Level III Curriculum 2022

[Semester 5 and 6]

University of Colombo School of Computing

March 2022

Table of Contents

EN5106 - Fundamentals of Management & Entrepreneurship

Program Content

Semester	V	
Course Code:	EN5106	
Course Name:	Fundamentals of Management & Entrepreneurship	
Credit Value:	2 (2L)	
Core/Optional	Core	
Hourly Breakdown	Theory	Independent Learning
	30 Hrs	70 Hrs

Course Aim:

This course aims to help learning partners understand the basic concepts and theories of management and entrepreneurship and to know how these theories and concepts could be applied in different types of organizations in order to achieve their goals efficiently and effectively.

Intended Learning Outcomes:

After successfully completing this course, students should be able to:

- Define what management is and describe why it is important to run organizations.
- Describe planning and its application in organizations.
- Describe organizing and its application in organizations.
- Describe leading and its application in organizations.
- Describe controlling and its application in organization.
- Describe business opportunities and entrepreneurial characteristics using the fundamental concepts of entrepreneurship and entrepreneur.
- Develop an appropriate business model for a new or existing business.
- Formulate a business plan and select proper strategies.

Course Content: (Main Topics, Sub topics)

Topic	Theory (Hrs)
1. Introduction to Management	03
2. Planning	04
3. Organizing	02
4. Leading	04
5. Controlling	02
6. Introduction to Entrepreneurship	04
7. Identify and evaluate potential business opportunities	02
8. Developing an appropriate business model	03
9. developing a business plan	03
10. Entrepreneurial grow	03
Total	**30**

1. Introduction to Management (03 hrs.) [Ref 1: Pg. (5-22)]

1.1. Definition of management

1.2. Importance of management

1.3. Process of management

1.4. Functional approach to management

1.5. Role approach to management

1.6. Different levels, types, and skills of managers

2. Planning (04 hrs) [Ref 1: Pg. (189-198)]

2.1. Definition of planning

2.2. Levels and types of planning

2.3. Process of planning

2.4. Benefits and limitations of planning

3. Organizing (02 hrs) [Ref 1: Pg. (270-392)]

3.1. Definition of organizing

3.2. Major functions in organizing

3.3. Types of organizational structures

3.4. Basic principles of organizing

4. Leading (04 hrs) [Ref 1: Pg. (402-543)]

4.1. Definition of leading

4.2. Leading and managing

4.3. Theories of leadership

4.4. Theories of motivation

4.5. Types of power

4.6. Developing successful leaders

5. Controlling (02 hrs) [Ref 1: Pg. (558-580)]

5.1. Definition of controlling

5.2. Process of controlling

5.3. Types of controlling

5.4. Methods of controlling

06. Introduction to Entrepreneurship (04 hrs)

6.1. Definitions of key concepts

- 6.1.1. Entrepreneur
- 6.1.2. Enterprise
- 6.1.3. Entrepreneurship

6.2. Why entrepreneurship is a popular and viable career choice

6.3. Various dimensions of entrepreneurs

- 6.3.1. Business entrepreneurs
- 6.3.2.Social entrepreneurs
- 6.3.3. Corporate entrepreneur

6.4. Characteristics of successful entrepreneurs

6.5. Self-evaluation to assess entrepreneurial characteristics

6.6. What are the similarities and differences between;

- 6.6.1. Businessmen and entrepreneurs
- 6.6.2. Inventors and entrepreneurs

6.7. Benefits of being an entrepreneur

6.8. Challenges faced by entrepreneurs

6.9. Examples of successful entrepreneurs

07. Identify and evaluate potential business opportunities (02 hrs)

7.1. Difference between ideas and business opportunities

7.2. Sources of business ideas

7.3. Evaluate business ideas and selecting viable business opportunities

7.5. What is my competition and who are my competitors?

7.6. How to select suppliers?

7.7. What is my business's advantage over existing firms?

7.8. What is the difference between product based and service-based businesses?

08. Developing an appropriate business model (03 hrs)

8.1. What is business model

8.2. Difference between business strategy and business model

8.3. What is meant by Competitive advantage?

8.4. Standard business models

8.5. Business model canvas

8.6. Business model for business and social enterprises

8.7. Examples of successful business models

09. Developing a business plan (03 hrs)

9.1. Identification of initial activities (vision, mission, goals)

9.2. Introduction to formulating a business plan

- 9.2.1. What is a business plan?
- 9.2.2. How to formulate a business
- 9.2.3. Who involve in preparing a business plan
- 9.2.4. What are the advantages of preparing a business plan and who are the readers?

