

IT5501 Mathematics for IT

Code	Title
IT5501	Mathematics for IT

Level	Credits
5	15

Pre-requisites	None
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Learning Hours

Tutor Directed	65 hours
Self-directed	85 hours

Aim

To introduce learners to topics in discrete mathematics that are important for studies in computing and to topics in statistics that are directed to the needs of the IT industry.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Solve problems in selected topics in discrete mathematics
2. Solve problems in selected topics in statistics

Indicative content

- Algorithms
- Number bases
- Computer representation of numbers
- Logic
- Sets and relations
- Functions
- Induction and recursion
- Boolean algebra and digital circuits
- Graph theory
- Trees
- Visual presentation of data
- Measures of central tendency
- Measures of dispersion including standard deviation
- Sampling
- Probability
- The normal distribution
- Correlation
- Regression
- Hypothesis testing

Assessments

Assessment Method	Weighting	Learning Outcome/s
Test 1	20%	1 - 2
Test 2	20%	1 - 2
Assignment	20%	1 - 2
Final Assessment	40%	1 - 2

Assignments can be broken down into a number of small modules.

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Indicative texts:

Grossman, P. *Discrete Mathematics for Computing* Macmillan. Third Edition, 2009

Croucher, J.S. *Introductory Mathematics and Statistics for Business* McGraw-Hill. 6th Edition, 2013

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Hardware lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT5502 Communications for IT

Code
IT5502

Title
Communications for IT

Level
5

Credits
15

Pre-requisites None

Learning Hours

Tutor Directed 65 hours
Self-directed 85 hours

Aim

To introduce learners to the theories, principles and practical skills associated with effective communication in relation to Information Technology contexts.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Describe effective ways to influence and improve communication in a business setting and demonstrate knowledge of the principles of communication methodologies and influences
2. Undertake a range of business communication techniques and practices
3. Apply effective communication strategies through co-operative work in a group, leadership, negotiation techniques and conflict management
4. Demonstrate an understanding of workplace ethics, law, cultural awareness, and Te Tiriti o Waitangi
5. Demonstrate an understanding of copyright and citation issues
6. Verbally present information in a professional manner

Indicative content

- Principles of effective communication strategies
- Business communication practices including: meeting techniques, interviews record keeping, technical writing and use of mainstream business software
- Principles and practices of team and group work, leadership, negotiation, conflict management, workplace ethics and legal implications
- Verbal and non-verbal communication
- Use of citations and referencing techniques
- Effective oral presentations

Assessments

Assessment Method	Weighting	Learning Outcome/s
Test	20%	1, 4
Assignment 1	30%	2, 5
Group Assignment 2	30%	1 - 5
Presentation	20%	4, 6

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Indicative text:

Dwyer, J (2016). *Communication for business and the professions* (6th Ed.). Frenchs Forest NSW: Pearson Australia.

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Hardware lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT6501 Systems Analysis and Design

Code
IT6501

Title
Systems Analysis and Design

Level
6

Credits
15

Pre-requisites
IT5507 Fundamentals of Data Science
IT5503 Programming I

Learning Hours

Tutor directed	52 hours
Self-directed	98 hours

Aim

To enable learners to evaluate and apply the important procedures involved in systems analysis and systems design.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Evaluate a range of models, as well as contemporary techniques and procedures, used in the Systems Development Life Cycle (SDLC)
2. Assess various approaches for systems analysis and design for an object-oriented SDLC
3. Produce appropriate analysis and design documentation for a given business problem
4. Analyse and design different components of a system to support contemporary systems architecture
5. Describe the current trends in systems development

Indicative content

The course may contain topics of

- the systems development life cycle models
- role of systems analyst, and systems designer
- adaptive approaches to SDLC compared to a predictive approach
- requirements analysis and its modelling
- systems design and its modelling
- model, view and controller layers of a system
- appropriate development methodologies
- current trends in systems development or equivalent

This content will be delivered in an applied manner, with extensive use of case studies.

Assessments

Assessment Method	Weighting	Learning Outcomes
Assignment 1	30%	1 - 5
Assignment 2	30%	1 - 5
Examination	40%	1 - 5

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Indicative text:

Systems analysis and design in a changing world, (most recent edition). By John W. Satzinger, Robert B. Jackson, Stephen D. Burd. *Cengage Learning*.

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT6502 Project Management

Code
IT6502

Title
Project Management

Level
6

Credits
15

Pre-requisites IT5502 Communications for IT

Learning Hours

Tutor Directed 52 hours
Self-directed 98 hours

Aims

- To enable learners to explain the requirements of project planning and control, and use best practice project management techniques and software to manage tasks
- To enable learners to incorporate typical IT industry practices into project management activities

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Define, select, and explain current theories and practices from the current Project Management Body of Knowledge (PMBOK) knowledge areas
2. Apply knowledge from the PMBOK knowledge areas and demonstrate this using appropriate practices and software
3. Explain and explore techniques to deal with significant human resources issues relevant to IT project management

Indicative content

The course may contain topics of:

- The knowledge areas identified in the Project Management Institute's PMBOK contextualised for application in the Information Technology industry
- Practical application of project planning and control tools
- Significant issues relating to managing people in projects
- Agile software development (Jira, VSTS)
- Code versioning
- Project risk

This content will be delivered in an applied manner, including the use of case studies and shared experiences.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Test	20%	1
Project	40%	2, 3
Examination	40%	1-3

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Indicative text:

Schwalbe, K., *Information Technology Project Management* (8th ed.), Cengage Learning, 2016.

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT7502 Digital Ethics

Code
IT7502

Title
Digital Ethics

Level
7

Credits
15

Pre-requisites IT5502 Communications for IT

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To enable learners, through careful research and analysis, to identify and manage ethical issues related to the use and advancement of digital technologies.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Critically analyse ethical issues related to ICT
2. Critically evaluate, assess and apply ethical theories and ICT Codes of ethics to an ethical problem
3. Analyse a current ICT ethical problem using critical thinking techniques and provide solutions within the context of the analysis

Indicative content

- Critical thinking
- professionalism
- ethical theories
- privacy
- security
- cybercrime
- intellectual property
- freedom of speech and regulation of the internet
- legislation related to course content
- big data
- reliability
- social and ethical issues related to emerging technologies
- piracy

Assessment

Assessment Method	Weighting	Learning Outcome/s
Assignment 1	30%	1
Assignment 2	30%	2
Examination	40%	3

Successful completion of course:

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Indicative Texts:

Tavani, H. T. (2013). *Ethics and technology: Controversies, questions, and strategies for ethical computing (4th Ed)*. Australia: Wiley.

Himma, K. E. & Tavani, H.T. (2009). *The handbook of information and computer ethics*. USA: Wiley.

Simpson, C.R., Nevile, L., Burmeister, O.K., (2003) Doing Ethics: A universal technique in an accessibility context. *Australasian Journal of Information Systems*. 10(2).

Spinello, R. A. & Tavani, H. T. (Eds.) (2010). *Readings in cyber ethics*. London: Jones and Bartlett.

Spinello, R. A. (2014). *Morality and law in cyberspace (5th Ed)*. Massachusetts: Jones & Bartlett.

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT7510 IT Capstone Project

Code IT7510	Title IT Capstone Project
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Level 7	Credits 45
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Pre-requisites	240 credits at levels 5 and above with one level 7 paper IT6502 Project Management
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Learning Hours

Tutor-directed	25 hours
Self-directed	425 hours

Aims

- To provide learners the opportunity to research, select, integrate and apply a range of techniques and technology to solve a business or industry based problem
- To provide learners the opportunity to demonstrate workplace-ready skills, attitudes and aptitudes suited to the IT industry

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Produce a proposal for the project
2. Work collaboratively, using professional and interpersonal skills, cooperative methods and communication with team members, project sponsor and advisor.
3. Apply the techniques and knowledge gained throughout the degree programme to research, analyse, design, develop, test and produce a solution
4. Manage and control all aspects of the project
5. Carry out a concluding review of the project with the sponsor
6. Produce relevant IT artefacts for the project. Range may include software, design, implementation, installation, testing, training, support, maintenance, administration, user manual and help documents
7. Critically reflect on learning that has taken place during the project and relevant courses during the degree
8. Effectively present the project experience and achievement to an audience including the project sponsor

Indicative content

Topics may include

- Developing a Business Proposal or Specification
- Effective communication
- Integration and application of knowledge
- Project management
- Project delivery
- Industry standard project documentation
- Promotion of project outcome

Assessments

Assessment Method	Weighting	Learning Outcome/s
Project proposal	10%	1, 2, 6
Self-management review	10%	2, 4
Panel assessment	80%	2-8

A Panel is defined as several evaluators. Panel Assessment may vary at the discretion of the Panel, depending on the type of project produced. A typical project may be:

Assessment Method	Weighting	Learning Outcome/s
Panel Assessment		
Development / deliverable	50%	3,5,6
Project management	5%	2,4
Self-evaluation and presentation	15%	2,3,7, 8
Client evaluation	10%	2,5

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

2.0 Cyber Security Major Courses

IT5504 Information Security I

Code	Title
IT5504	Information Security I

Level	Credits
5	15

Pre-requisites	None
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Learning Hours

Tutor Directed	65 hours
Self-directed	85 hours

Aim

To provide learners with an understanding of basic information security principles and approaches as well as to recognise the major information security threats and countermeasures.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Explain information security fundamentals
2. Analyse personal security
3. Identify threats to computer security
4. Identify and apply internet security procedures
5. Examine mobile security
6. Identify risks to Internet privacy

Indicative content

- Information security fundamentals
- Personal security
- Computer security
- Malware
- Mobile security
- Privacy

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment 1	30%	1 - 3
Assignment 2	30%	4 - 6
Examination	40%	1 - 6

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Indicative texts

Ciampa, M. (2017). *Security Awareness: Applying Practical Security in Your World* (5th Ed). USA: Cengage

ISECOM. (2017), *Network Security Essentials: Study Guide and Workbook – Volume 1* (2nd Ed)

ISECOM. (2017), *Security Analysis Essentials: Study Guide and Workbook – Volume 2*

