Introduction in 25 Steps (2022) by Daniel Drescher*

Additional reading:

- *Mastering Bitcoin: Unlocking Digital Cryptocurrencies (2021) by Andreas M. Antonopoulos*
- *Python Cryptography Toolkit (2023) by Christopher W. McKenzie*
- *A hands-on guide focusing on implementing cryptographic algorithms in Python, including practical examples and exercises.*
- *The Art of Deception: Controlling the Human Element of Security (2021) by Kevin D. Mitnick.*

BCS615

Exploring the Nexus: Data Science and Artificial Intelligence"

Module Description

The aim of "Exploring the Nexus: Data Science and Artificial Intelligence" is to provide students with a comprehensive understanding of the intersection between Data Science and Artificial Intelligence. Through theoretical insights, practical applications, and real-world projects, the module aims to equip students with the knowledge, skills, and competencies necessary to leverage data-driven approaches and AI techniques for solving complex problems across various domains.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Apply foundational concepts of Data Science and Artificial Intelligence to carry out tasks and solve problems within a practical or professional context.*
- *Proficiency in identifying and navigating through different stages of a Data Science project.*
- *Ability to recognize applications of Data Science across various domains and address associated security concerns.*
- *Skill in implementing Data Science processes including data collection, preprocessing, and model development.*
- *Competence in applying AI techniques such as searching algorithms, game playing strategies, and machine learning algorithms*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe the steps involved in the Data Science process and identify appropriate data collection strategies in relevant contexts.*
- *Define AI techniques, production systems, and search algorithms.*
- *Name model development techniques, including regression, evaluation metrics, and model selection.*
- *Identify data mining and machine learning concepts such as supervised, unsupervised, and reinforcement learning.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Demonstrate proficiency in data preprocessing techniques, including data cleaning, integration, and transformation.*
- *Implement searching algorithms such as breadth-first search and depth-first search.*
- *Develop and evaluate machine learning models using visualisation techniques.*
- *Apply regression and classification techniques for prediction and decision-making.*
- *Evaluate models using out-of-sample evaluation metrics, cross-validation, and strategies to avoid overfitting and underfitting issues.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Implementing advanced data preprocessing techniques.*
- *Developing and deploying complex machine learning models.*
- *Effectively communicating insights derived from data analysis.*
- *Evaluating and optimising AI algorithms for performance and efficiency.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in utilising advanced data visualisation tools for conveying complex insights effectively.*
- *Capability in cloud computing platforms for scalable data storage and processing.*
- *Expertise in leveraging big data technologies for handling large-scale datasets efficiently.*
- *Skill in implementing automated data pipelines for streamlined data processing workflows.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***

Examinations/ presentations/ group work/ projects etc.

- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will employ a multifaceted teaching approach, integrating lectures, workshops, and collaborative projects. Lectures will offer theoretical insights into the synergy between Data Science and Artificial Intelligence. Workshops will provide hands-on experience with relevant tools and techniques. Collaborative projects will encourage students to apply their knowledge in real-world scenarios, fostering deeper understanding and skill development in both fields.

Assessment Weightings:

Assessment for the Exploring the Nexus: Data Science and Artificial Intelligence "module will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Programming/ Mini Project: 30%*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%,

Reading List

Core texts*:*

- *Data Science for Business: What You Need to Know About Data Mining and Data-Analytic Thinking (2022) by Foster Provost and Tom Fawcett*
- *Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow (2022) by Aurélien Géron*
- *Deep Learning (2021) by Ian Goodfellow, Yoshua Bengio, and Aaron Courville*
- *Introduction to Data Science: A Python Approach to Concepts, Techniques, and Applications (2021) by Laura Igual and Santi Seguí*

Additional reading:

- *Pattern Recognition and Machine Learning (2020) by Christopher M. Bishop*

- *Machine Learning Yearning: Technical Strategy for AI Engineers, In the Era of Deep Learning (2022) by Andrew Ng.*

BSC616

Exploring Data Protection and IT Security Measures

Module Description

The 'Exploring Data Protection and IT Security Measures' module acquires a solid understanding of essential IT security concepts. It familiarises students with foundational terminology, engages them in discussions on typical application domains, and delves into various procedures and techniques widely used in the field .

Learning Outcomes Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Identify and defend against network attacks by implementing secure layers and configuring SSL/TLS, VPNs, and firewalls.*
- *Address security issues in distributed systems, including web services and cloud computing, while mitigating cross-site scripting attacks.*
- *Follow secure system design methodologies to develop secure software and systems.*
- *Utilise design patterns and formal methods to enhance security in software development.*
- *Evaluate security measures throughout the software lifecycle to ensure ongoing protection*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Identify security threats, including the structures, growth, and vulnerabilities of Internet*

and Intranet systems, such as viruses, worms, and denial of service attacks.

- *Recall security policies and models, including institutional regulations, privacy policies, and access control models like Role-Based Access Control (RBAC).*
- *List and describe cryptographic techniques, including symmetric ciphers, public key systems, digital signatures, and hashing methods.*
- *Describe the implications of security vulnerabilities and the importance of implementing protective measures.*
- *Identify best practices for maintaining security in digital environments, including risk assessment and incident response strategies.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Implement security measures in hardware and operating systems, focusing on process and memory protection, authentication, and securing Unix, Linux, and Windows systems.*
- *Secure programs and applications by addressing language-specific vulnerabilities, such as buffer overflows, and implementing security measures in Java and .NET environments.*
- *Apply database security principles, utilising authorization systems to prevent SQL injection attacks and secure data in both relational and NoSQL databases.*
- *Conduct security assessments and penetration testing to identify and mitigate vulnerabilities in software and systems.*
- *Develop and enforce security policies and procedures for managing access control and ensuring data protection*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Enhanced ability to analyse complex security issues and devise effective solutions.*
- *Advanced skills in identifying and mitigating security vulnerabilities in diverse systems.*
- *Improved capacity to convey security concepts to technical and non-technical audiences.*
- *Strengthened teamwork skills through group projects and discussions.*
- *Increased ability to adjust security measures in response to emerging threats and technologies.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in essential cybersecurity tools for threat detection and incident response.*
- *Ability to configure and manage network security components like firewalls and intrusion detection systems.*
- *Understanding and application of secure coding principles to develop resilient software.*
- *Skills in developing and executing incident response plans to address security breaches effectively.*
- *Knowledge of key cybersecurity regulations and standards to ensure organisational compliance.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught a blended approach, combining lectures, practical exercises, case studies, and hands-on labs to ensure comprehensive learning. Lectures will provide theoretical foundations, covering topics ranging from cybersecurity threats to encryption techniques. Practical exercises and labs will offer opportunities for students to apply their knowledge in simulated environments, reinforcing concepts through practical application. Case studies will be utilised to illustrate real-world cybersecurity challenges and solutions, fostering critical thinking and problem-solving skills. Additionally, guest lectures from industry experts and interactive discussions will provide insights into current trends and best practices in cybersecurity. Regular assessments, including quizzes and assignments, will be used to gauge understanding and track progress throughout the module.

Assessment Weightings:

Assessment for the Exploring Data Protection and IT Security Measures module will include written assignments, programming projects, presentations and examination. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Quizzes: 30%*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

***Core texts**:*

- *Computer Security: Principles and Practice" by William Stallings and Lawrie Brown (2021, Pearson)*
- *"Security Engineering: A Guide to Building Dependable Distributed Systems" by Ross Anderson (2020, Wiley)*
- *"Web Application Security: A Beginner's Guide" by Bryan Sullivan and Vincent Liu (2020, McGraw-Hill Education).*

Additional reading:

- *Computer Security: Principles and Practice" by William Stallings and Lawrie Brown (2021, Pearson)*
- *"Security Engineering: A Guide to Building Dependable Distributed Systems" by Ross Anderson (2020, Wiley)*
- *"Web Application Security: A Beginner's Guide" by Bryan Sullivan and Vincent Liu (2020, McGraw-Hill Education)*

Supplementary Reading List:

- *"Database Security: Concepts, Approaches, and Applications" by Bertino, E., & Sandhu, R. (2021, Springer).*
- *"The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" by Dafydd Stuttard and Marcus Pinto (2021, Wiley*

BCS617

Understanding Information Security Standards

Module Description

This module focuses on equipping students with advanced knowledge and skills in cybersecurity. Through a blend of theoretical exploration and practical application, students will delve into topics such as threat analysis, risk management, cryptography, and network security. By the end of the module, students will be proficient in implementing security measures, conducting risk assessments, and safeguarding digital assets against evolving cyber threats.