9.3. Elements of a business plan

- 9.3.1. Executive summary
- 9.3.2. Setting goals and objectives
- 9.3.3. Feasibility analysis
- 9.3.4. Business organization & its products/services
- 9.3.5. Key personnel
- 9.3.6. Operations plan
- 9.3.7. The market and marketing plan
- 9.3.8. Premises and equipment
- 9.3.9. Finance and costing and financial projection

10. Entrepreneurial Growth (03 hrs)

10.1. What is meant by growth and growth perspectives

10.2. Growth stages

10.3. Growth options

- 10.3.1 Market penetration
- 10.3.2 Product development
- 10.3.3 Market development
- 10.3.4 Diversification

10.4. Growth Strategies/Generic strategies

10.4.1. Low-cost strategy

10.4.2. Differentiation strategy

10.4.3. Focus strategy

Teaching /Learning Methods:
You can access all learning materials and this syllabus in the VLE: http://vle.bit.lk/, if you are a registered student of the BIT degree program.

Assessment Strategy:

Continuous Assessments/Assignments:
In the course, case studies/Lab sheets will be introduced, and students have to participate in the learning activities.

Final Exam:
The final exam of the course will be held at the end of the semester. This course is evaluated using a one-hour written question paper which consists of 25 MCQs AND an online assessment given in the VLE for two weeks soon after the written examination. In order to pass this enhancement course (a compulsory requirement to obtain the BIT degree), you will need to pass the online assessment AND the written examination paper in one sitting.

References/ Reading Materials:

- **Ref 1**: Daft, R.L. (2012). New era of management. (10th edition). New Delhi: Cengage Learning.
- **Ref 2:** Kuratko, D. (2013). Entrepreneurship: Theory, process, and practice. (9th edition). Wiley.

Supplementary Reading:

- Griffin, R.W. (2008). *Management.* (9th edition). Boston, MA: Houghton Miffin Company.
- Hellriegel, D. & Slocum, J.W. (1986). *Management.* (4th edition). Reading, MA: Addison-Wesley.
- Kreitner, R. (2009). *Management.* (9th edition). Boston, MA: Houghton Miffin Company.
- Timmons, J. A. & Spinelly, S. (2004). *New venture creation.* New York: McGraw-Hill.
- Bruce R. Barringer & R. Duane Ireland. (2016). *Entrepreneurship: Successfully launching new ventures.* (5th edition). Pearson Education, Inc.
- Osterwalder, A. & Pigneur, Y. (2010). *Business model generation.* Hoboken, NJ: Wiley.

IT5206 - Professional Practice

Program Content

Semester	V	
Course Code:	IT5206	
Course Name:	Professional Practice	
Credit Value:	3 (3L)	
Core/Optional	Core	
Hourly Breakdown	Theory	Independent Learning
	45 Hrs	105 Hrs

Course Aim
Students will develop a sense of professional responsibility through exploring professional codes of ethics articulated by professional accrediting bodies. Students will explore a range of social, legal, ethical and business issues that IT professionals face in their career.

Intended Learning Outcomes:
After following this course, students should be able to

- Describe the nature of professionalism and its place in the field of information technology.
- Contrast ethical and legal issues as related to information technology.
- Describe how IT uses or benefits from social and professional issues.
- Identify professional issues and responsibilities
- Identify organization and human resource management concepts.
- Identify ethical, legal, and privacy issues related to Information Technology.
- Identify types of Intellectual property.
- Develop proper teamwork and conflict management skills.
- Improve employability skills and career development in IT

Course Content: (Main Topics, Sub topics)

Topic	Theory (Hrs)
1. Introduction to Professional Practice	6
2. Structure and Management of IT Organizations	6
3. Human Resource Issues	7
4. Software License and Contracts	7
5. Intellectual Property	7
6. Internet Issues	6
7. Ethics: IT Developers' Perspective	6
Total	**45**

1. Introduction to Professional Practice (6 hours)

1.1. Law and Government [Ref 1:Pg (33-47)]
1.2. The Concept of a Profession [Ref 1: Pg. (51-56)]
1.3. Nature of professionalism and its place in the field of information technology [Ref 1: Pg. (51-65)]
1.4. Professional Codes of Conduct [Ref 2: Pg. (21-37)]
1.5. Professional Development [Ref 1: Pg. (68-72)]
1.6. Professional Bodies in Computing [Ref 1: Pg. (81-39)]