ISECOM. (2017), *Hacking Essentials: Study Guide and Workbook – Volume 3*

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

CS6501 Information Security II

Code	Title
CS6501	Information Security II

Level	Credits
6	15

Pre-requisites	None
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Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To enable learners to develop an understanding of the foundations of cyber security, threats towards information system, and perform risk assessment and management.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Describe information security principles, key terms and essential concepts and examine the business drivers behind the design process of information security analysis
2. Identify and explain common attack techniques and sources of threat
3. Conduct a fundamental information security assessment for an organisation, including risk identification and assessment, implementing effective control measures to minimise the risk introduced by potential threats, and performing cost benefit analysis
4. Describe and apply physical, procedural and technical controls to protect information system components
5. Describe and explain legal, regulatory, and ethical standards relevant to an information systems

Indicative content

- Confidentiality, integrity and availability
- Identification, authentication, authorisation and access control
- Auditing and accountability
- Attacks, threats and vulnerabilities
- Operating system and application security
- Physical, personnel and operations security
- Network security controls
- Security standards and policies
- Risk assessment and management
- Legal, ethical and professional issues in information security

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment 1	30%	1-3
Assignment 2	30%	3-5
Examination	40%	1-5

Successful completion of course:

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

CS6502 Linux System Administration

Code	Title
CS6502	Linux System Administration

Level	Credits
6	15

Pre-requisites	IT5504 Information Security 1 IT5506 Introduction to Networking
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Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To provide a practical introduction to junior and intermediate level Linux/Unix system administration and to enable the learner to develop the skills required to manage small-sized Linux networks.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Explain the fundamental elements of the Linux/Unix systems
2. Install, configure and manage a workstation including partitioning, managing software and devices, Linux desktop and shell environments through the command line
3. Explain and perform administrative and troubleshooting tasks including, but not limited to, management of users, groups, printing services, managing Linux processes, file and folder permissions, log management, backup and basic security tasks through command line
4. Demonstrate an understanding of Linux networking services, setup basic Local Area Network (LAN) and Internet connectivity and perform network troubleshooting
5. Install, configure and manage a range of systems present in a typical Linux network environment

Indicative content

- Kernel, boot, initialisation, shutdown and run levels
- Printing, documentation and shell environments
- Linux installation, GNU and Unix commands, managing hardware and devices
- The X Window System, Linux file systems, Linux user and group management, file and folder permissions, Linux processes and task scheduling
- Package management, compiling software from source, shell scripting and basic shell programming
- Administrative tasks including management of networking services, backup and security
- Basic network configuration, setup and configuration of network services such as web server, file server, Dynamic Host Configuration Protocol (DHCP) and email servers

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment 1	30%	1-3
Assignment 2	30%	2-5
Examination	40%	1-5

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

CS6503 Digital Forensics

Code **Title**
CS6503 Digital Forensics

Level **Credits**
6 15

Pre-requisites IT5504 Information Security I
 IT5506 Introduction to Networking

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To provide learners with a comprehensive understanding of digital forensic principles and the collection, preservation, and analysis of digital evidence.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Identify the attributes of file systems and storage media and perform analysis on at least two common file systems
2. Identify and analyse potential sources of electronic evidence
3. Describe the importance of maintaining the integrity of digital evidence
4. Perform basic forensic data acquisition and analysis using computer and network-based applications and utilities
5. Accurately document forensic procedures and results and develop a case summary

Indicative content

- Forensic investigation
- Operating system functionality
- File system analysis
- Operating system artifact analysis
- Browser and email analysis
- Investigative methodologies
- Forensic report writing
- Overview of memory forensics

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment 1	30%	1, 2, 4
Assignment 2	30%	2, 3, 5
Examination	40%	1-5

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

CS6504 Cryptography and Blockchain Fundamentals

Code
CS6504

Title
Cryptography and Blockchain Fundamentals

Level
6

Credits
15

Pre-requisites
IT5504 Information Security I
IT5506 Introduction to Networking

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

This course exposes learners to blockchain technology, smart contracts, fundamentals of cryptocurrency and applications. Learners will also learn the fundamentals of cryptography.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Explain blockchains and the cryptocurrency ecosystem
2. Analyse the role cryptography plays in a blockchain
3. Develop simple blockchains and distributed applications
4. Examine security issues within the cryptocurrency ecosystem

Indicative content

- Basic Cryptography: public/private key encryption, hash functions, digital signatures, Merkle trees
- Blockchain:
 - Properties: immutability, consensus, anonymity
 - Components: node, distributed ledger, transaction
 - Operations: verification, proof of work
- Smart contracts and blockchain applications
- Privacy and scalability issues in blockchain
- Block ciphers
- Digital signatures

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment 1: written	20%	1-2
Assignment 2: Labs	20%	1-2
Group Project	20%	3
Examination	40%	1-4

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

CS7501 Information Security III

Code	Title
CS7501	Information Security III

Level	Credits
7	15

Pre-requisites	IT5504 Information Security I IT5506 Introduction to Networking
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Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

This course covers the key technologies and systems required to implement defence in depth and protect organisational information infrastructures from threats and attacks.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Describe and implement systems and methods employed to provide operating system and host-based security for a range of potential threats
2. Categorise the technologies and techniques necessary for the defence and maintenance of networks and their hosts and demonstrate their use
3. Explain the functionality and operation of security techniques and implement them as they apply to software, databases and data
4. Evaluate the security models, deployment and management of the security of information systems and methods available to identify and reduce risk

Indicative content

- Host-based and operating system security
- Application and data security
- Database security
- Network security
- Security architecture and models
- Risk mitigation techniques

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment 1	30%	1-2
Assignment 2	30%	3-4
Examination	40%	1-4

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

CS7502 Special Topic in Cyber Security

Code	Title
CS7502	Special Topic in Cyber Security

Level	Credits
7	15

Pre-requisites	IT5504 Information Security I IT5506 Introduction to Networking
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Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To enable learners to select a focus area of study in cyber security to reach their desired career and/or graduate studies goals. Topic selection will be based upon learner interest and faculty research and expertise and will generally change annually. Learners may substitute a cyber security related graduate diploma course for this requirement.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Evaluate, and analyse characteristics of, a specified current topic relating to cyber security.
2. Define, apply and implement an appropriate technological solution to a problem or problems related to the topic.

Indicative content

- Topic selection will be based upon learner interest and faculty research and expertise and will generally change annually.
- Detailed learning outcomes, content and assessment for the selected topic(s) will be developed prior to the commencement of the course and approved by the Head of School.
- In the event of course substitution, indicative content will be that of the substituted graduate diploma course.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Applied work	60%	1, 2
Examination	40%	1, 2

Successful completion of course:

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Indicative Texts:

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

3.0 Applied Data Science Major Courses

IT5507 Fundamentals of Data Science

Code
IT5507

Title
Fundamentals of Data Science

Level
5

Credits
15

Pre-requisites None

Learning Hours

Tutor Directed 65 hours
Self-directed 85 hours

Aim

To provide learners with a basic understanding of how data is modelled, stored, manipulated and analysed using databases and visualisation techniques.

Learning Outcomes

On successful completion of this course, the learner will be able to

1. Describe and explain data using a variety of visualisation techniques and software tools
2. Analyse the data requirements of simple systems and model those requirements using conceptual and logical data modelling techniques
3. Create a simple database that includes tables, columns, primary keys, foreign keys and simple queries

Indicative content

- Data visualisation techniques such as bar charts, pie charts, scatter diagrams, gauges and bubble charts created within a variety of software tools
- Conceptual and logical data modelling techniques that capture the data requirements of simple systems
- Normalisation of tables
- Introduction to Structured query Language (SQL) such as Data Definition language (DDL) and Data manipulation language (DML) statements to create simple databases and to manipulate and extract data

Assessments

Assessment Method	Weighting	Learning Outcome/s
Coursework	60%	1, 2, 3
Test	40%	1, 2

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners
- Specialist guest speakers
- Hardware lab
- Library including online resources

The course outline will contain a list of recommended resources.

DS6501 Social Data Analytics

Code
DS6501

Title
Social Data Analytics

Level
6

Credits
15

Pre-requisites IT5507 Fundamentals of Data Science

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To introduce learners to the analysis of social data using tools and techniques to extract knowledge and insights from social media networks.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Identify and explain contemporary text mining tasks typically applied to document collections
2. Perform introductory text mining tasks on publically available social media data
3. Identify and explain the visual analytical concepts applied to large social data sets
4. Analyse and discuss current social, ethical, security and privacy issues relating to large-scale social data analytics

Indicative content

- Social data analytics and the factors of context, content and sentiment
- Machine learning techniques employed to model and structure the information content of textual data
- Text analytics techniques used in sentiment analysis to determine people's attitudes
- Data mining techniques such as link and association analysis, visualisation and predictive analytics using statistical programming tools
- API's for accessing data on social networks
- Contemporary issues relating to social media data

Assessments

Assessment Method	Weighting	Learning Outcome/s
Course work	60%	1, 2
Test	40%	1, 3, 4

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

DS6502 Data Analysis and Visualisation

Code
DS6502

Title
Data Analysis and Visualisation

Level
6

Credits
15

Pre-requisites IT5507 Fundamentals of Data Science

Learning Hours

Tutor Directed 52 hours
Self-directed 98 hours

Aim

To introduce learners to a range of data analysis and visualisation techniques used in statistical inference and exploratory data analysis.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Use statistical programming tools and visualisation techniques to analyse data
2. Identify and explain a variety of techniques used in statistical inference and exploratory data analysis
3. Interpret and evaluate results derived from the application of confirmatory data analysis techniques
4. Communicate the meaning of results derived from data analysis to a target audience

Indicative content

- Intermediate statistics for data analysis; confidence intervals, regression analysis, hypothesis tests, accuracy, precision, specificity/selectivity and correlation analysis
- Information visualisation techniques used in exploratory data analysis
- Statistical programming languages used to generate descriptive models of data
- Methods of communicating results derived from data analysis to a target audience

Assessments

Assessment Method	Weighting	Learning Outcome/s
Course work	60%	1, 3, 4
Test	40%	2, 3, 4