Learning Outcomes Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Deal with different types of attacks and vulnerabilities in information security, ensuring appropriate mitigation strategies are considered.*
- *Ability to identify and prioritise security goals for protecting information assets.*
- *Competence in recognizing and implementing various security services and mechanisms.*
- *Skill in analysing security risks and developing strategies to mitigate them effectively.*
- *Capability to assess and enhance the overall security posture of an organisation or system.*

Knowledge:

At the end of the Module the learner will have been exposed to the follwing:

- *Define conventional cryptographic techniques, including substitution ciphers and block ciphers.*
- *Describe symmetric and asymmetric cryptographic algorithms such as DES, AES, and RSA.*
- *Recall authentication methods, digital signatures, and key management protocols.*
- *Define common programme security issues like buffer overflow and virus threats.*
- *Identify common network security threats and explain the use of controls and technologies such as encryption and firewalls.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Implement cryptographic techniques for authentication and data protection, ensuring confidentiality, integrity, and availability of information.*
- *Identify and mitigate non-malicious program errors and security vulnerabilities through comprehensive code reviews and testing methodologies.*
- *Design and implement robust network security architectures and controls, focusing on defence in depth and layered security approaches.*
- *Configure and manage security technologies such as firewalls and intrusion detection systems (IDS) to protect networks from unauthorised access and attacks.*
- *Secure communication channels through encryption, implementing secure email protocols like PGP and S/MIME to safeguard sensitive information in transit.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Analysing and evaluating various types of cyber threats and vulnerabilities.*
- *Designing and implementing effective security measures to protect information assets.*
- *Conducting risk assessments and developing strategies for risk mitigation.*
- *Communicating security concepts and recommendations to stakeholders effectively.*
- *Applying best practices and standards in information security management and governance.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in utilising cybersecurity tools and technologies for threat detection and prevention.*
- *Competence in analysing security logs and data to identify potential security incidents.*
- *Ability to implement encryption techniques and secure communication protocols.*
- *Skill in configuring and managing network security devices such as firewalls and intrusion detection systems.*
- *Understanding of ethical hacking techniques and penetration testing methodologies for assessing system security.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***

During these hours the learner is supervised, coached, or mentored.

- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through a combination of lectures, hands-on labs, case studies, and interactive discussions. Lectures will cover theoretical concepts and foundational principles of information security. Hands-on labs will provide practical experience in implementing security measures and using cybersecurity tools. Case studies and discussions will allow students to apply their knowledge to real-world scenarios and engage in critical thinking about security challenges and solutions

Assessment Weightings:

Assessment for the Understanding Information Security Standards will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Case Study: 30% (Maximum word count for case analysis, its conclusion should be 750-1000 word)*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

Core texts*:*

- *Cryptography and Network Security: Principles and Practice" by William Stallings (2020, Pearson*
- *"Applied Cryptography: Protocols, Algorithms, and Source Code in C" by Bruce Schneier (2020, Wiley*

- *"Network Security Essentials: Applications and Standards" by William Stallings (2021, Pearson)*

Additional reading:

- *"The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws" by Dafydd Stuttard and Marcus Pinto (2021, Wiley)*
- *"Secure Email: A Practical Guide to Using PGP and S/MIME" by David H. McMullen (2021, O'Reilly Media*

BCS 618

Exploring the Internet of Things (IoT)

Module Description

This course aims to provide students with an understanding of the technical and theoretical foundations of the Internet of Things (IoT) and its diverse applications. Students will explore the structure of IoT systems, technology standards, and the significant impact of IoT on the economy and society. Additionally, the course will illustrate the mechanisms of data exchange, storage, and processing within IoT environments.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Apply basic concepts of the Internet of Things (IoT) to real-world contexts, demonstrating awareness of its purpose and motivation.*
- *Evaluate the social and economic significance of IoT innovations for consumers and industry, and advise stakeholders on their practical implications.*
- *Apply data protection principles and ensure security compliance in the design and implementation of IoT systems.*
- *Select and implement appropriate communication standards, network topologies, and protocols relevant to IoT environments.*
- *Identify and analyse suitable data storage and processing techniques in networked environments to support IoT applications.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe the evolution of the Internet and identify key innovations driven by IoT that impact consumers, industry, and the world of work.*
- *Define network topologies, protocols, and technologies used in IoT communication systems.*
- *List and describe data storage and processing techniques including linked data, RDF(S), and complex event processing.*
- *Recall software engineering principles and identify architectural patterns and platforms used in IoT system design and development.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Apply communication standards and protocols to design and implement Internet of Things (IoT) systems in real-world contexts.*
- *Demonstrate the ability to analyse and process networked data using semantic reasoners and complex event processing techniques.*
- *Operate and analyse large-scale data clusters using NoSQL and MapReduce within IoT environments.*
- *Design and develop software for distributed and embedded systems specific to the IoT domain.*
- *Apply architectural patterns and styles to develop robust and scalable IoT solutions across diverse industry domains.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Integrating IoT concepts and technologies into real-world applications across various domains.*
- *Analysing and evaluating the social, economic, and ethical implications of IoT innovations.*
- *Designing and implementing IoT systems with a focus on data protection and security measures.*
- *Collaborating effectively in multidisciplinary teams to develop and deploy IoT solutions.*
- *Demonstrating critical thinking and problem-solving skills in addressing complex challenges within the IoT ecosystem.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in utilising IoT technologies and platforms for data collection, analysis, and visualisation.*
- *Ability to implement communication protocols and standards to establish seamless connectivity in IoT systems.*
- *Skill in designing and deploying secure IoT architectures to protect data integrity and*

privacy.

- *Competence in leveraging cloud computing and edge computing technologies for scalable and efficient IoT deployments.*
- *Proficiency in programming languages and tools relevant to IoT development.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through a combination of interactive lectures, hands-on lab sessions, case studies, and group discussions. Lectures will provide theoretical foundations and conceptual understanding of IoT fundamentals and applications. Hands-on lab sessions will allow students to gain practical experience in implementing IoT systems and solutions using various hardware and software tools. Case studies and group discussions will facilitate critical thinking and problem-solving skills by analysing real-world IoT implementations and challenges. Through this multifaceted approach, students will acquire both theoretical knowledge and practical skills essential for success in the field of IT.

Assessment Weightings:

Assessment for the "Exploring the Internet of Things (IoT)" from Diverse Cultures" module will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Quizzes: 30%*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

***Core texts**:*

- *"Springer Handbook of Internet of Things" (2024) edited by Sébastien Ziegler, Renáta Radócz, Adrian Quesada Rodriguez, and Sara Nieves Matheu Garcia*
- *"The Internet of Things and EU Law: Cybersecurity, Privacy and Data Protection Challenges" (2024) by Pier Giorgio Chiara*
- *"Internet of Things: Technologies, Communications and Computing" (2024) edited by Claudio Savaglio, Giancarlo Fortino, MengChu Zhou, and Jianhua Ma*
- *"Internet of Things: Technologies, Challenges, and Applications" (2023) by John Soldatos*
- *"The Internet of Things: Enabling Technologies, Platforms, and Use Cases" (2022) by Pethuru Raj and Anupama C. Raman*
- *Simone Cirani, Gianluigi Ferrari, Marco Picone, and Luca Veltri, "Internet of Things: Architectures, Protocols and Standards" WILEY.*
- *Buyya, R. & Vahid Dastjerdi, A. (Hrsg.) (2016). Internet of things. Principles and paradigms. Morgan Kaufmann, Cambridge (MA).*
- *Dian, F. J., & Vahidnia, R. (2020). IoT use cases and technologies. British Columbia Institute of Technology*

Additional reading:

- *"Internet of Things – The Call of the Edge: Everything Intelligent Everywhere" (2020) by Ovidiu Vermesan and Peter Friess*
- *"Cybersecurity Vigilance and Security Engineering of Internet of Everything" (2024) edited by Kashif Naseer Qureshi, Thomas Newe, Gwanggil Jeon, and Abdellah Chehri*
- *"Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations" (2020) by Fei Hu*
- *"IoT Inc: How Your Company Can Use the Internet of Things to Win in the Outcome Economy" (2020) by Bruce Sinclair*
- *Andrew Minteer, "Analytics for the Internet of Things (IoT): Intelligent analytics for your*

intelligent devices".