2. Structure and Management of IT Organizations (6 hours)

2.1. What is an Organization? [Ref 1: Pg. (84 - 111)] [Ref 2: Pg. (39 - 58)]
2.2. Organizational Models [Ref 1: Pg. (119-123)]
2.3. Structuring Principles [Ref 1: Pg. (124-138)]
2.4. Setting up Structure in Practice [Ref 1: Pg. (138-146)]
2.5. Management Issues in IT [Ref 1: Pg. (138-146)]

3. Human Resource Issues (7 hours)

3.1. What are Human Resources? [Ref 1: Pg. (230-236)]
3.2. Recruitment and Selection [Ref 1: Pg. (237-242)]
3.3. Staff Training and Development [Ref 1: Pg. (243-245)]
3.4. Remuneration Policies, Job Evaluation, and Appraisal Schemes [Ref 1: Pg. (245-255)]
3.5. Redundancy, Dismissal, and Grievance Management [Ref 1: Pg. (256-265)]
3.6. Human Resource Planning [Ref 1: Pg. (266-270)]
3.7. Work-Life Balance [Ref 6: Pg. (176-196)]

4. Software License and Contracts (7 hours)

4.1. What is a contract? [Ref 1: Pg. (343-345)]
4.2. License agreements [Ref 1: Pg. (345-348)]
4.3. Outsourcing [Ref 1: Pg. (349-351)]
4.4. Contracts for Custom Built Software [Ref 2: Pg. (119-129)]
4.5. Contracts for Consultancy and Contract Hire [Ref 1: Pg. (359-364)]
4.6. Liability for Defective Software [Ref 1: Pg. (364-369)]
4.7. Health and Safety [Ref 1: Pg. (369-372)] [Ref 2: Pg. (261-298)]

5. Intellectual Property (7 hours)

5.1. Intellectual Property [Ref 1: Pg. (295-298)]
5.2. Copyrights [Ref 1: Pg. (299-307)]
5.3. Examples of Copyright Cases Involving Software [Ref 1: Pg. (308-315)]
5.4. Confidential Information [Ref 1: Pg. (316-322)]
5.5. Patents [Ref 1: Pg. (323-333)]
5.6. Trademarks [Ref 1: Pg. (334-337)]
5.7. Creative Commons Licensed Resources [Ref:7]
5.8. Domain Names [Ref 1: Pg. (338-340)]
5.9. Fair use policy [Ref 8]

6. Internet Issues (6 hours)

6.1. The Effects of the Internet [Ref 1: Pg. (403-405)]
6.2. Internet Service Providers [Ref 1: Pg. (405-408)]
6.3. Defamation [Ref 1: Pg. (415-420)]
6.4. Pornography [Ref 1: Pg. (421-435)]
6.5. Spam [Ref 1: Pg. (436-443)]
6.6. Cyber Attacks and Cybersecurity [Ref 3: Pg. (83-119)]
6.7. E-commerce Regulations [Ref 1: Pg. (444-446)]

7. Ethics: IT Developers' Perspective (6 hours)

7.1. Avoiding Discrimination [Ref 1: Pg. (271-295)]
7.2. Freedom of Expression [Ref 3: Pg. (185-210)]
7.3. Social Media Ethics [Ref 3: Pg. (329-344)]
7.4. Big Data Ethics [Ref 3: Pg. (129-142)]
7.5. Ethics of AI [Ref 4: Pg. (3 -76)]
7.6. Environmental Issues [Ref 5: Pg. (3 -30)]

Teaching /Learning Methods:
You can access all learning materials and this syllabus in the VLE: http://vle.bit.lk/, if you are a registered student of the BIT degree program.

Assessment Strategy:

Continuous Assessments/Assignments:
In the course, case studies/Lab sheets will be introduced, and students have to participate in the learning activities.

Final Exam:
The final exam of the course will be held at the end of the semester. This course is evaluated using a two-hour question paper consisting of 4 Structured Questions.

References/ Reading Materials:

- Ref 1: Bott, F., 2014. Professional issues in information technology (2nd edition). BCS Learning & Development Limited.
- Ref 2: Bott, F., Coleman, A., Eaton, J. and Rowland, D., 2018. Professional Issues in Software Engineering (3rd Edition). CRC Press.