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

DS6503 Data Mining Tools and Techniques

Code
DS6503

Title
Data Mining Tools and Techniques

Level
6

Credits
15

Pre-requisites IT5507 Fundamentals of Data Science

Learning Hours

Tutor Directed 52 hours
Self-directed 98 hours

Aim

To introduce learners to the data science process and the application of data mining tools and techniques.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Identify and explain the steps associated with the data science process
2. Define the data requirements for a range of analytical problems
3. Identify and explain the basic application of a variety of commonly used data mining techniques
4. Perform an introductory analytical investigation using the data science process and a statistical programming tool

Indicative content

- The steps of the data science process and its application within business analytics
- Data pre-processing techniques for dealing messy data using software tools
- Determining data requirements to develop predictive models
- Types of data, descriptions of data, measures of similarity and dis-similarity
- Introductory Classification, Association Rules, Clustering and Machine Learning categories of data mining techniques using statistical programming tools

Assessments

Assessment Method	Weighting	Learning Outcome/s
Course work	60%	2, 3, 4
Test	40%	1, 3, 4

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

DS6504 Business Intelligence and Big Data

Code
DS6504

Title
Business Intelligence and Big Data

Level
6

Credits
15

Pre-requisites IT5507 Fundamentals of Data Science

Learning Hours

Tutor Directed 52 hours
Self-directed 98 hours

Aim

To introduce learners to the techniques used in the design and implementation of business intelligence solutions and the issues relating to big data.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Create Structured Query Language (SQL) queries for extracting and summarising data using joins, subqueries and aggregate functions
2. Identify and explain the issues relating to the management of data and the role of the Database Administrator (DBA)
3. Construct stored procedures to be used in the implementation of reporting applications and to perform basic data pre-processing steps
4. Create a multidimensional model using the star schema architecture in the design of a data warehouse
5. Discuss and explain contemporary issues and challenges relating to big data and business intelligence

Indicative content

- Intermediate Data Manipulation Language (DML) statements involving inner joins, outer joins, aggregate functions, date and string functions to create views and other reporting functionality
- Stored procedures with input and output parameters for data summarisation, error handling, and row processing involved in generating reports and dashboards and the handling messy data
- Issues relating to the management of data and the role of the DBA
- Data warehousing design strategies, star and snowflake schemas
- Issues and challenges relating to big data, cloud computing and the storage of unstructured data
- The Four V's of Big Data.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Coursework	60%	1, 3, 4
Test	40%	2, 4, 5

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

DS7501 Data Mining for Business Analytics

Code
DS7501

Title
Data Mining for Business Analytics

Level
7

Credits
15

Pre-requisites

DS6502 Data Analysis and Visualisation

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To provide learners with practical experience in developing analytical tools that provide insight and understanding of business performance based on data mining methods.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Create a range of explanatory and predictive models that support fact-based management and decision making
2. Critically assess analytical results and convey their meaning to a target audience
3. Use statistical programming tools to perform a variety of commonly applied data mining functions on business data
4. Apply visualisation techniques for evaluating predictive models and the presentation of analytical results
5. Identify and explain appropriate data mining methods for tasks relating to business analytics
6. Critically assess the quality of predictive models using statistical methods

Indicative content

- Data mining algorithms and their application on business analytical problems including clustering, association rules, classification and machine learning
- Statistical methods for evaluating the predictive accuracy of data mining models
- Visual approaches for presenting and evaluating predictive models and their results
- Contemporary issues relating to data mining and its application within business analytics
- Communication strategies for conveying meaning from analytical results to a target audience
- Statistical programming tools and techniques for creating and evaluating predictive and explanatory models

Assessments

Assessment Method	Weighting	Learning Outcome/s
Course work	60%	1 - 6
Examination	40%	2, 5, 6

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

DS7502 Data Warehouse Design and Implementation

Code
DS7502

Title
Data Warehouse Design and Implementation

Level
7

Credits
15

Pre-requisites DS6503 Data Mining Tools and Techniques

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To provide learners with practical experience in the design and implementation of data warehouses and the development of Online Analytical Processing (OLAP) tools.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Identify and explain commonly used architectures in the design of data warehouses
2. Create multidimensional models using star and snowflake schemas
3. Perform Extract-Transform-Load (ETL) procedures to populate a data warehouse
4. Create queries that analyse multidimensional data from multiple perspectives
5. Identify and explain the characteristics of data warehouses and their role within strategies for achieving business intelligence
6. Perform data mining functions on data cubes and explain analytical results to a target audience

Indicative content

- ETL procedures involving staging, data integration and access layers
- Multidimensional modelling approaches for implementing data warehouse architectures
- Querying languages and reporting tools commonly used on OLAP cubes for roll-up, drill-down and slice and dice operations
- Approaches for conveying the analytical results from OLAP tools and data cube mining to a target audience
- Contemporary issues relating to data warehousing and its role within strategies for achieving business intelligence

Assessments

Assessment Method	Weighting	Learning Outcome/s
Course work	60%	2, 3, 4, 6
Examination	40%	1, 2, 5,

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

4.0 Interaction Design Major Courses

IT5505 Interaction Design Fundamentals

Code
IT5505

Title
Interaction Design Fundamentals

Level
5

Credits
15

Pre-requisites None

Learning Hours

Tutor Directed	65 hours
Self-directed	85 hours

Aim

To provide learners with the skills to utilise design principles to evaluate digital interactive products. Learners will develop the skills and knowledge to design and develop a digital interactive product.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Describe the history, business and technical changes of a digital, interactive platform and be able to evaluate social impacts.
2. Investigate interactive tools and apply design principles to critically evaluate and user-test digital interactive products.
3. Plan a digital interactive product demonstrating consideration of users and clients.
4. Understand and apply front-end development processes to create an interactive product.
5. Integrate toolsets and/or languages to create digital content and/or interactivity.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Project 1	55%	1 - 3
Project 2	45%	4, 5

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

ID6501 Responsive Web Design

Code
ID6501

Title
Responsive Web Design

Level
6

Credits
15

Pre-requisites
None

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

Learners will be able to design and build websites that respond to any device for example, phone, tablet desktop or headset.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Evaluate the design and architecture of a web or mobile application.
2. Plan a website and organise information effectively.
3. Describe and apply design principles and process to create a website utilising web standards from bodies such as W3C.
4. Use a variety of strategies and technologies to create websites.
5. Create and evaluate responsive web interface designs that adjust to a range of screen sizes and or devices.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Project 1	30%	1,2
Project 2	30%	2, 3
Project 3	40%	3-5

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

ID6502 3D Environments

Code
ID6502

Title
3D Environments

Level
6

Credits
15

Pre-requisites IT5505 Interaction Design Fundamentals

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To introduce learners to 3D graphics, modelling, animation, software and environments. Learners will use complex software tools to build 3D models, develop motion, texture and render projects.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Use problem solving techniques to follow a brief using 3D environment/s.
2. Apply a range of modelling tools to build digital models.
3. Investigate and apply methods of controlling motion and/or 3D environments.
4. Apply lighting, texturing and rendering techniques.
5. Plan and create short motion or interactive 3D work.
6. Demonstrate investigation and analysis of interaction within a sophisticated software environment.

Indicative content

- inverse kinematics
- remote rendering
- virtual world solutions
- motion solutions
- modelling solutions
- interactive environments such as game engines

Assessments

Assessment Method	Weighting	Learning Outcome/s
Project 1	50%	1, 2, 4,
Project 2	50%	1, 3,4, 5, 6

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

ID6503 Advanced Interaction Design

Code **Title**
ID6503 **Advanced Interaction Design**

Level **Credits**
6 **15**

Pre-requisites IT5505 Interaction Design Fundamentals

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

At the end of the course, learners will be able to analyse and apply user centred design processes to build digital interactive artefacts that demonstrate effective user experiences.

Learning Outcomes

On successful completion of this course, the learner will be able to:

- 1 Explain how the user interface (UI) and interaction affect usability.
- 2 Analyse design problems and utilise user centred methods to support design from requirements analysis to planning, prototyping and reflection.
- 3 Design an effective interface in relation to users' characteristics (e.g., age, education, cultural differences and abilities).
- 4 Demonstrate responsive design using a range of digital tools.
- 5 Explain and apply the use of emerging technologies. This could include the use of multimodal interfaces or the integration of emerging toolsets.
- 6 Explain and apply methods to evaluate interaction designs and demonstrate ethical evaluation procedures.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Course work	20%	1-5
Project 1	30%	1, 2
Project 2	40%	2, 3, 4, 5, 6
Test	10%	1 - 6

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Indicative Texts:

The Encyclopaedia of Human-Computer Interaction, 2nd Ed. Don Norman

Interaction Design: Beyond Human-Computer Interaction, Yvonne Rogers, Jenny Preece, Helen Sharp, 4th Ed

Microinteractions: Full Color Edition: Designing with Details, Dan Saffer, 1st Ed.

Universal Principles of Design, Revised and Updated: 125 Ways to Enhance Usability, Influence Perception, Increase Appeal, Make Better Design Decisions, and Teach through Design, William Lidwell, Kritina Holden, Jill Butler, 2nd Ed

The Design of Everyday Things: Revised and Expanded Edition, Donald Norman

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

ID6504 User Interface and User Experience Design

Code	Title
ID6504	User Interface and User Experience Design

Level	Credits
6	15

Pre-requisites IT5505 Interaction Design Fundamentals

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

Learners will analyse and synthesise the processes of contextual inquiry relating to client objectives. They will evaluate the effectiveness of user experience design for multi-device environments. They will utilise design processes and technologies to create highly resolved solutions. Learners will apply appropriate industry standards to digital product implementation.

Learning Outcomes

By the end of this course, the learner will be able to:

1. Define project objectives, in relation to user needs for multi-device environments.
2. Synthesise and apply flexible content strategies to integrate technologies, delivered across devices and applications.
3. Scope and illustrate requirements and processes to create products with flexible architecture and content.
4. Create prototypes and analyse the ways that user experiences can be enhanced.
5. Apply user experience design principles to evaluate products.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Course work	20%	1-5
Project 1	30%	1, 2
Project 2	40%	2, 3, 4, 5
Test	10%	1 - 5

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Indicative Texts:

The Design of Everyday Things: Revised and Expanded Edition, Donald Norman

Communicating Design: Developing Web Site Documentation for Design and Planning, Dan M Brown, 2nd Ed.