- *Raj, P., & Raman, A. C. (2017). The Internet of things: enabling technologies, platforms, and use cases. CRC Press.*

BCS619

Machine Learning: supervised learning and unsupervised learning

Module Description

The aim of this module is to equip students with a thorough understanding of both supervised and unsupervised learning techniques. By combining theoretical learning with practical applications, students will develop the necessary knowledge and skills to design, implement, and evaluate machine learning models. These models will be applicable to a range of tasks, including classification, regression, clustering, and dimensionality reduction.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Proficiency in understanding various learning paradigms and their applications in supervised and unsupervised learning.*
- *Ability to analyse perspectives and issues related to learning algorithms, including biases and generalisation capabilities.*
- *Competence in implementing supervised learning algorithms such as decision trees, neural networks, and support vector machines for classification and regression tasks.*
- *Skill in utilising unsupervised learning techniques such as clustering and dimensionality reduction to discover patterns and structures in data.*
- *Capability to evaluate and compare different learning algorithms based on their performance metrics and computational complexity.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Define concepts such as version spaces, PAC learning, and VC dimension in the context of machine learning theory.*
- *Describe various supervised learning algorithms, including decision trees, linear regression, logistic regression, neural networks, and support vector machines.*
- *Identify advanced supervised learning techniques, such as multilayer perceptron and kernel methods, in the context of non-linear classification.*

- *Explain model evaluation techniques and algorithms for assessing the performance and generalisation ability of machine learning models.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Demonstrate capability in implementing supervised learning algorithms and fine-tuning model parameters to achieve optimal performance on classification and regression tasks.*
- *Apply unsupervised learning techniques to explore and extract meaningful patterns from large datasets.*
- *Interpret and visualise results obtained from machine learning models to gain insights into underlying data structures.*
- *Practice preprocessing and feature engineering to enhance the performance of machine learning models.*
- *Apply dimensionality reduction techniques effectively to reduce the complexity of high-dimensional data while preserving essential information.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Implementing and fine-tuning supervised learning algorithms for classification and regression tasks, considering both linear and non-linear models.*
- *Applying unsupervised learning techniques to identify patterns and structures within data, utilising clustering and dimensionality reduction methods.*
- *Evaluating and comparing different machine learning algorithms based on their performance metrics and computational complexity.*
- *Interpreting and visualising the results obtained from machine learning models to derive actionable insights and make informed decisions.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in utilising machine learning libraries like scikit-learn, TensorFlow, or PyTorch for implementing various algorithms.*
- *Mastery of data preprocessing techniques using pandas, NumPy, or similar libraries to clean and prepare datasets effectively.*
- *Skill in visualising and interpreting model performance metrics using tools such as Matplotlib or Seaborn.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

  Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through a combination of lectures, practical exercises, and hands-on projects. Lectures will cover foundational concepts and theories, supplemented with real-world examples to illustrate their applications. Practical exercises will provide students with opportunities to implement machine learning algorithms and techniques using relevant tools and libraries. Additionally, hands-on projects will allow students to apply their knowledge to solve real-world problems, fostering critical thinking and practical skills in machine learning.

Assessment Weightings:

Assessment for the Machine Learning: supervised learning and unsupervised learning Theory module will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Presentations: 30% (It should be an individual presentation of 10 minutes of 850 words (Approximately) or maximum 10 slides)*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%,

Reading List

Core texts*:*

- *Aurélien Géron, “Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow”, O'Reilly Media, 2nd Edition, 2022.*
- *Peter Flach, “Machine Learning: The Art and Science of Algorithms that Make Sense of Data”, Wiley, 2nd Edition, 2021.*
- *Kevin P. Murphy, “Probabilistic Machine Learning: An Introduction”, MIT Press, 2022*

Additional reading:

- *H. Bashir, “Deep Learning for Vision Systems”, Springer, 2022.*
- *Prateek Joshi, “TensorFlow 2.0 in Action”, Manning Publications, 2021.*

BCS620

Data Structure & Algorithm

Module Description

The course covers key elements of digital system abstractions, including digital information representation, digital logic, Boolean algebra, and state elements. Students will learn to design basic components of digital systems using combinational and sequential circuits. These components will be used to create digital systems, employing tools such as Verilog

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Analyse asymptotic notation to compare the efficiency of algorithms.*
- *Develop data structures such as trees, queues, stacks, and heaps.*
- *Design advanced searching algorithms, including binary search trees and hash tables.*
- *Integrate sorting algorithms like insertion sort and quicksort into software applications.*
- *Implement graph algorithms for depth-first search and connected components.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Define the mathematical foundations of algorithm analysis, including asymptotic notation, summations, and recurrence relations.*
- *Describe the structure and operations of data structures like trees, FIFO queues, stacks, priority queues, and heaps.*
- *Explain the principles and mechanisms of searching algorithms, identifying the advantages and disadvantages of different approaches.*
- *Describe various sorting algorithms, including their computational complexities and appropriate use cases in different computing contexts.*
- *Identify common graph algorithms and explain their applications in solving computing problems, such as searching and sorting within graph structures.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Analyse complex computational problems using mathematical tools and principles.*
- *Design efficient data structures and algorithms in programming languages such as Verilog or similar tools.*
- *Develop the ability to select and apply appropriate searching techniques to optimise data retrieval and manipulation.*
- *Implement sorting algorithms to ensure accurate and efficient data organisation in software projects.*
- *Apply graph traversal techniques to practical problems, enhancing problem-solving skills in graph-related domains.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Apply asymptotic notation, summations, and recurrence relations to evaluate and enhance the performance of algorithms.*
- *Design, implement, and utilise fundamental data structures such as trees, FIFO queues, stacks, priority queues, and heaps in practical applications.*
- *Implement and compare searching algorithms like binary search trees, balanced search trees, and hash tables.*
- *Apply various sorting algorithms such as insertion sort, merge sort, quick sort, and heap sort to organise data efficiently.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Develop and refine algorithms using advanced techniques such as divide-and-conquer and dynamic programming.*
- *Translate theoretical concepts into efficient, practical implementations using programming languages like Verilog.*
- *Gain expertise in using programming tools to design, implement, and test digital systems.*
- *Utilise graphical and simulation tools to visualise, analyse, and validate the behaviour of digital circuits and algorithms.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***

During these hours the learner is supervised, coached, or mentored.

- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will focus on foundational theoretical aspects such as digital system abstractions, mathematical concepts like asymptotic notation and recurrence relations, and practical topics such as data structures and algorithms. Students will engage in virtual labs where they will use tools like Verilog to implement and simulate digital systems. The learning experience will include assignments and collaborative sessions designed for problem-solving and discussion. Additional resources and virtual office hours will be available to provide comprehensive support, enabling students to develop both theoretical understanding and practical skills in digital system design effectively.