Supplementary Materials:

- A teacher's note will be provided for the contents which are covered from the supplementary materials.
- Ref 3: Reynold, G., 2018. Ethics in Information Technology (6th Edition). Cengage Learning
- Ref 4: Abbas, A.E. ed., 2019. Next-generation ethics: Engineering a better society. Cambridge University Press.
- Ref 5: Unhelkar, B., 2016. Green IT strategies and applications: using environmental intelligence. CRC Press.
- Ref 6: Jerome, V.B. and Antony, A., 2018. Soft Skills for Career Success: Soft Skills. Educreation Publishing.
- Ref 7: Creative Commons Licensed resources, https://creativecommons.org/
- Ref 8: More Information on Fair Use, https://www.copyright.gov/fair-use/more-info.html

IT5306 - Principles of Information Security

Program Content

Semester	V	
Course Code:	IT5306	
Course Name:	Principles of Information Security	
Credit Value:	3 (3L)	
Core/Optional:	Core	
Hourly Breakdown:	Theory	Independent Learning
	45 Hrs	105 Hrs

Course Aim:

This course focuses on the fundamentals of information system security that are used in protecting both the information present in computer storage as well as information traveling over computer networks. Information security is enabled through securing data, computers, and networks. In this course, students will learn topics such as fundamentals of information security, cryptography algorithms and protocols, authentication mechanisms, and software security. By the end of this course, students will be able to identify information security issues and provide suitable solutions.

Intended Learning Outcomes:

After following this course, students should be able to:

- Explain the concepts of securing information.
- Explain the concept of symmetric key and asymmetric key cryptography.
- Contrast the encryption and decryption algorithms, and key distribution protocols.
- Differentiate the security requirements of various software systems, such as operating systems, database management systems, and other programs.
- Develop solutions for various security-related problems in information systems.

Course Content: (Main Topics, Sub topics)

Topic	Theory (Hrs)
1. Information Security Concepts	3
2. Hash Functions and MAC	3
3. Symmetric Key Encryption	9
4. Asymmetry Key (Public Key) Encryption	9
5. Key Distribution Protocols	5
6. Operating Systems Security	3
7. Database Security	3
8. Program Security	3
9. Electronic Payment Systems	4
10. Digital Crime and Legal Background of Information Security	3
Total	**45**

1. Information Security Concepts (3 hours)

1.1. Computer Security Concepts: Confidentiality, Integrity, and Availability [Ref 1: Pg.(12-19)]
1.2. Threats, Attacks, and Assets [Ref 1: Pg.(19-25)]
1.3. Security Functional Requirements [Ref 1: Pg.(25-27)]
1.4. Fundamental Security Design Principles [Ref 1: Pg.(27-31)]
1.5. Attack Surfaces and Attack Trees [Ref 1: Pg.(31-34)]
1.6. Computer Security Strategy [Ref 1: Pg.(34-36)]
1.7. Concepts of Encryption, Decryption, Plain Text and Cipher Text [Ref 1: Pg.(41-42)]
1.8. Stream and Block Ciphers [Ref 1: Pg.47, Pg.(651-655)]

2. Hash Functions and MAC (3 hours)

2.1. Hash Concept [Ref 1: Pg.(50-51)]
2.2. Description of Hash Algorithms [Ref 1: Pg.(670-675)]
2.3. HMAC Algorithms [Ref 1: Pg.(48-50), Pg.(675-678)]
2.4. Security Issues [Ref 1: Pg.(678-679)]

3. Symmetric Key Encryption (9 hours)

3.1. The Data Encryption Standard (DES) [Ref 1: Pg.(43-44), Pg.(643-645)]
3.2. Triple DES [Ref 1: Pg.45, Pg.(643-645)]
3.3. Advanced Encryption Standard (AES) [Ref 1: Pg.45, Pg.(645-651)]
3.4. Block Cipher Modes [Ref 1: Pg.(655-660)]
3.5. Applications of symmetric key algorithms [Ref 1: Pg.(660-662)]

4. Asymmetry Key (Public Key) Encryption (9 hours)

4.1. Concept and Characteristics of Asymmetric key (Public key) Encryption System [Ref 1: Pg.(55-58)]
4.2. Rivest-Shamir-Adelman (RSA) algorithm [Ref 1: Pg.59, Pg.(679-684)]
4.3. Introduction to Elliptic Curve (EC) Cryptography [Ref 2: Pg.(330-334)]
4.4. Application of public key cryptography [Ref 1: Pg.58]
4.5. Digital signatures [Ref 1: Pg.(60-61)]