A Project Guide to User Experience Design: For user experience designers in the field or in the making, Russ Unger, Carolyn Chandler, 2nd Ed.

The Elements of User experience: User-Centered Design for the Web and Beyond, Jesse James Garrett, 2nd Ed.

The Non-Designer's design hand book, Robin Williams

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

ID7501 Advanced Interface Technologies

Code	Title
ID7501	Advanced Interface Technologies

Level	Credits
7	15

Pre-requisites ID6504 User Interface and User Experience Design

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

Learners will synthesise their knowledge of technologies and techniques in relation to interface design. Learners will develop the ability to apply advanced techniques in designing and implementing innovative, interactive interface solutions.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Analyse and critically evaluate the technologies and principles needed to design and implement advanced interactive applications.
2. Analyse the elements required for effective communication with a specific target audience.
3. Appraise and implement complex interaction and interface design techniques.
4. Use advanced interaction design technologies to create interactive interfaces and communication experiences for users.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Project 1	40%	1-2
Project 2	40%	2-4
Test	20%	1-3

Successful completion of course:

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

ID7502 Human Computer Interaction

Code ID7502	Title Human Computer Interaction
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Level 7	Credits 15
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Pre-requisites	IT5505 Interaction Design Fundamentals
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Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To enable learners to understand the principles of human-computer interaction (HCI) in relation to the design and implementation of computer systems and to experience different application tools in the design, implementation and documentation of user interfaces.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Analyse and critique interaction design products, methods utilising current theory and standards.
2. Appraise, select and implement appropriate data gathering techniques in order to interpret and analyse a user problem.
3. Apply user interface design processes and to analyse and develop requirements and scenarios.
4. Create a range of prototypes from low fidelity parallel prototypes to high fidelity functional prototypes utilising relevant technologies.
5. Plan user testing frameworks and guidelines.
6. Evaluate, interpret and present data to create a development plan.

Indicative content

- Human Computer Interaction theory, user interface architecture and technologies.
- Conceptual terms for analysing human interaction with products (e.g., affordance and feedback).
- Ethical and practical constraints in relation to HCI fieldwork
- HCI frameworks, models and life cycles including need finding and data gathering techniques
- User interface design processes, in response to triangulated data collections and requirements:
 - conceptual modelling
 - development of interface metaphors
 - affordances
 - scenarios and experience mapping
- User centred design research, prototyping techniques and technologies
- User testing frameworks and guidelines

- Creating a development plan
- Applying findings to an interaction design life cycle utilising relevant technologies.
- Ubiquitous computing
- Virtual reality and Augmented reality

Assessments

Assessment Method	Weighting	Learning Outcome/s
Research Essay	25%	1, 2
Project 1	35 %	2,3,4,5,6
Project 2	40 %	2,3,4,5,6

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Indicative text

Rogers, Y., Sharp, H., & Preece, J. (2015). *Interaction design* (4rd Ed.). Chichester, West Sussex, U.K.: Wiley.

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

5.0 Networking and Infrastructure Major Courses

IT5506 Introduction to Networking

Code	Title
IT5506	Introduction to Networking

Level	Credits
5	15

Pre-requisites None

Learning Hours

Tutor Directed	65 hours
Self-directed	85 hours

Aim

To introduce fundamental networking concepts, technologies, the basics of network theory and the skills needed to implement a simple network.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Describe network protocol models and devices to explain the layers of communications in data networks.
2. Design and calculate IP addresses and subnet masks for both IPv4 and IPv6 for given simple networks, using IPv4 and IPv6.
3. Explain fundamental Ethernet concepts.
4. Describe and build a simple Ethernet network using routers and switches employing basic cabling and network design.
5. Identify and perform basic router and switch configuration and verification.

Indicative content

- Network Protocols
- IP address calculations
- Ethernet concepts
- Subnetting
- Basic Router and Switch Configuration
- Network Topologies
- Networking concepts: client/server, Peer-to-peer

Assessment

Assessment Method	Weighting	Learning Outcomes
Test 1	20%	1, 2, 3
Test 2	30%	4, 5
Practical 1	20%	1, 2, 3
Practical 2	30%	4, 5

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Cisco Network Academy: CCNA Routing and Switching: Introduction to Networks

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

NI6501 Networking II - LAN

Code	Title
NI6501	Networking II LAN

Level	Credits
6	15

Pre-requisites IT5506 Introduction to Networking

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

This course introduces the essential knowledge and skills of a networking professional and develops knowledge of the logic and algorithms involved in routing and switching traffic. Learners will develop an understanding of individual routing protocols and concepts and learn to configure network addressing services and to analyse, verify and troubleshoot routing and switching operations.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Configure routers and switches using a variety of common network technologies.
2. Troubleshoot routers and switches using a variety of common network technologies.
3. Configure static and dynamic routes
4. Design and implement classless IPv4 and IPv6 addressing schemes for networks
5. Configure basic router and switch operations and troubleshoot common issues and problems
6. Configure and verify basic addressing services in a small routed and switched network

Indicative content

- Static and Dynamic Routing
- Switch Configuration
- Router Configuration
- Network Address Translation
- ACL , RIP, DHCP & VLANs
- Access Control Lists
- Dynamic Host Configuration Protocol

Assessment

Assessment Method	Weighting	Learning Outcomes
Test 1	20%	1, 2, 3
Test 2	30%	4,5,6
Practical 1	20%	1, 2, 3
Practical 2	30%	4,5,6

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Cisco Network Academy: CCNA Routing and Switching: Routing and Switching Fundamentals

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

NI6502 Networking III - Campus

Code	Title
NI6502	Networking III - Campus

Level	Credits
6	15

Pre-requisites NI6501 Networking II – LAN

Learning Hours

Tutor Directed	52 hours
Self-directed	93 hours

Aim

To provide a comprehensive, theoretical and practical approach and resolve common issues with routing and switching implementation for a larger sized network using IPv4 and IPv6.

Learning Outcomes

On successful completion of this course, the learner will be able to:

- 1 Demonstrate a comprehensive knowledge of the technologies and techniques necessary to design and implement a converged network.
- 2 Apply appropriate actions to configure, verify and troubleshoot routing and switching implementation for a network with some complexity, including IPv4 and IPv6.

Indicative content

- LAN architecture
- Multiple Switch implementations
- Enhanced performance between switches
- Dynamic routing implementations
- Configuring varied implementations
- Tuning and troubleshooting

Assessments

Assessment Method	Weighting	Learning Outcome/s
Test 1	25%	1, 2
Test 1	25%	1, 2
Practical 1	25%	1, 2
Practical 2	25%	1, 2

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Indicative Texts:

Cisco Networking Academy. (2017). Scaling Networks v6 Companion Guide (Vol. 6). Cisco Press.

Oswald Coker & Siamak Azodolmolky. (2017). Software-Defined Networking with Openflow (Second). Packt Publishing, Limited, 2017.

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

NI6503 Unified Infrastructure Services

Code	Title
NI6503	Unified Infrastructure Services

Level	Credits
6	15

Pre-requisites IT5506 Introduction to Networking

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To introduce the fundamental network infrastructure components necessary to implement a small to medium sized network.

Learning Outcomes

On successful completion of this course, the learner will be able to:

- 1 Demonstrate a comprehensive knowledge of the technologies and techniques necessary to configure Directory Services, Group Policy and account management
- 2 Analyse and implement and maintain appropriate unified infrastructure services

Indicative content

- Server operating system
- Directory services
- User account administration
- Administration via group policies
- DNS configuration and deployment scenarios
- DHCP including deployment and backup
- Managing DNS and DHCP

Assessments

Assessment Method	Weighting	Learning Outcome/s
Test 1	25%	1, 2
Test 1	25%	1, 2
Practical 1	25%	1, 2
Practical 2	25%	1, 2

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Indicative Texts

MCSA Guide to Networking with Windows Server 2016, Exam 70-741 by Greg Tomsho

MCSA Guide to Identity with Windows Server 2016, Exam 70-742 by Greg Tomsho

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

NI6504 Cloud Computing

Code
NI6504

Title
Cloud Computing

Level
6

Credits
15

Pre-requisites IT5506 Introduction to Networking

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To develop an understanding of the incorporation and management of cloud technologies as part of broader systems operations. Learning about new technologies that support the changing cloud market as more organisations depend on cloud-based technologies to run mission critical systems, where hybrid and multi-cloud have become the norm.

Learning Outcomes

On successful completion of this course, the learner will be able to:

- 1 Demonstrate a comprehensive knowledge of the technologies and techniques necessary to configure and maintain a cloud environment
- 2 Identify and apply appropriate actions to implement and troubleshoot common problems within a cloud environment

Indicative content

- Cloud deployments and configurations
- Security in the cloud
- Maintenance including backup and patching
- Disaster recovery and business continuity
- Cloud management of resources and account provisioning
- Performance baseline comparison and service level agreements
- Troubleshooting common cloud issues
- Troubleshooting networking and security issues
- Storage technologies and cloud storage concepts

Assessments

Assessment Method	Weighting	Learning Outcome/s
Test 1	25%	1, 2
Test 1	25%	1, 2
Practical 1	25%	1, 2
Practical 2	25%	1, 2

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Indicative Text

CompTIA Cloud+ Study Guide CVO -002

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

NI7501 Current Topic in Networking and Infrastructure

Code
NI7501

Title
Current Topic in Networking and Infrastructure

Level
7

Credits
15

Pre-requisites
NI6501 Networking II - LAN
NI6502 Networking III - Campus

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To enable learners to understand the underlying principles of a current topic relating to Networking and Infrastructure, apply the underlying principles and concepts to the identification and solution of a variety of problems in various settings, research the topic and evaluate and implement methods of solving problems related to the topic.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Evaluate, and analyse characteristics of a specified current topic relating to Networking and Infrastructure.
2. Design and implement an appropriate technological solution to a problem or problems related to the topic.