Assessment Weightings:

Assessment for the Data Structure & Algorithm module will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Presentations: 30% (It should be an individual presentation of 10 minutes of 850 words (Approximately) or maximum 10 slides)*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

***Core texts**:*

- *Robert Sedgewick and Kevin Wayne, "Algorithms," 4th Edition, 2021, Addison-Wesley*
- *Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms," 4th Edition, 2022, MIT Press*

- *Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++," 4th Edition, 2020, Pearson*

Additional reading:

- *Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures and Algorithms in Java," 6th Edition, 2021, Wiley*
- *Adnan Aziz, Tsung-Hsien Lee, and Amit Prakash, "Elements of Programming Interviews: The Insiders' Guide," 2021, EPI.*

BSC621

Exploring the Fundamentals of Web Security

Module Description

This module aims to equip students with a solid foundation in web security fundamentals, including understanding web application architecture, common attack trends, and security protocols. Through theoretical learning, practical demonstrations, and hands-on exercises, students will develop the skills to identify and mitigate security threats in web applications, enabling them to implement effective security measures to safeguard web-based systems against cyber-attacks.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Analyse the components of the Internet to identify weak points and mitigate security risks.*
- *Differentiate between HTTP and HTTPS protocols and evaluate their significance for web security.*
- *Identify various web authentication technologies and their roles in securing web applications.*
- *Assess recent attack trends and types of web security threats to implement effective defence strategies.*
- *Distinguish the importance of web application security from network security principles.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe web application architecture and common attack trends, including injection flaws and programming bugs.*
- *Explain email security protocols such as PGP and S/MIME, and their role in securing online communications.*
- *Identify wireless network security components and strategies for securing wireless networks.*
- *Outline mobile security management principles, disaster recovery protocols, and ethical hacking techniques.*
- *Summarise cyber laws, security audit procedures, and cybersecurity solutions for mitigating online threats.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Manage web application configurations and implement web application firewalls for infrastructure security.*
- *Identify and mitigate web hacking techniques, including XSS, SQL injection, and memory corruption exploits.*
- *Secure web browsers and e-commerce platforms against security vulnerabilities and malicious code.*
- *Conduct security testing to assess vulnerabilities in wireless networks.*
- *Implement XML security, Content Security Policy, and logging collection and analysis for web applications.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Proficiency in identifying and mitigating various web security threats, including injection flaws and malicious code.*
- *Advanced understanding of email security protocols such as PGP and S/MIME for securing online communications.*
- *Competence in securing wireless networks and implementing security measures to protect against cyber-attacks.*
- *Skill in conducting security testing and forensic analysis to investigate cyber security incidents effectively.*
- *Ability to apply ethical hacking techniques and penetration testing methodologies to identify vulnerabilities in web applications and networks.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Ability in conducting security testing and analysing results to identify vulnerabilities and weaknesses in web applications.*
- *Competence in utilising XML security, Content Security Policy, and logging collection for enhanced web application security.*
- *Ability to implement advanced security measures such as serialisation security and DNS rebinding to protect against evolving web threats.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module on Exploring the Fundamentals of Web Security will be taught through a combination of theoretical lectures, practical demonstrations, and hands-on exercises. Theoretical lectures will cover key concepts such as web application architecture, common attack trends, and web security protocols. Practical demonstrations will illustrate the implementation of security measures like web application firewalls and encryption protocols, while hands-on exercises will allow students to apply these concepts in simulated scenarios. Interactive discussions and case studies will further deepen understanding and foster critical thinking about web security challenges and solutions

Assessment Weightings:

Assessment for the Exploring the Fundamentals of Web Security will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Quizzes: 30%*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

***Core texts**:*

- *Andrew Hoffman, "Web Application Security: A Beginner's Guide," McGraw-Hill Education, 2021.*
- *Dafydd Stuttard, Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws," Wiley, 2021.*
- *David E. D. Schlesinger, "Securing the Web: A Comprehensive Guide to Web Application Security," Apress, 2022.*

Additional reading:

- *Bruce Schneier, "Applied Cryptography: Protocols, Algorithms, and Source Code in C," Wiley, 2021.*
- *J. J. D. Thomas, "Introduction to Cyber Security: The Comprehensive Guide for Beginners," Cybersecurity Press, 2023.*

BCS622

Mathematical Modelling

Module Description

The aim of this module is to equip students with the theoretical knowledge and practical skills required for mathematical modelling. Through a combination of theoretical learning and hands-on exercises, students will learn to develop mathematical models for dynamic phenomena and apply computational techniques for analysis and problem-solving

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Apply decay and growth models in linear and nonlinear forms to analyse dynamic phenomena across various fields.*
- *Develop mathematical models for compartments and population dynamics, applying them to real-world scenarios such as pandemics and financial dynamics.*
- *Utilise differential equations to model planetary motions, satellite orbits, and circular motion in diverse applications.*
- *Comprehend and apply basic models and theories of constant-coefficient linear difference equations in economic and financial contexts.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Define decay and growth models, including linear and nonlinear formulations, and identify their applications in analysing dynamic systems.*
- *Describe the significance of compartmental models in modelling population dynamics, financial dynamics, and other dynamic phenomena.*
- *Identify differential equations and their role in modelling planetary motions, satellite orbits, and circular motion.*
- *List and define basic models and theories related to constant-coefficient linear difference equations, with applications in economics and finance.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Demonstrate proficiency in developing mathematical models for dynamic phenomena using decay and growth models, compartmental models, and differential equations.*

- *Apply mathematical models to analyse and predict complex systems like population dynamics and planetary motions.*
- *Utilise modelling techniques such as regular expressions, automata, and hidden Markov models in computational linguistics.*
- *Employ computational techniques for tasks like information extraction, question answering, and summarization in natural language processing and machine translation.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Developing and applying mathematical models to analyse dynamic phenomena in various fields.*
- *Utilising advanced modelling techniques to predict complex systems and dynamics accurately.*
- *Interpreting and applying computational techniques for tasks such as information extraction and question answering*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in utilising computational tools and software for mathematical modelling and analysis.*
- *Ability to process and analyse large datasets using digital tools and techniques.*
- *Skill in applying computational algorithms for solving complex problems in various domains.*
- *Competence in utilising digital platforms for collaborative research and project work.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours:20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be delivered through a combination of lectures, practical demonstrations, and hands-on exercises. Lectures will cover theoretical concepts in mathematical modeling, while practical sessions will focus on applying these concepts using computational tools. Hands-on exercises will reinforce learning, ensuring a comprehensive understanding of mathematical modeling.

Assessment Weightings:

Natural Language Processing (NLP) Theory module will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Programming/ Mini Project: 30%*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%,

Reading List

***Core texts**:*

- *M. Anthony, N. Biggs, "Mathematical Models for Society and the Environment", Springer, 2021.*
- *L. P. McGowan, "Mathematical Modeling: A Comprehensive Introduction", Wiley, 2021.*
- *H. H. G. M. Huijben, "Differential Equations for Engineers and Scientists", CRC Press, 2022*

Additional reading:

- *S. R. de Jong, "Introduction to Mathematical Modelling", Springer, 2022*
- *R. D. Smith, "Applied Mathematical Modeling: A Multidisciplinary Approach", Academic Press, 2023Business Model Generation: A Handbook for Visionaries, Game Changers,*

and Challengers by Alexander Osterwalder and Yves Pigneur.

BCS623

Introduction to Quantum Computing

Module Description

The aim of this module is to provide students with a comprehensive understanding of quantum computation fundamentals and their practical applications. By delving into topics such as quantum circuits, algorithms, and computational complexity, students will develop the necessary knowledge and skills to engage with quantum computing technologies and contribute to advancements in the field.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Apply the fundamental principles of quantum computation in practical contexts, including the manipulation of qubits and quantum gates.*
- *Apply principles of quantum mechanics to analyse the states and behaviour of quantum systems.*
- *Design and implement quantum algorithms for various computational tasks.*
- *Assess computational complexity and error correction techniques in quantum computation.*
- *Evaluate and compare different quantum algorithms based on their efficiency and performance.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe key concepts in quantum computation, including the circuit model and fundamental principles of quantum physics.*
- *Define quantum gates and operations, including single-qubit and multiple-qubit gates.*
- *Name and describe quantum algorithms such as superdense coding and Shor's algorithm.*
- *Describe the quantum computational complexity theory and error correction techniques.*
- *Identify and explain classical and quantum error correction methods, highlighting their significance in achieving fault-tolerant quantum computation.*
- *Assess major business torts and liabilities such as negligence and product liability, and analyse their implications for business risk management and legal strategies.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Design and implement quantum circuits by utilising both single and multiple qubit gates effectively.*
- *Apply quantum algorithms to solve computational problems efficiently.*
- *Analyse and evaluate the computational complexity of quantum algorithms.*
- *Implement error correction techniques in quantum computation.*
- *Develop fault-tolerant quantum computation systems.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Designing and implementing quantum circuits for various computational tasks, utilising single and multiple qubit gates.*
- *Analysing and evaluating the behaviour of quantum systems, including their states and quantum operations.*
- *Applying principles of quantum mechanics to solve complex computational problems efficiently.*
- *Assessing computational complexity and error correction techniques in quantum computation.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in utilising quantum computing software and simulation tools for designing and testing quantum circuits.*
- *Capability of data analysis techniques to interpret and visualise the behaviour of quantum systems and algorithms.*
- *Skill in programming languages commonly used in quantum computing, such as Qiskit or Quipper, for algorithm implementation.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***

During these hours the learner is supervised, coached, or mentored.

- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

  Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through a combination of lectures, practical demonstrations, and hands-on exercises. Lectures will cover theoretical concepts, while practical demonstrations will illustrate their application in quantum computing. Hands-on exercises will allow students to implement and experiment with quantum circuits and algorithms using software tools and simulation environments.

Assessment Weightings:

Assessment for the Introduction to Quantum Computing Theory module will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Programming/ Mini Project: 30%*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%,

Reading List

Core texts*:*

- *Michael A. Nielsen, Isaac L. Chuang, "Quantum Computation and Quantum Information," Cambridge University Press, 10th Anniversary Edition, 2021.*
- *John Preskill, "Quantum Computing in the NISQ Era and Beyond," Quantum, 2021.*
- *David Deutsch, "The Beginning of Infinity: Explanations That Transform the World," Penguin Books, 2021.*

Additional reading:

- *Christopher G. Granade, et al., "Quantum Algorithms for Fixed Qubit Architectures," Cambridge University Press, 2021.*
- *Seth Lloyd, "Programming the Universe: A Quantum Computer Scientist Takes on the Cosmos," Knopf, 2022.*

BCS624

System Analysis and Designing

Module Description

The aim of this module is to develop learners' awareness of system analysis and design in an organisational context. The module introduces various techniques used within systems analysis and design and the methodologies used in the system development process.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Explain how systems analysis and design contribute to each stage of the software development life cycle, including requirements gathering, design, implementation, testing, and maintenance.*
- *Identify and describe the key components of systems analysis, including problem identification, feasibility analysis, requirements gathering, and system design.*
- *Analyse different approaches to system analysis and design, such as structured analysis, object-oriented analysis, and agile methodologies.*
- *Evaluate system design requirements in terms of functionality, usability, scalability, and security.*
- *Discuss the importance of each stage in traditional software life cycle approaches and evaluate various software development lifecycle models.*
- *Differentiate between hard and soft system methodologies and discuss their application in system analysis and design.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe the fundamentals of quantum computation, including qubits and quantum gates.*
- *Recognize various types of information systems, including business information systems, decision support systems, and enterprise resource planning systems.*
- *Define the principles of human-computer interface (HCI) design and its impact on system usability and user experience.*
- *List and describe concepts and methodologies related to system design, including prototyping, agile development, and rapid application development.*
- *Identify security and control considerations in system design, including authentication, authorization, and encryption techniques.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Produce comprehensive system design documents that outline system requirements, functionalities, and design specifications.*
- *Create models of software systems using various techniques such as data flow diagrams, entity-relationship diagrams, and UML diagrams.*
- *Design security and control mechanisms to protect system data and resources from unauthorised access and manipulation.*
- *Implement testing strategies to ensure system reliability, performance, and compliance with specified requirements.*
- *Collaborate with stakeholders to gather feedback and iteratively refine system designs to meet user needs and enhance functionality.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Analysing system components and design requirements.*
- *Evaluating software development lifecycle models.*
- *Applying system design methodologies to produce system designs.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in HCI principles and methodologies.*
- *Knowledge of system design concepts and methodologies.*
- *Ability to use digital tools for system design and modelling.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.

- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through a combination of lectures, workshops, and practical exercises conducted in a virtual learning environment (VLE). Lectures will cover theoretical concepts and principles, supplemented by demonstrations and case studies. Workshops and practical exercises will provide opportunities for hands-on application of system analysis and design techniques using digital tools such as modelling software and collaboration platforms.

Assessment Weightings:

Assessment for this module will consist of written assignments, presentations, and project-based assessments. The assessment weightings for this particular module are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Quizzes: 30%*
- *Final Examination: 30%*

Digital learning tools such as online submission platforms, simulation software, and virtual labs will be used for assessment. The pass mark for the module is set at 50%

Reading List

Core texts*:*

- *John F. McGregor and Geraldine W. McGregor, "Systems Analysis and Design: An Active Approach", Cengage Learning, 2021.*
- *Hoffer, George, and Valacich, "Modern Systems Analysis and Design", Pearson, 2021.*
- *Sommerville, Ian, "Software Engineering", Pearson, 10th Edition, 2016 (latest relevant content).*

Additional reading:

- *Ambler, Scott W., "Agile Modeling: Effective Practices for Extreme Programming and the Unified Process", Wiley, 2021.*
- *R. Kelly Rainer and Brad Prince, "Introduction to Information Systems", Wiley, 2022.*

BCS625

Overview of Block chain and its security

Module Description

In this module, students will explore the fundamentals of blockchain technology, including its applications beyond cryptocurrencies, decentralised consensus mechanisms, and smart contracts. Through practical exercises and case studies, they will develop skills in analysing blockchain use cases, designing decentralised applications, and understanding the potential impact of blockchain adoption across various industries.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Ensure the integrity of data by recognising the necessity and implications of distributed record-keeping systems.*
- *Model faults and adversaries within distributed systems, including the Byzantine Generals problem.*
- *Analyse consensus algorithms to identify scalability challenges and propose solutions for improved performance.*
- *Evaluate various distributed ledger technologies and their applications in ensuring data transparency and security.*
- *Implement strategies for fault tolerance and recovery in distributed systems to enhance reliability.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Identify cryptographic primitives and consensus mechanisms employed in blockchain technology.*
- *Define the Bitcoin blockchain, Ethereum smart contracts, and Hyperledger Fabric as permissioned blockchain platforms.*
- *List and describe privacy-preserving technologies like Zcash and zk-SNARKS, along with vulnerabilities and attacks on blockchains.*
- *Describe role of decentralised applications (dApps) and their architecture in blockchain ecosystems.*

- *Name and explain regulatory and ethical considerations surrounding blockchain technology and its implementation in various industries.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Exhibit expertise in implementing and deploying smart contracts on blockchain platforms, considering verification challenges and Turing completeness.*
- *Demonstrate proficiency in assessing and mitigating security threats in blockchain networks, including Sybil attacks and selfish mining.*
- *Evaluate different consensus mechanisms and select appropriate solutions based on application requirements.*
- *Implement security protocols to safeguard blockchain applications against common vulnerabilities.*
- *Develop effective testing strategies for smart contracts to ensure functionality and security before deployment.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Proficiency in modelling faults and adversaries within distributed systems, including the Byzantine Generals problem.*
- *Advanced understanding of consensus algorithms and their scalability challenges, with the capability to propose solutions for improved scalability.*
- *Competence in assessing and implementing blockchain applications, including smart contracts and permissioned blockchain platforms like Hyperledger Fabric.*
- *Skill in evaluating security threats in blockchain networks and implementing measures to mitigate vulnerabilities such as Sybil attacks and selfish mining.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in cryptographic techniques such as hash functions and digital signatures.*
- *Skill in designing and deploying smart contracts on blockchain platforms.*
- *Competence in assessing and mitigating security threats in blockchain networks.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module will be taught through a combination of theoretical lectures, practical exercises, and hands-on projects. Students will engage in discussions on blockchain fundamentals, participate in group activities to model faults and analyse consensus algorithms, and work on real-world case studies to understand the practical applications of blockchain technology. Additionally, guest lectures and industry speakers will provide insights into current trends and challenges in the field. Through collaborative learning environments and guided practice, students will develop a comprehensive understanding of blockchain concepts and gain practical skills for blockchain application development and security analysis.