Indicative content

- A specific topic relating to Networking and Infrastructure will be approved for this course, and advised to prospective learners in advance of enrolling.
- The topic will be approved by the Head of School.
- Detailed learning outcomes, content and assessment for the topic will be developed prior to the commencement of the course, approved by the Head of School, and made available to learners.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Applied work	50%	1, 2
Written assignment	50%	1, 2

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

NI7502 Emerging Topic in Networking and Infrastructure

Code
NI7502

Title
Emerging Topic in Networking and Infrastructure

Level
7

Credits
15

Pre-requisites
NI6501 Networking II – LAN
NI6502 Networking III – Campus

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To enable learners to understand the underlying principles of an emerging topic relating to Networking and Infrastructure, apply the underlying principles and concepts to the identification and solution of a variety of problems in various settings, research the topic and evaluate and implement methods of solving problems related to the topic.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Evaluate and analyse characteristics of a specified emerging topic relating to networking and infrastructure.
2. Design and implement an appropriate technological solution to a problem or problems related to the topic.

Indicative content

- A specific topic relating to Networking and Infrastructure will be selected for this course, and advised to prospective learners in advance of enrolling.
- Networking specialists from industry will be involved in selecting the emerging topic
- The topic will be approved by the Head of School.
- Detailed learning outcomes, content and assessment for the topic will be developed prior to the commencement of the course, approved by the Head of School, and made available to learners.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Applied work	50%	1, 2
Written assignment	50%	1, 2

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

6.0 Software Development Major Courses

IT5503 Programming I

Code
IT5503

Title
Programming I

Level
5

Credits
15

Pre-requisites
None

Learning Hours

Tutor Directed	65 hours
Self-directed	85 hours

Aim

A learner will be able to design software using appropriate syntax, implement software designs and apply basic object-oriented concepts.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Translate program designs into a programming language.
2. Design structured programs using the principles of the top-down-refinement of pseudocode.
3. Design structured programs using flow charts to illustrate the nesting of control structures.
4. Design object-oriented programs using an iterative and incremental process.
5. Execute and debug programs.

Indicative content

- Introduction to primitive data types, operators
- Pseudocode and flow chart
- Conditional statements and iteration
- Declaring, defining and using functions for structural as well as object-oriented programming
- Passing parameters to functions by value and by reference
- Arrays
- String class
- User defined types
- Unit testing
- Reusability
- Recursion

Assessments

Assessment Method	Weighting	Learning Outcomes
Assignment 1	30%	1 - 5
Assignment 2	30%	1 - 5
Examination	40%	1 - 5

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

SD6501 Mobile Application Development

Code
SD6501

Title
Mobile Application Development

Level
6

Credits
15

Pre-requisites
IT5503 Programming I
IT5507 Fundamentals of Data Science

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To equip learners with the knowledge and fundamental skills of mobile application development using a contemporary programming language and mobile platform.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Develop mobile applications on a popular mobile platform
2. Write mobile application programs that exhibit different features of a programming language
3. Design and develop sophisticated mobile interfaces that utilize rapid prototyping techniques
4. Construct mobile applications that integrate data storage, serialization techniques, and cloud services
5. Combine relevant code debugging and testing methodologies for developing mobile applications
6. Prepare a mobile application for distribution

Indicative content

- Core and advanced concepts of a programming language
- Techniques to plan, design and prototype mobile application
- Development tools
- Mobile device architecture
- User experience and interface design
- Data Storage and Serialization Techniques
- Cloud Services
- Geo-location and Maps
- Multithreading
- App distribution

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment 1	30%	1, 3
Assignment 2	30%	1, 5
Final Project	40%	1- 6

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

SD6502 Programming II

Code
SD6502

Title
Programming II

Level
6

Credits
15

Pre-requisite IT5503 Programming I

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To allow learners to extend their programming skills with the introduction of advanced concepts.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Implement software designs in an object-oriented programming language
2. Analyse relationship between algorithms and programming, and determine their efficiency
3. Implement most commonly used abstract data types and data structures used in software development
4. Apply prototyping techniques
5. Apply effective problem-solving strategies to foster programming skills

Indicative content

- Syntax and semantics of a selected programming language
- Object-oriented programming
- Advanced algorithms, data structures, problem solving strategies
- Static and Dynamic libraries
- Templates

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment 1	25%	1, 2
Assignment 2: labs	10%	2, 3, 5
Group Project	25%	4
Examination	40%	1, 2, 3, 5

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

SD6504 Game Development

Code
SD6504

Title
Game Development

Level
6

Credits
15

Pre-requisites
IT5503 Programming I
IT5501 Mathematics for IT

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

Provide learners with a foundation of effective game design and development using tools, algorithms, and game programming techniques.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Explain basic game architecture and different phases in game development
2. Describe 2D and 3D graphics, game animation and fundamental concepts of game programming
3. Use an industry standard game development engine to build interactive computer games
4. Evaluate and apply game physics, multi-valued logic, and Artificial Intelligence (AI) solutions for game development
5. Optimize, test and deploy developed games into variety of platforms (Desktop, Mobile, Web)

Indicative content:

- Introduction: Design vs Development, architecture, phases of development
- Level Design, 2D & 3D graphics, animation
- Game physics, Collision and Trigger detection
- Artificial Intelligence solutions: Path finding, Finite state machines, Fuzzy logic
- User interface and GUI
- Optimization, Testing, Publishing

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment 1	30%	1, 3
Assignment 2	30%	3, 5
Project	40%	1-5

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

SD6503 Testing and Secure Coding

Code
SD6503

Title
Testing and Secure Coding

Level
6

Credits
15

Pre-requisites SD6502 Programming II

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To provide learners with an advanced level of knowledge and skills required for developing secure software that is designed and tested using appropriate testing and security tools.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Plan and implement the appropriate level of testing within the context of a software development application following the Systems Development Life Cycle (SDLC) and Software Testing Life Cycle (STLC) models
2. Construct a system that executes advanced testing processes and core testing concepts
3. Develop an automated testing environment that tests complex software application and integrates analysis and interpretation of test data
4. Explain the principles and mechanisms of software security
5. Evaluate common security risk and vulnerabilities
6. Evaluate and use appropriate tools to mitigate security risks in the new code or repair security flaws in the existing code

Indicative content

- SDLC and STLC
- Test Documentation and Test Case Design
- Unit Testing
- Automated Testing and Testing Tools
- Software security and risk principles
- Threat modelling ,Secure coding practices
- Types of software vulnerabilities, Exploits

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment 1	30%	1, 2, 3
Assignment 2	30%	4, 5, 6
Final Project	40%	1-6

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

SD7501 Web Application Development

Code SD7501	Title Web Application Development
Level 7	Credits 15
Pre-requisites	IT5507 Fundamentals of Data Science SD6502 Programming II

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aims

To enable the learner to:

- Evaluate and apply the use of appropriate platform and architecture, for the development of web applications.
- Integrate applications with a database and learn how to access web data using managed data providers and objects.
- Investigate the security challenges and security models for web applications.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Evaluate the business, technical and social implications of web application development.
2. Analyse the background and underlying principles of web application development in the selected framework.
3. Design and implement an appropriate secure internet application solution to an unstructured problem.
4. Research and critically evaluate new tools and technologies in relation to internet application development.

Indicative Content

The course will contain the following topics:

- ASP.NET framework, development tools and environment
- MVC framework
- MVC routing, tracing & debugging
- AJAX & JQuery
- Data access and Data Binding
- ASP.NET Core with Entity Framework
- ASP.NET Core Identity
- RESTful Web Services and Web API's
- Web Application Security
- Windows Presentation Foundation (WPF)
- Frontend Development platforms for Web Application
- Web Application Deployment

Assessment

Assessment Method	Weight %	Learning Outcomes
Research Report and Presentation	25%	1, 2, 4
Programming Project	35%	3, 4
Final Exam	40%	1, 2, 3, 4

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Indicative text:

Lastest edition of Pro ASP.NET Core MVC: Develop cloudy-ready web applications using Microsoft's latest Framework, ASP.NET Core MVC Author: Adam Freeman, Publisher: aPress

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

SD7502 Intelligent Systems Development

Code
SD7502

Title
Intelligent Systems Development

Level
7

Credits
15

Pre-requisites
IT5501 Mathematics for IT
SD6502 Programming II

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To provide learners with an advanced level of knowledge and skills required for developing artificially intelligent applications.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Prepare framework in a suitable programming environment.
2. Apply the software tools required for a complex application.
3. Implement the recent advances in software development.
4. Analyse data using a pattern recognition approach to identify features of interest.
5. Research, design, develop, and reconstruct models by using current APIs for building a machine learning based application for a complex problem.

Indicative content

- Introduction to computer vision, and Open Source Computer Vision (OpenCV) library
- Use and improve open source W&W Vision library
- Types of features and their application
- Image segmentation
- Deep Learning and GPU processing
- Google Tensor flow vs. Microsoft Cognitive Toolkit
- Keras
- Identify and apply filters for noise estimation and data prediction

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment	40%	1, 3
Midterm project	20%	1, 4
Final Project	40%	1 - 5

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

OpenCV # Computer Vision Application Programming Cookbook, latest edition. Author Robert Laganier.

Hands-On Machine Learning with Scikit-Learn and Tensorflow, latest edition. Author Aurélien Géron

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recent research articles as well as tutorials for libraries.

7.0 Elective courses

IT5510 Introduction to Operating Systems

Code
IT5510

Title
Introduction to Operating Systems

Level
5

Credits
15

Pre-requisites None

Learning Hours

Tutor Directed 65 hours
Self-directed 85 hours

Aim

- To introduce the underlying principles, evolution and the implementation of operating systems.
- To provide an opportunity to gain experience in using operating system instructions.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Identify the components of operating systems.
2. Describe the evolutionary path of operating systems.
3. Describe the background and underlying principles of operating systems.
4. Describe the operational methods of operating systems.
5. Apply operating system commands.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment	25%	1, 2, 3
Lab Activities	35%	4, 5
Final Exam	40%	1 - 5

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Indicative text:

OpenCV # Computer Vision Application Programming Cookbook, latest edition. Author Robert Laganier.