Assessment Weightings:

Assessment for the Overview of Block chain and its security will include written assignments, programming projects, presentations and examinations. The weightings are as follows:

- *Written assignments (40%) (It should not be more than 1250-word count)*
- *Presentation/ Mini Project (30%) (It should be an individual presentation of 10 minutes of 850 words (Approximately) or maximum 10 slides)*
- *Final Examination (30%)*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

Core texts*:*

- *Christoforos M. K. Vasilakos, "Blockchain Technology: Principles and Applications," Wiley, 2021.*
- *Sujith Ravi, "Mastering Blockchain: Unlocking the Power of Bitcoin, Ethereum, Blockchain Technology, and Smart Contracts," Packt Publishing, 2021.*
- *Daniel Drescher, "Blockchain Basics: A Non-Technical Introduction in 25 Steps," Apress, 2021.*
- *Alex Tapscott, Don Tapscott, "Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World," Penguin, 2021.*
- *Miklos C. M. K. A. Papp, "Smart Contracts: The Blockchain Technology That Will Replace Lawyers," Independently Published, 2022.*

Additional reading:

- *Mastering Blockchain: Unlocking the Power of Cryptography and Distributed Ledger Technology" by Imran Bashir, 2021.*
- *"Blockchain Basics: A Non-Technical Introduction in 25 Steps" by Daniel Drescher, 2020 (2nd Edition).*
- *"Building Blockchain Projects" by Narayan Prusty, 2021.*
- *"Smart Contracts: The Essential Guide to Using Blockchain Smart Contracts for Your Business" by Chris Wysopal, 2021.*
- *"Blockchain Technology Explained: A Practitioner's Guide to Using Blockchain Technology" by Alan T. Norman, 2021.*

BCS626

IT Project Management

Module Description

The aim of this module is to develop learners' skills in managing Information Technology projects to implement systems or change in their organisations. This unit is particularly relevant for middle and senior managers whose responsibilities include the introduction of operational or strategic change in their organisations.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Apply the OSI model and TCP/IP operations effectively in network-related tasks and troubleshooting scenarios.*
- *Manage the implementation and configuration of client-server architecture using socket interfaces in real-world networking environments.*
- *Apply practical skills in Linux installation and usage.*
- *Demonstrate adeptness in socket programming using the C language.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe the structure and functions of the OSI model and TCP/IP in the context of computer networking.*
- *Explain how client-server architecture operates and the role of sockets in communication.*
- *Identify the foundational concepts and historical context of the Linux operating system within the field of open-source computing.*
- *Describe the functionality and components of DNS servers, clients, and various network security devices.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Demonstrate proficiency in configuring network protocols based on the OSI model and TCP/IP.*

- *Implement client-server architecture in application development, utilising sockets for communication.*
- *Utilise Linux commands and tools effectively for system management and troubleshooting.*
- *Configure DNS servers and clients, ensuring proper domain name resolution and network security measures.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Advanced troubleshooting capabilities in network configurations.*
- *Enhanced communication skills for technical concepts.*
- *Proficiency in Linux system administration tasks.*
- *Ability to design secure network architectures*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiency in network protocol analysis tools like Wireshark.*
- *Advanced skills in Bash and Python language for automation purposes.*
- *Awareness and practice of cybersecurity measures.*
- *Competence in deploying and managing cloud computing environments.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- *Supervised Placement and Practice Hours: 20*
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- *Assessment Hours: 5*
  Examinations/ presentations/ group work/ projects etc.

Total Number of ECTS of this Module/Unit: 6 ECTS

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

This module on Advanced Computer Networks will be taught through a combination of theoretical lectures, practical lab sessions, and hands-on assignments. Lectures will cover foundational concepts such as OSI model structure, TCP/IP operations, and client-server architectures. Lab sessions will provide opportunities for students to apply their knowledge through hands-on exercises in configuring network devices, programming socket applications, and implementing security measures. Assignments will challenge students to apply their learning to real-world scenarios, fostering critical thinking and problem-solving skills. Additionally, interactive discussions and case studies will be utilised to deepen understanding and encourage peer learning.

Assessment Weightings:

Assessment for the module will include written assignments, programming projects, presentations and examination. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Presentations: 30% (It should be an individual presentation of 10 minutes of 850 words (Approximately) or maximum 10 slides)*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%,

Reading List

***Core texts**:*

- *Andrew S. Tanenbaum, David J. Wetherall, "Computer Networks," 5th Edition, Pearson, 2020.*
- *William Stallings, "Data and Computer Communications," 10th Edition, Pearson, 2021.*
- *Behrouz A. Forouzan, "Data Communications and Networking," 5th Edition, McGraw-Hill, 2021.*
- *Michael W. Lucas, "Network Performance and Security: Testing and Analyzing Using*

Open-Source Tools," 2nd Edition, No Starch Press, 2021.

Additional reading:

- *Jason W. Gillam, "Linux Network Programming," 2nd Edition, Springer, 2021.*
- *Ben Martin, "Linux in Action," 2nd Edition, Manning Publications, 2021.*
- *Omar Santos, "The Linux Command Line, 2nd Edition," No Starch Press, 2021*

BCS627

E-Commerce

Module Description

The E-Commerce module aims to provide students with a comprehensive understanding of the principles and practices of electronic commerce in today's digital landscape. It covers various aspects of online business, including key e-commerce business models such as B2B, B2C, and C2C, while examining the technological infrastructure required for e-commerce operations, including web development, payment systems, and security measures. Students will explore online marketing strategies, including digital marketing techniques, search engine optimization (SEO), and customer relationship management (CRM). The module also addresses legal and ethical issues surrounding online transactions, emphasising relevant laws and data protection. Additionally, students will be introduced to e-commerce analytics tools to assess performance and inform decision-making. Through a combination of theoretical knowledge and practical application, this module equips students with the skills necessary to design, implement, and manage effective e-commerce solutions.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Identify various e-commerce business models (B2B, B2C, C2C) and their implications for business operations and consumer behaviour.*
- *Implement e-commerce technologies, including web development tools, payment gateways, and security protocols, to design effective online business solutions.*
- *Create digital marketing strategies using SEO, social media, and other online marketing techniques to enhance brand visibility and customer engagement.*
- *Assess legal and ethical issues associated with e-commerce, including data protection regulations and consumer rights, to ensure compliance in online transactions.*
- *Utilise ecommerce analytics tools to analyse user behaviour and track performance metrics for data-driven decision-making.*
- *Propose innovative solutions to real-world e-commerce challenges by analysing case studies to enhance operational efficiency and customer satisfaction.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Explain various e-commerce business models (B2B, B2C, C2C) and their roles in the digital economy.*

- *Describe the technological components of e-commerce systems, including web development, payment processing, and security measures.*
- *Outline digital marketing principles and strategies used in e-commerce, including search engine optimization (SEO) and social media marketing.*
- *Discuss the legal and ethical considerations surrounding e-commerce, including data protection laws and consumer rights.*
- *Identify key metrics and analytics used to evaluate e-commerce performance and user engagement.*
- *Summarise the challenges and opportunities in the e-commerce landscape, including trends in consumer behaviour and technological advancements.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Develop a functional e-commerce website using web development tools and platforms.*
- *Implement secure payment processing systems to facilitate online transactions.*
- *Create and manage digital marketing campaigns using various online channels to drive traffic and sales.*
- *Analyse user data and e-commerce metrics to evaluate website performance and customer behaviour.*
- *Conduct research to identify legal and ethical standards applicable to e-commerce operations.*
- *Collaborate effectively in teams to design and present comprehensive e-commerce solutions for real-world business scenarios.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Develop the ability to use web development tools and platforms to create and manage e-commerce websites.*
- *Gain skills in analysing user data and e-commerce metrics to inform marketing strategies and enhance website performance.*
- *Acquire the skills to design and implement effective digital marketing campaigns, utilizing SEO, social media, and email marketing.*
- *Understand and apply legal and ethical principles relevant to e-commerce transactions and data protection.*

- *Enhance problem-solving skills through the analysis of case studies and the development of innovative solutions to real-world e-commerce challenges.*
- *Cultivate teamwork and communication skills by working collaboratively on e-commerce projects and presentations.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficiently use HTML, CSS, and JavaScript to design and build responsive e-commerce websites.*
- *Navigate and manage popular e-commerce platforms (e.g., Shopify, WooCommerce) for setting up and operating online stores.*
- *Implement and manage secure digital payment gateways, including credit card processing and e-wallets.*
- *Apply SEO techniques to optimise e-commerce websites for better visibility and ranking on search engines.*
- *Utilise analytics tools (e.g., Google Analytics) to track website performance, analyse user behaviour, and generate reports for decision-making.*
- *Develop skills in managing social media accounts and creating targeted advertising campaigns to drive traffic and engagement on e-commerce platforms.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

The E-Commerce module will be delivered through a fully online format, utilising a blend of synchronous and asynchronous learning activities to create an engaging virtual learning

environment. Lectures will be conducted via live video sessions, where instructors will introduce key concepts and facilitate interactive discussions. Students will have access to recorded lectures, reading materials, and online resources, allowing them to learn at their own pace. Discussion forums and collaborative tools will enable students to engage with their peers, share insights, and work on group projects, simulating real-world e-commerce scenarios. Practical assignments will involve using e-commerce platforms and digital marketing tools, with students submitting their work through an online learning management system. Additionally, webinars featuring industry experts will provide valuable insights into current e-commerce trends and practices. Assessments will be conducted through online quizzes, project submissions, and presentations, ensuring that students can demonstrate their understanding and application of e-commerce principles effectively.

Assessment Weightings:

Assessment for the module will include written assignments, programming projects, presentations and examination. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Presentations: 30% (It should be an individual presentation of 10 minutes of 850 words (Approximately) or maximum 10 slides)*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%,

Reading List

***Core texts**:*

- *"E-Business and E-Commerce Management: Strategy, Implementation and Practice" (2024) by Dave Chaffey*
- *"Building a StoryBrand: Clarify Your Message So Customers Will Listen" (2024) by Donald Miller*
- *"Ecommerce Evolved: The Essential Playbook To Build, Grow & Scale A Successful Ecommerce Business" (2024) by Tanner Larsson*
- *"E-Commerce 2023: Business, Technology, Society" (2023) by Kenneth C. Laudon and Carol Guercio Traver*
- *"Digital Business and E-Commerce Management" (2021) by Dave Chaffey*
- *"Internet Retailing and Future Perspectives" (2022) by Eleonora Pantano and Charles Dennis*

- *Laudon, K. C., & Traver, C. G. (2021). E-commerce: Business, Technology, Society. Pearson.*
- *Chaffey, D. (2019). Digital Marketing: Strategy, Implementation and Practice. Pearson.*
- *Kalakota, R., & Whinston, A. B. (2017). Frontiers of E-Commerce. Addison-Wesley.*
- *Payne, A., & Frow, P. (2020). Customer Relationship Management: Strategy and Implementation. Cambridge University Press.*
- *Peltier, J. W., & Schibrowsky, J. A. (2018). E-Commerce: Business Models, Technologies, and Applications. Routledge.*

Additional reading:

- *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses" (2024) by Eric Ries*
- *"Retail Futures: The Good, the Bad and the Ugly of the Digital Transformation" (2020) by Eleonora Pantano*
- *"European E-commerce Report 2023" (2023) by Ecommerce Europe and EuroCommerce*
- *Shapiro, C., & Varian, H. R. (1999). Information Rules: A Strategic Guide to the Network Economy. Harvard Business Review Press.*
- *Clifton, B. (2020). SEO: The Essential Guide to Search Engine Optimization. Wiley.*
- *Turban, E., & Volonino, L. (2020). Information Technology for Management: On-Demand Strategies for Performance, Growth and Sustainability. Wiley.*

BCS628

Knowledge Management

Module Description

The aim of this course is to equip learners with a comprehensive understanding of knowledge management (KM) processes, focusing on the creation, capture, representation, storage, and reuse of intellectual assets within a firm. Students will apply tools and techniques for knowledge acquisition, assessment, evaluation, and dissemination to real-world business scenarios, gaining insights into knowledge generation, coordination, transfer, and reuse. The course aims to enhance the learner's ability to manage information technologies that support effective knowledge management strategies

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Manage the implementation of knowledge management systems within an organisation to ensure alignment with strategic objectives.*
- *Supervise teams in executing knowledge-sharing activities that enhance collaboration and innovation.*
- *Monitor the effectiveness of knowledge management practices and ensure their proper use in decision-making processes.*
- *Advise stakeholders on best practices and strategies for improving organisational knowledge management.*
- *Ensure compliance with organisational policies during knowledge-sharing initiatives and knowledge asset utilisation.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe the role of digital technologies in capturing, storing, and disseminating knowledge within organisational contexts.*
- *List and define the functions of knowledge management software and digital tools in facilitating collaboration and knowledge sharing.*
- *Analyse the impact of artificial intelligence (AI) and machine learning (ML) on improving knowledge management processes.*
- *Identify the security challenges and solutions associated with managing digital knowledge*

assets.

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Identify key concepts, models, and frameworks in knowledge management and their application in various organisational contexts.*
- *Operate knowledge management processes to capture, store, and disseminate information effectively in an organisation.*
- *Analyse the role of technology in facilitating knowledge management systems and enhancing organisational learning.*
- *Evaluate different knowledge management strategies and tools to support decision-making and innovation.*
- *Explain the importance of knowledge assets and intellectual capital in creating a competitive advantage for organisations.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Apply knowledge management tools and technologies to enhance organisational learning and decision-making.*
- *Develop strategies for effective knowledge sharing and collaboration across teams and departments.*
- *Critically assess the impact of knowledge management practices on organisational performance and innovation.*
- *Implement processes for capturing and managing organisational knowledge assets to support business goals.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Utilise digital platforms and tools (e.g., intranets, knowledge repositories, and cloud-based systems) to manage and disseminate organisational knowledge effectively.*
- *Leverage data analytics tools to extract insights from knowledge repositories and support decision-making.*
- *Implement enterprise knowledge management systems (e.g., Microsoft SharePoint, Confluence) to facilitate collaboration and knowledge sharing across digital platforms.*
- *Secure digital knowledge assets using appropriate cybersecurity measures to ensure data integrity and compliance with regulations.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 30***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 20***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 95***
  Estimated workload of research and study
- ***Assessment Hours: 5***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 6 ECTS***

Total Learning Hours of this Module: 150 Hours

Pedagogy for this Module

The Knowledge Management module will be taught online through a combination of asynchronous and synchronous learning methods. Pre-recorded video lectures and curated reading materials will provide foundational knowledge, while discussion forums will facilitate engagement and collaboration among students. Live webinars will offer opportunities for real-time interaction with instructors and industry experts. Practical assignments will enable hands-on experience with knowledge management tools, and regular quizzes will assess understanding. Additionally, virtual office hours and a resource library will support student learning and provide access to further materials.

Assessment Weightings:

Assessment for the module will include written assignments, programming projects, presentations and examination. The weightings are as follows:

- *Written assignments: 40% (It should not be more than 1250-word count)*
- *Presentations: 30% (It should be an individual presentation of 10 minutes of 850 words (Approximately) or maximum 10 slides)*
- *Final Examination: 30%*

Digital learning tools like online submission platforms, code repositories, and video conferencing software will facilitate assessment. The pass mark for the module is 50%.

Reading List

Core texts*:*

- *K. K. & G. T. (2023). Knowledge Management for the Intelligent Organization: The Art of Turning Knowledge into Value. Routledge.*
- *M. K. (2021). Knowledge Management: Theoretical and Practical Perspectives. Emerald Publishing Limited.*
- *F. H. & J. A. (2022). Knowledge Management: A European Perspective. Palgrave Macmillan.*

Additional reading:

- *C. M. (2021). Digital Knowledge Management in Europe: Practices and Innovations. IGI Global.*
- *E. T. (2022). Knowledge Management Strategies: A European Approach to Management and Innovation. Springer.*

BCS629

Capstone Project

Module Description

The aim of this module is to provide students with an opportunity to apply their knowledge and skills to solve a real-world computing problem. Common objectives include applying knowledge, conducting in-depth research, showcasing problem-solving skills, demonstrating effective project management, communicating findings clearly, exhibiting technical proficiency, applying critical thinking, considering ethical considerations, and promoting collaboration. The specific requirements may vary, so it's essential to refer to your institution's guidelines for precise Information.

Learning Outcomes

Competences:

At the end of the Module the learner will have acquired the responsibility and autonomy to:

- *Solve intricate challenges in computer science using advanced problem-solving techniques.*
- *Manage comprehensive projects through effective organisation and execution.*
- *Apply advanced concepts and tools relevant to specialised fields with technical expertise.*
- *Assess solutions critically to optimise project outcomes through critical thinking skills.*
- *Propose innovative approaches and solutions to enhance project effectiveness.*
- *Navigate uncertainties and obstacles with adaptability and resilience.*
- *Uphold ethical conduct and professional responsibility throughout project execution.*

Knowledge:

At the end of the Module the learner will have been exposed to the following:

- *Describe foundational theories in computer science, including algorithms, data structures, computational complexity, and formal languages, in the context of developing problem-solving abilities.*
- *Acquire in-depth knowledge in a specific domain, such as artificial intelligence or cybersecurity.*
- *List and define strong research methodologies to critically evaluate existing literature and*

contribute to advancements in computer science.