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT5508 Electronics Fundamentals

Code	Title
IT5508	Electronics Fundamentals

Level	Credits
5	15

Pre-requisites	None
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Learning Hours

Tutor Directed	65 hours
Self-directed	85 hours

Aim:

- To provide learners with the safe working knowledge of analogue and digital electronics, correct terminology, and the skills required to test computers and related electronic equipment.
- To explain the fundamentals of the safe use of appropriate electronic test instruments to make measurements in electronic and computer equipment.
- To enable learners to identify symbols, packages, operation, and uses of various Analogue and Digital devices.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Read circuit diagrams and apply Ohm's Law to calculate volts, amps and resistance to simple series and parallel circuits and calculate electrical power.
2. Explain the characteristics of analogue devices, their fundamentals principles of operation, and their use.
3. Explain the characteristics of digital devices, their fundamentals principles of operation, and their use.
4. Apply fundamental principles of the safe use of the appropriate electronic test instruments to make measurements in electronic and computer equipment.
5. Use technical terminology correctly.
6. Apply safe design principles and protection.

Indicative Content

Topics may include:

Electro technology

- Electrical components and symbols: capacitors, resistors, inductors, transformers, switches
- Electrical units: amperes, volts, ohms, watts
- Magnitude prefixes: pica to giga
- Ohms Law

Analogue Electronics

- Symbols, packages and operation of: diodes, LEDs, Op-amp-parameters: gain offsets, positive and negative feedback, slew rate, bandwidth CMRR and applications. Filtering (high and low pass, band pass, band reject)

Digital Electronics

- Numbering Systems: binary, hexadecimal, code conversion
- Logic Gates: gates, standard logic symbols, truth tables, timing diagram, Boolean algebra.
- Combination logic: multi-level circuits, logic simplification
- Synchronous sequential: latches, flip flops, registers counters Schmitt triggers.

Instrumentation

- The use of a range of meters: voltmeters, ammeters, multi meters, basic oscilloscope, and power supplies.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Test 1	20%	1, 2, 5
Test 2	20%	1, 3, 5
Labs	30%	1 - 6
Assignment	30%	1 - 4

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Indicative Text

Jackson, H W & White, PA, *Introduction to electrical Circuits*, Prentice-Hall

Tocci, RJ, *Digital Systems: Principles and Applications*, Prentice –Hall.

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT5509 Software Testing Fundamentals

Code IT5509	Title Software Testing Fundamentals
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Level 5	Credits 15
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Pre-requisites	None
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Learning Hours

Tutor Directed	65 hours
Self-directed	85 hours

Aim

This course introduces the theory and practice of software testing. This is a vocational course to help learners seek employment in junior software testing roles and/or gain foundation level software testing certification.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Describe the fundamentals of testing, testing throughout the software life cycle, and static techniques.
2. Identify test design techniques, and apply specification-based or black-box techniques, and structure-based or white-box techniques in a practical situation.
3. Describe the management of testing and apply incident management in a practical situation.
4. Explain static techniques.

Indicative Content

- Fundamentals:
 - The importance of testing and general testing principles.
 - The fundamental test process.
 - Procedures and processes in software testing. Range psychology of testing, Software development models, Test levels, Test types, Maintenance testing, Static techniques and the test process, Review process, and Static analysis by tools.
- Test Design Techniques:
 - Test Development Process, and categories of test design techniques.
 - Equivalence partitioning, boundary value analysis, decision table testing and state transition testing.
 - Designing test cases for given control flows.
 - Experience-based techniques and choosing test techniques.
- Test management:
 - Test organization, Test planning and estimation, Test progress monitoring and control, Configuration management, and Risk and testing
 - Incident reporting

- Tool support for testing:
 - Types of test tools, effective use of tools, and potential benefits and risks
 - Fundamentals of introducing a tool into an organization

Assessments

Assessment Method	Weighting	Learning Outcome/s
Theory assessment	30%	1 - 4
Practical assessment	30%	2, 3
Examination	40%	1 - 4

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT6509 IT Business Environment

Code	Title
IT6509	IT Business Environment
Level	Credits
6	15
Pre-requisites:	IT5502 Communications for IT

Learning Hours

Tutor-directed	52 hours
Self-directed	98 hours

Aim

To enable learners to act as an analyst to bridge the gap between business and IT and to contribute to improving the quality of the products and services delivered to business by IT professionals.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Explain the contribution, functions and role of IT professionals within various organisation structures and use communication tools to convey IT complexity.
2. Analyse the key principles of Business/IT Service Lifecycles using industry standard frameworks.
3. Analyse the application of various IT legal implications, compliance, IT/business ethical impacts, IT employment methodologies and workplace environments
4. Analyse IT business process risk through IT Auditing standards.

Indicative content

The course will contain the following topics:

- IT operational environments including financial operational practices.
- Communicate IT service processes through diagrams and technical writing.
- Legal implications within the IT service industry workplace environments, IT professional practice implications.
- Tendering, IT Service Contracts, Service Level Agreements, Conflict of Interest.
- IT service and TQM frameworks. May involve: ITIL, CMM, COBIT, ISO9000, ISO/IEC 20000, ISO 21500, ISO 27000, ISO/IEC 38500, ISO/IEC 31000, TOGAF
- IT audit standards. Links to financial systems, continuity systems and disaster recovery.

This content will be delivered in an applied manner, with extensive use of case studies.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment 1	20%	1 - 4
Assignment 2	20%	1 - 4
Test	20%	1 - 3
Examination	40%	1 – 4

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT6503 Microcomputer Systems

Code	Title
IT6503	Microcomputer Systems

Level	Credits
6	15
Pre-requisites:	IT5503 Programming I

Learning Hours

Tutor-directed	52 hours
Self-directed	98 hours

Aim

To enable learners to appreciate, programme and use the features of microcontroller systems.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Analyse and explain the features of various types of microcontrollers and areas of application.
2. Demonstrate the characteristics of a range of available microprocessors.
3. Select the appropriate microprocessor for a given task.
4. Program a microprocessor in a selected language.
5. Describe the operation of several of the most common industry standard interfaces.
6. Write and test a driver for one or more of the standard interfaces, some of which may be a mixture of language.
7. Develop a small embedded program to illustrate a combination of two or more standard interfaces being used at the same time.

Indicative content

Topics may include:

- Assembler, C and C++ languages
- The development of programmes in High Level Language (HLL) and assembler

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment	20%	1-7
Test	20%	1-7
Practical Labs	20%	2-6
Examination	40%	1-6

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT6508 Research in Information Technology

Code	Title
IT6508	Research in Information Technology

Level	Credits
6	15
Pre-requisites:	IT5502 Communication for IT

Learning Hours

Tutor-directed	52 hours
Self-directed	98 hours

Aims

The aim of this course is to provide a comprehensive overview of rigorous research practice and to lay a foundation of research skills, which will be relevant to both further study and professional practice.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Critically evaluate of the nature of research and the research process in IT (including sources of bias and ethical considerations).
2. Critically analyse the sources of research evidence and demonstrate through critical appraisal how such evidence should be interpreted and evaluated.
3. Scope a useful research question.
4. Construct an appropriate research design for a specific research question.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment 1	30%	1
Assignment 2	30%	2
Assignment 3	40%	2-4

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT6504 Embedded Systems I

Code	Title
IT6504	Embedded Systems I

Level	Credits
6	15
Pre-requisites:	IT5503 Programming I

Learning Hours

Tutor-directed	52 hours
Self-directed	98 hours

Aims

To develop the learner's knowledge of the technical requirements, both hardware and software, and implementation of a small scale embedded system.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Derive technical requirements for an embedded system from requirements and select appropriate hardware and software for the requirements.
2. Select and use the appropriate development tools.
3. Develop hardware and software for a simple embedded system.

Indicative Content

- Customer specifications and written technical requirements: hardware and software, processing engines, interface requirements, operating systems, development tools
- Tools for host and target machines: cross compilers/assemblers, linker/loader, memory map management
- Development hardware and test equipment: Development boards, ISP, JTAG, Protocol and Logic analysers.
- Domain-specific requirements including operating system and environment issues
- Hardware and software tools
- Interfacing methods
- Target operating system: pre-emptive, multitasking, foreground/background
- Diagnostic techniques: hardware and software

Assessment

Assessment Method	Weighting	Learning Outcome/s
Assignment	20%	1, 2, 3
Test	20%	1, 2, 3
Labs	20%	1, 2, 3
Examination	40%	1, 2, 3

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT6505 Advanced Software Testing

Code	Title
IT6505	Advanced Software Testing

Level	Credits
6	15

Pre-requisites: IT5509 Software Testing Fundamentals

Learning Hours

Tutor-directed	52 hours
Self-directed	98 hours

Aims

- Enable learners to apply fundamental principles of unit testing standards and practices, both independently or as part of a team.
- To apply knowledge and practice that underpin sound testing practice to support the delivery of quality systems consistent with industry standards across several levels.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Conduct unit testing to demonstrate an understanding of effective ways to influence and improve software testing in a business setting.
2. Undertake a range of integrated testing practices, to enable the writing of professional test reports.
3. Apply the role of tester within a development team, using effective communication strategies, through co-operative work in a group, leadership, negotiation techniques and conflict management.
4. Create, maintain and run test scripts to automate testing.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Project 1	20%	1, 2
Group Project 2	20%	3
Project 3	20%	4
Examination	40%	1, 2, 4

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT6506 Carrier Technology I

Code	Title
IT6506	Carrier Technology I

Level	Credits
7	15

Pre-requisites:	IT5506 Introduction to Networking IT5501 Mathematics for IT
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Learning Hours

Tutor-directed	52 hours
Self-directed	98 hours

Aims

The aim of this course is to introduce the principles and practices of technology used to carry data, video and voice traffic for New Zealand businesses and Internet Service Providers.

Learning Outcomes

On successful completion of this course, the learner will be able to:

- 1 Investigate encoding and signalling techniques used for conveying digital information of copper media to end subscribers.
- 2 Identify and compare industry standards for end subscriber services including Asymmetric digital subscriber line (ADSL) and Very-high-bit-rate digital subscriber line (VDSL).
- 3 Configure simple end subscriber services.
- 4 Evaluate Multiprotocol Label Switching (MPLS) features and practices for end subscriber service provisioning.
- 5 Configure services utilising MPLS features.

Indicative Content

Principles of transmission of digital information

- End subscriber technology including encoding techniques, xDSL and DSLAM.
- The purpose and features of a simple DSLAM for end subscriber use.
- The operation of and application of fibre optic cables for digital communications including encoding, installation, GPON, CWDM and DWDM.
- The fundamentals of the TCP/IP architecture, Ethernet, IPv4 and IPv6 from the perspective of circuit provisioning including typical devices such as repeater, bridge, switch, router, and gateway.
- Configurations and arrangements for providing end subscribe services utilising Ethernet and IP technology including VLAN, Q in Q, loop prevention and address resolution.

Multi-Protocol Label Switching

- Fundamentals of MPLS as used in provider networks
- Supporting protocols such as LDP and RRP
- How providers can use TE features to offer a variety of end subscriber services

Assessments

Assessment Method	Weighting	Learning Outcome/s
Theory assessment	50%	1-5
Practical assessment	50%	1-5

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT6507 Wireless Networking Technology

Code	Title
IT6507	Wireless Networking Technology

Level	Credits
6	15
Pre-requisites:	None

Learning Hours

Tutor-directed	52 hours
Self-directed	98 hours

Aims

The aim of this course is to enable learners to develop an in depth understanding of the structure and operation of wireless networks

Learning Outcomes

On successful completion of this course, the learner will be able to:

- 1 Identify mandatory and conformance standards and be able to list the main standards organisations.
- 2 Define basic elements of wireless technology.
- 3 Identify the purpose, features and functions of wireless networking components.
- 4 Demonstrate the fundamental concepts of wireless data transmission within the PC environment.
- 5 Demonstrate the fundamental concepts of site surveying to develop practical wireless installations.
- 6 Describe the fundamental concepts of wireless security.

Indicative Content

- Wi-Fi Technology and Standards
 - Radio theory, modulation/demodulation, antennae, attenuation etc., and wireless topologies.
 - Standards organisations, range, coverage and capacity, frequencies, channel reuse and co-location, active and passive scanning, data rates, authentication, infra-structure and ad-hoc.
- Hardware (wireless adapters, access points) and software (drivers, clients and servers) required for wireless networking: Access Points, Routers, Bridges, Repeaters, PoE, Drivers, Clients and Servers.

- RF Fundamentals: units of RF measurement, range affecting factors, physical layer wireless technologies, Spread Spectrum, Gain and loss.
- Site Surveying and Installation
 - Gathering business requirements
 - Multiple / Single Channel Architecture
 - Active / Passive Surveys.
 - practical wireless installations
- Security and Compliance
 - SSID hiding
 - Legacy security (passphrase) (WEP, MAC)
 - User-based security (EAP / RADIUS)
 - Data Encryption
 - Regulatory Compliance.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Coursework Laboratories	50%	1-6
Test 1	25%	1-3
Test 2	25%	4-6

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Indicative texts

Certified Wireless Technology Guide Specialist (CWTS) Official Study Guide – Robert J Bartz (ISBN 978-1-118-35911-2)

Certified Wireless Network Administrator (CWNA) Official Study Guide – David D Coleman, David A Westcott (ISBN 978-1-118-89370-8)

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

Code	Title
CS7503	Network Fundamentals for Information Assurance and Security

Level	Credits
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7	15
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Pre-requisites	None
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Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To develop a student's knowledge of network protocol fundamentals and the analysis and correlation of data sourced from network packet streams and from various network devices in an enterprise network

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Capture, manipulate, and replay packets
2. Analyse data retrieved from network packet capture data using command line tools.
3. Develop and apply an advanced knowledge of key live and network forensic principles and methods.
4. Evaluate network forensics tools and evidence acquisition and analysis from various network devices.
5. Evaluate common approaches to network forensic analysis and their utility in various investigative scenarios
6. Apply knowledge of networking protocols to identify potential evidence within traffic captures and intrusion detection alerts.

Indicative content

- Network protocol fundamentals
- Packet capture, manipulation, replay
- Packet capture applications and data
- Network evidence types and sources
- Investigation OPSEC and footprint considerations
- Common network protocol analysis
- NSM data types
- Log data and other data to supplement network examinations

Assessments

Assessment Method	Weighting	Learning Outcome/s
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Assessments	60%	1-6
Examination	40%	1-6

Successful completion of course:

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Indicative texts:

Davidoff, S., & Ham, J. (2012). *Network forensics: Tracking hackers through Cyberspace*. Boston, MA: Pearson Education.

Messier, R. (2017). *Network forensics*. New York: Wiley.

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

Code	Title
CS7504	Security for DevOps
Level	Credits
7	15
Pre-requisites	None
Learning Hours	

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To equip students with the knowledge of developing secure software using the DevOps process and cloud services

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Evaluate the appropriate framework to examine possible architectures, automation, CI/CD and development toolset.
2. Develop software by implementing DevOps methodology and practices
3. Implement security in DevOps

Indicative content

- DevOps fundamentals, core-concepts, principles and practices
- DevOps Tools (Git, GitHub, Docker, Jenkins, etc.)
- Continuous Integration and Continuous Deployment in DevOps
- Testing Automation, Validation, Monitoring and Security

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assessment	30%	1-2
Assessment	30%	1-3
Examination	40%	1-3

Successful completion of course:

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Indicative Texts

Hsu, T. (2018). *Hands-On security in DevOps*. Birmingham, UK: Packt Publishing

Kim, Gene, et al. (2016) *The DevOps handbook: How to create world-class agility. Reliability, and security in technology organizations*. IT Revolution Press, LLC.

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

Code **Title**

CS7505 Incident Response and Digital Forensics

Level **Credits**

7 15

Pre-requisites None

Learning Hours

Tutor Directed 52 hours

Self-directed 98 hours

Aim

To provide students with the essential skills to conduct an investigation of compromised systems during or after a cyber/security incident.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Evaluate the use and application of incident response methodologies in dealing with system security-related incidents.
2. Acquire and analyse live response data from compromised systems.
3. Analyse memory for evidence of a compromise.
4. Analyse file system and operating system artefacts for evidence of a compromise.
5. Evaluate and apply tools and common processes in performing analysis of compromised systems.
6. Apply research methods to obtain current knowledge of events and tools/support kits in the subject area.

Indicative content

- Incident response methodologies
- File system analysis
- Operating system artefact analysis
- Acquisition and analysis of data from 'live' systems
- Memory analysis
- Common methods used by malicious actors to compromise systems

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assessment	20%	1-6
Assessment	20%	2-3

Assessment	20%	4-5
Examination	40%	1-6

Successful completion of course:

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Indicative Texts

Luttgens, J., Pepe, M., & Mandia, K. (2014). *Incident response & computer forensics, (3rd Ed)*. USA: McGraw-Hill Education

Murdoch, D. (2016), *Blue Team Handbook: Incident response edition: A condensed field guide for the Cyber Security Incident Responder (2.2 Ed)*, USA: CreateSpace Independent Publishing Platform

Murdoch, D. (2019), *Blue Team Handbook: SOC, SIEM, and Threat Hunting Use Cases: A condensed field guide for the Security Operations Team (Volume 1.02)*, USA: CreateSpace Independent Publishing Platform

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

Code **Title**

CS7506 Cloud Security

Level **Credits**

7 15

Pre-requisites None

Learning Hours

Tutor Directed 52 hours

Self-directed 98 hours

Aim

To enable students to understand the technologies and services that enable cloud computing, discuss different types of cloud computing models and investigate security and legal issues associated with cloud computing.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Compare and contrast the various cloud delivery and deployment models, particularly the security implications of each.
2. Analyse virtualisation technology and current attacks against it.
3. Critically evaluate service orchestration, business continuity, security, and service management functions for a cloud infrastructure.
4. Appraise the mechanisms used to secure cloud computing platforms, including trustworthy computing, secure computation, and data security in cloud environments.
5. Analyse the challenges that cloud computing introduces for regulatory compliance and digital forensics.

Indicative content

- Cybersecurity concepts, roles, threat model, problem escalation paths, legal environment and compliance requirements.
- Technical security techniques, tools (including tool validation), reporting, compliance to best practice (rules of engagement, penetration testing contracts and others).
- Practical security testing.
- Exposure to a wide range of tools, operating systems and attack techniques.
- Providing input to the security threat model and suggesting security policy solutions.
- Business security testing

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assessment	20%	1, 2, 5
Assessment	20%	2-3
Assessment	20%	3-4
Examination	40%	1-5

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Cloud Security Alliance. (2018). *Security guidance for critical areas of focus in cloud computing v4.0*

ENISA (2009), *Cloud Computing Risk Assessment*

Dell/EMC (2018), *Cloud Infrastructure and Services v3*

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

Code **Title**

IA7307 Cryptography and Security Mechanisms

Level **Credits**

7 15

Pre-requisites None

Learning Hours

Tutor Directed 52 hours

Self-directed 98 hours

Aim

To enable students to develop an understanding of the design requirements and the application of secure systems in business, government and high security environments.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Evaluate and apply modern symmetric and asymmetric cryptographic techniques.
2. Explain and analyse the workings of fundamental public key and symmetric key cryptographic algorithms.
3. Analyse existing authentication and key agreement protocols, identify the weaknesses of these protocols.
4. Apply various security mechanisms derived from cryptography to network, web, and in a variety of system security scenarios.
5. Research, model and design/deploy real-world applications of cryptographic primitives and protocols within business context.

Indicative content

- Mathematical foundation for cryptography.
- Security attacks.
- Principles of modern cryptography: the history, block ciphers, message authentication codes, hash functions, public-key cryptography, digital signatures.
- Key management and distribution.
- Cryptanalysis.
- Zero knowledge proofs, secret sharing, and oblivious transfer and secure multi-party computation.
- Real-world applications of cryptographic primitives and protocols: network security practice, email security, IP security, web security, wireless network security, cloud security and system security.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assessment	20%	1-2
Assessment	20%	2-3
Assessment	20%	3-4
Final Assessment	40%	1-5

Successful completion of course:

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

Code **Title**

IA7308 Security Testing and Network Defence

Level **Credits**

7 15

Pre-requisites None

Learning Hours

Tutor Directed	52 hours
Self-directed	98 hours

Aim

To develop the technical skills to conduct security tests against networks and the business skills necessary for providing justification, efficiency and an understanding of contemporary business and security needs.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Evaluate the business needs of security testing and apply Cybersecurity knowledge and technical security baselines.
2. Undertake practical security testing and analyse and verify test results using industry processes.
3. Monitor the threat environment, using local and international security alert reports to provide timely and accurate advice to the security team and update the threat model.
4. Analyse the functionality and operation of security techniques and implement them as they apply to software, databases and data.