- *Describe project management frameworks to effectively plan, execute, and monitor projects.*
- *Identify interdisciplinary connections between computer science and other fields to address complex, real-world problems.*

Skills:

At the end of the Module the learner will have acquired the following skills:

- *Design and implement algorithms to solve complex problems efficiently, ensuring optimal performance in various applications.*
- *Utilise development frameworks and tools to create robust software applications, leveraging modern programming practices.*
- *Debug and troubleshoot software issues effectively, employing systematic approaches to enhance code quality and system reliability.*
- *Collaborate within multidisciplinary teams to share knowledge, enhance project outcomes, and foster innovative solutions.*
- *Adapt to new technologies and methodologies, continually improving skills to meet evolving project and industry demands.*

Module-Specific Learner Skills

Upon completion of the module, learners will demonstrate enhanced abilities in

- *Enhanced problem-solving skills to address complex challenges in computer science.*
- *Improved critical thinking abilities for analysing and evaluating technical solutions.*
- *Advanced communication skills for effectively conveying complex ideas to diverse audiences.*
- *Heightened creativity and innovation in proposing novel approaches to technical problems.*

Module-Specific Digital Skills and Competences

Learners will develop digital skills and competencies including

- *Proficient use of cutting-edge software development tools and technologies.*
- *Competent utilisation of data analytics platforms for extracting valuable insights from extensive datasets.*
- *Skilled implementation of cybersecurity measures to safeguard digital assets and mitigate potential risks.*
- *Adept navigation and utilisation of cloud computing platforms for scalable and adaptable*

computing resources.

- *Proficient application of emerging technologies like artificial intelligence and machine learning for pioneering solutions.*

Hours of Total Learning for this Module

- ***Total Contact Hours: 60***
  Contact Hours are hours invested in learning new content under the Direction of a tutor/lecturer e.g. lectures participation in online forums
- ***Supervised Placement and Practice Hours: 100***
  During these hours the learner is supervised, coached, or mentored.
- ***Self-Study Hours: 115***
  Estimated workload of research and study
- ***Assessment Hours: 15***
  Examinations/ presentations/ group work/ projects etc.
- ***Total Number of ECTS of this Module/Unit: 12 ECTS***

Total Learning Hours of this Module: 300 Hours

Pedagogy for this Module

The capstone project for the B.Sc. Computer Science programme will be facilitated through virtual platforms and online resources. The teaching approach will adapt to the digital environment while ensuring effective delivery of instruction and support to students.

- ***Virtual Orientation Sessions:*** *Orientation sessions and workshops will be conducted virtually, where students will receive information about project requirements, timelines, and expectations. They will also be introduced to their faculty mentors and receive guidance on accessing online resources.*

- ***Remote Guidance and Mentorship:*** *Faculty mentors will provide remote guidance and mentorship to students through video conferencing, email, and online chat platforms. Regular virtual meetings will be scheduled to discuss project progress, address queries, and provide feedback on research and implementation strategies.*

- ***Online Research Resources:*** *Students will utilise online libraries, databases, and academic journals to conduct research and gather literature relevant to their project topics. Access to digital resources will enable students to explore a wide range of sources and stay updated with the latest developments in their field.*

- ***Virtual Collaboration Tools:*** *Online collaboration tools such as video conferencing platforms, discussion forums, and project management software will facilitate peer collaboration and communication. Students will have opportunities to engage in virtual group discussions, share resources, and collaborate on project tasks remotely.*

- ***Remote Project Implementation: Students*** *will implement their projects remotely using*

virtual development environments, cloud-based platforms, and collaboration tools. They will have access to online coding platforms, version control systems, and testing environments to develop and test their solutions.

- ***Presentations and Reviews**: Reviews, presentations, and evaluations will be conducted online using video conferencing tools. Students will present their project progress, findings, and outcomes to faculty mentors and peers virtually. Feedback and discussions will be facilitated through online platforms to ensure effective communication and collaboration.*

- ***Digital Documentation and Reporting:** Project documentation, reports, and presentations will be created and shared digitally using online document editing tools, slide presentation software, and virtual whiteboards. Students will submit their project deliverables electronically, and evaluations will be conducted online.*

- ***Remote Reflection and Evaluation:** Students will reflect on their learning experiences and project outcomes through online reflection activities, discussion forums, and self-assessment tools. Evaluation of individual performance and project outcomes will be conducted remotely, with feedback provided digitally.*

The examination for the B.Sc. Computer Science programme will cover a range of technical material, incorporating both foundational concepts and advanced techniques relevant to the field of computer science.

Assessment Method and Weightings

1. Project Assessment Components:

- ***Presentation and Demonstration** - 40% (Overall presentation, clarity of writing, coherence of argumentation, adherence to academic conventions (e.g., referencing), and overall quality of communication.)*

- ***Thesis/Project report** - 30% (Students detail their chosen language, Algorithm used, test cases, problem to be solved and justify their appropriateness for addressing the problem. This includes discussions on data collection, analysis techniques, and ethical considerations.)*

- ***Software Coding** - 20% (Coding should be well defined, error free and must follow a strong syntax and semantics.)*

- ***Documentation** - 10% (Students submit the complete document, outlining the project Introduction, problem statement, objectives, methodology, and expected outcomes. It will be typically assessed for its clarity, feasibility, and alignment with academic standards.)*

2. Digital Learning Tools:

- ***Learning Management System (LMS):** Often used for document submission, announcements, and tracking progress.*

- ***Plagiarism Detection Software:** Tools like Turnitin or SafeAssign to ensure academic integrity in dissertation submissions.*

- *Research Databases: Access to online libraries and databases for literature review and research data gathering.*
- *Collaboration Tools: Platforms like Google Workspace or Microsoft Teams for communication and collaborative work with supervisors and peers.*

Pass Mark: *Typically, the pass mark for capstone projects in a B.Sc. Computer Science program might be set at 50%.*

Assessment Weightings:

- *Presentation and Demonstration - 40%*
- *Thesis/Project report - 30%*
- *Software Coding - 20%*
- *Documentation - 10%*

Reading List

Core texts*:*

- *"Designing and Managing a Research Project: A Business Student's Guide" (2022) by Michael Jay Polonsky and David S. Waller*
- *"The Craft of Research" (2020) by Wayne C. Booth, Gregory G. Colomb, and Joseph M. Williams*
- *"Research Methods for Business Students" (2021) by Mark Saunders, Philip Lewis, and Adrian Thornhill*
- *"Doing Your Research Project" (2020) by Judith Bell and Stephen Waters*
- *"The Essential Guide to Doing Your Research Project" (2023) by Zina O'Leary*
- *Bock, J. (2019). The Capstone Project: A Comprehensive Guide. Springer.*
- *Blanco, S. (2018). Research Methods for Computer Science: A Practical Guide. Academic Press.*
- *Pfleeger, S. L., & Pfleeger, C. J. (2015). Security in Computing. Pearson.*
- *Satzinger, J. W., Jackson, R. B., & Burd, S. D. (2016). Systems Analysis and Design in a Changing World. Cengage Learning.*
- *Schwalbe, K. (2018). Information Technology Project Management. Cengage Learning.*

- *Laudon, K. C., & Laudon, J. P. (2020). Management Information Systems: Managing the Digital Firm. Pearson.*

Additional reading:

- *"Undertaking Capstone Projects in Education: A Practical Guide for Students" (2021) by Jolanta Burke and Majella Dempsey*
- *"Undertaking Capstone and Final Year Projects in Psychology: Practical Guide for Students" (2021) by Jolanta Burke and Simon Dunne*
- *Sommerville, I. (2019). Software Engineering. Addison-Wesley.*
- *Bennett, S., & Fowler, J. (2018). Developing Quality Technical Information: A Handbook for Writers and Editors. Wiley.*

Project Specific Reading List

Based on research subject