Indicative content

- Cybersecurity concepts, roles, threat model, problem escalation paths, legal environment and compliance requirements.
- Technical security techniques, tools (including tool validation), reporting, compliance to best practice (rules of engagement, penetration testing contracts and others).
- Practical security testing.
- Exposure to a wide range of tools, operating systems and attack techniques.
- Providing input to the security threat model and suggesting security policy solutions.
- Business security testing

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assessment	20%	1-2
Assessment	20%	2-3
Assessment	20%	3-4
Final Assessment	40%	1-4

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT7503 Special Topic

Code
IT7503

Title
Special Topic

Level
7

Credits
15

Pre-requisites: Level 6 study as appropriate for topic

Learning Hours

Tutor-directed	52 hours
Self-directed	98 hours

Aims

To enable learners to:

- Understand the underlying principles of a specific topic relating to information technology
- Apply those underlying principles and concepts to the identification and solution of unstructured problems in unfamiliar settings
- Implement novel methods of solving problems related to the topic.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Research, evaluate and analyse the background and underlying principles of the major concepts of the topic.
2. Evaluate the business, technical and social implications of the topic.
3. Design and implement an appropriate technological solution to an unstructured problem or problems related to the topic.

Indicative content

- A specific topic relating to IT will be approved for this course, and advised to prospective learners in advance of enrolling.
- The topic will be approved by the Head of School.
- Detailed learning outcomes, content and assessment for the topic will be developed prior to the commencement of the course, approved by the Head of School, and made available to learners.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Presentation	20%	1,2
Report and Presentation	40%	1,2
Project	40%	3

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT7504 Middleware

Code
IT7504

Title
Middleware

Level
7

Credits
15

Pre-requisites: SD6502 Programming II
IT5507 Fundamentals of Data Science

Learning Hours

Tutor-directed 52 hours
Self-directed 98 hours

Aims

To enable learners to understand the underlying principles of middleware, apply the underlying principles and concepts of middleware to identify and solve information architecture and interconnectivity problems, and research techniques and topics in the field of middleware needed to evaluate and implement middleware solutions.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Research, analyse and critically evaluate the background, underlying principles and aspects of the major middleware concepts.
2. Assess the business, technical and social implications of middleware implementations.
3. Design and implement an appropriate technological solution to a problem requiring a middleware enabled solution.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Poster Presentation	15%	1,2
Project: Database enabled web application	35%	3
Project: Distributed database application	50%	3

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT7505 Embedded Systems II

Code	Title
IT7505	Embedded Systems II

Level	Credits	
7	15	
Pre-requisites:	IT6503 Microcomputer Systems IT6504 Embedded Systems I	OR

Learning Hours

Tutor-directed	52 hours
Self-directed	98 hours

Aims

The aim of this course is to:

- Introduce 32-bit multi-tasking embedded systems.
- Build on the learner's knowledge of pre-emptive, real-time systems with complex tasks.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Produce development proposals for making cost-effective design choices for the development of embedded systems
2. Set up the development system and toolchain
3. Set up the selected operating system
4. Implement the specifications
5. Test the system to verify and demonstrate that the specification has been met.

Indicative content

- Analysis of the requirements of an Embedded System and a specification to support those requirements.
- Selection of an operating system methodology and a suitable toolchain.
- System design and selection of hardware.
- Development Plan, Development and Production Costing.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Assignment	20%	1, 3, 4
Test	20%	2, 5
Labs	20%	1-5
Examination	40%	1-5

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Indicative Texts and tutorials

Barr, M, Massa, A (2006), *Programming Embedded Systems with C and GNU Development Tools*, 2nd Edition, O'Reilly

The FreeRTOS Project: <http://www.freertos.org/>

eCos: <http://ecos.sourceware.org/>

Real-Time Linux Tutorial: <http://www.isd.mel.nist.gov/projects/rtlinux-2O/doc/tutorial.htm#index>

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT7506 Testing Automation

Code	Title
IT7506	Testing Automation

Level	Credits
7	15

Pre-requisites: IT6505 Advanced Software Testing

Learning Hours

Tutor-directed	52 hours
Self-directed	98 hours

Aims

- To enable learners to apply automated testing and integrated regression testing across a variety of platforms and technologies, both independently or as part of a team.
- To enable the integration of defect tracking within configuration management to manage performance.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Select and deploy appropriate tools to test activities across a range of software architecture and application types utilising advanced version control and scripting test automation.
2. Use a range of software testing communication techniques and practices within a typical environment: mobile applications, test automation and web application testing.
3. Apply effective software testing information design and efficiency outcomes in a typical organisational environment.
4. Incorporate an appreciation of workplace software ethics, cultural awareness and legal implications into the testing process within an organisational environment.
5. Produce test reports in a highly technical and professional manner.

Indicative Content

- Principles of effective automated testing and integrated regression testing development through continuous integration and deployment of software testing strategies.
- Execute testing and automate data for various requirements to determine whether systems meets requirements.
- Project and statistic tools to analyse, bug and report tracking.
- Performance test techniques to determine whether system meets requirements.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Project 1	30%	1, 2, 3, 5
Project 2	30%	4, 5
Examination	40%	1 – 4

Successful completion of course

To pass a course where there is an examination set, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments, including the examination
- Achieve a mark of **40%** or above in their final examination

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT7507 Carrier Technology II

Code	Title
IT507	Carrier Technology II

Level	Credits
7	15

Pre-requisites: IT6506 Carrier Technology I

Learning Hours

Tutor-directed	52 hours
Self-directed	98 hours

Aims

The aim of this course is to introduce the principles and practices of technology used to carry data, video and voice traffic for New Zealand businesses and Internet Service Providers.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Evaluate Optical Transmission Concepts, Wave Division Multiplexing (WDM) and Optical Transport Hierarchy (OTH) within a given context.
2. Critically examine Multicast types and applications, Component protocols of a multicast enabled network, Multicast addressing, Interior gateway protocol (IGP) in a multicast-enabled network, Internet Group Management Protocol (IGMPv2 and IGMPv3) within a given context.
3. Compare and Contrast the options and configurations utilising policers and shapers in a quality assured network.
4. Evaluate bandwidth allocation models and features that utilise these.
5. Outline service types and the technology upon which they rely; configure technology to provide services; decide management tools to manage services; and troubleshoot services.

Indicative Content

- Principles of transmission of digital information
 - Main transmission concepts and the related devices involved in an optical link, the main impairments occurring within an optical fibre and the related solutions used to compensate these impairments; laser classes risks and safety mechanisms, deploying a WDM network.
 - Basic WDM technology and the operational concepts, the functions of the major components used in WDM; quote the main monitoring parameters related to the transmission quality; evaluate the propagation penalties due to the wavelength multiplexing, evaluate possible ways to improve the signal transmission.

- WDM terrestrial network topology, protection and supervision and the evolution to 40G to 400G.
- Multicast
 - Explain the need for multicasting and the types of multicast applications.
 - Differentiate between the methods of IP packet delivery and their characteristics.
 - Recognize the component protocols of a multicast enabled network.
 - Define IP multicast addressing.
 - Evaluate the role of the interior gateway protocol (IGP) in a multicast-enabled network.
 - Evaluate the operation of Internet Group Management Protocol (IGMPv2 and IGMPv3) and IGMP snooping.
- Quality of Service: Policing and Shaping; Hierarchical Bandwidth Allocation among Queues; Hierarchical Bandwidth Allocation among Policers; Queue Sharing and Redirection within a given context.
- Services Architecture
 - Match services with given scenarios
 - Explain the operation of technology to provide services.
 - Configure, manage and troubleshoot services.

Assessments

Assessment Method	Weighting	Learning Outcome/s
Practical 1	25%	1-5
Practical 2	25%	1-5
Test 1	25%	1-5
Test 2	25%	1-5

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.

IT7508 Internship

Code	Title
IT7508	Internship

Level	Credits
7	30

Pre-requisites: Completion of 240 credits at level 5 and above

Learning Hours

Tutor-directed	10 hours
Self-directed	290 hours

Aims

To provide an opportunity for learners to gain industry experience relevant to a chosen area of IT and to reflect critically on concepts and perspectives studied.

Learning Outcomes

On successful completion of this course, the learner will be able to:

1. Apply taught knowledge, research evidence and skills to a field of IT to assess work practices
2. Identify a problem relevant to the chosen organisation and recommend strategies for solving the problem
3. Document and present recommended strategies as appropriate to a selected audience

Indicative Content

Topics covered:

- Application of taught knowledge, research evidence and skills to a practical context
- Assessment of work practices based on theoretical frameworks
- Problem identification and recommendation of strategies

Assessments

Assessment Method	Weighting	Learning Outcome/s
Internship Logbook. Report on internship experience, including assessment of work practices in an IT Team in the chosen organisation, and referring to advanced concepts, theories and research relevant to the learner's area of IT.	30%	1
Final Report. Report on recommended strategies for solving a problem relevant to the chosen organisation, including relevant theories and practice	50%	2, 3
Presentation of recommended strategies to a selected audience	20%	2,3

Successful completion of course

To pass a course where there is no final examination, a learner must:

- Attempt all assessments
- Achieve an average mark of **50%** or above over all assessments

Resources

Teaching and Learning resources can include:

- Lecturer
- Tutorial assistant
- Classrooms equipped with computer and data projector
- Online course resources such as lab work sheets, walkthroughs, readings, video demos, and quizzes are available to learners.
- Specialist guest speakers
- Specialist IT lab
- Library including online resources

The course outline will contain a list of recommended resources.