5. Key Distribution Protocols (5 hours)

5.1. Diffie-Hellman Algorithm [Ref 1: Pg.(684-688)]
5.2. Key Exchange with Public Key Cryptography [Ref 1: Pg.(62-64)]
5.3. Concept of Digital Certificate [Ref 1: Pg.(61-62)]
5.4. Certificate Authorities and its roles [Ref 1: Pg.(61-62)]
5.5. Public Key Infrastructures (PKI) [Ref 1: Pg.(727-729)]
5.6. Certificate Revocations [Ref 1: Pg.(724-728)]

6. Operating Systems Security (3 hours)

6.1. System Security Planning [Ref 1: Pg.(417-419)]
6.2. Operating Systems Hardening [Ref 1: Pg.(419-423)]
6.3. Application Security [Ref 1: Pg.(424-425)]
6.4. Security Maintenance [Ref 1: Pg.(425-426)]

6.5. Linux/Unix Security [Ref 1: Pg.(426-430)]
6.6. Windows Security [Ref 1: Pg.(430-432)]
6.7. Virtualization Security [Ref 1: Pg.(432-436)]

7. Database Security (3 hours)
7.1. The Need For Database Security [Ref 1: Pg.(156-163)]
7.2. SQL Injection Attacks [Ref 1: Pg.(163-168)]
7.3. Database Access Control [Ref 1: Pg.(169-173)]
7.4. Inference [Ref 1: Pg.(173-176)]
7.5. Database Encryption [Ref 1: Pg.(176-180)]

8. Program Security (3 hours)
8.1. Types of Malicious Software [Ref 1: Pg.(200-203)]
8.2. Advanced Persistent Threat [Ref 1: Pg.(203-204)]
8.3. Viruses and Worms [Ref 1: Pg.(204-218)]
8.4. System Corruption [Ref 2: Pg.(221-222)]
8.5. Attack Agents [Ref 1: Pg.(222-225)]
8.6. Keyloggers, Phishing, and Spyware [Ref 1: Pg.(224-226)]
8.7. Stealthing: Backdoors and Rootkits [Ref 1: Pg.(226-229)]
8.8. Countermeasures [Ref 1: Pg.(229-235)]

9. Electronic Payment Systems (4 hours)
9.1. Fundamentals of e-payment [Ref 5: Pg(05-17)]
9.2. Credit Card Payment Protocols [Ref 5: Pg(73-125)]
9.3. Digital Cash and other e-payments methods [Ref 5: Pg.(171-214), Ref 6: Pg(04-15)]
9.4. Cryptocurrency [Ref 6: Pg(23-73)]
9.5. Blockchain [Ref 6: Pg(75-95)]

10. Legal Background (3 hours)
10.1. Cybercrime and Computer Crime [Ref 1: Pg.(611-615)]
10.2. Intellectual Property [Ref 1: Pg.(615-621)]
10.3. Privacy [Ref 1: Pg.(621-626)]
10.4. Sri Lanka Computer Crime Act [Ref 3]
10.5. Sri Lanka Electronic Transaction Act [Ref 4]

Teaching /Learning Methods:
You can access all learning materials and this syllabus in the VLE: http://vle.bit.lk/, if you are a registered student of the BIT degree program.

Assessment Strategy:
Continuous Assessments/Assignments:
In the course, case studies/Lab sheets will be introduced, and students have to participate in the learning activities.

Final Exam:
The final exam of the course will be held at the end of the semester. This course is evaluated using a two-hour question paper consisting of 4 Structured Questions.

References/ Reading Materials:

- **Ref 1.** Computer Security - Principles and Practice (3rd Ed) by William Stallings and Lawrie Brown
- **Ref 2.** Cryptography and Network Security: Principles and Practice (7th Edition) by William Stallings
- **Ref 3.** Sri Lanka Computer Crime Act No 24 of 2007
- **Ref 4.** Electronic Transactions Act, No. 19 of 2006
- **Ref 5.** Electronic Payment Systems for E-Commerce (2nd Ed) by, Donal O'Mahony, Michael A. Peirce, and Hitesh Tewari, Artech House
- **Ref 6.** Bitcoin and Cryptocurrency Technologies by Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder

IT5406 - Systems and Network Administration

Program Content

Semester	V		
Course Code:	IT5406		
Course Name:	Systems and Network Administration		
Credit Value:	3 (2L + 1P)		
Core/Optional	Core		
Hourly Breakdown	Theory	Practical	Independent Learning
	30 Hrs	30 Hrs	90 Hrs

Course Aim:

- Develop systems and network administration skills such as planning, creating, building, and troubleshooting on GNU/Linux-based systems and services, ethical and professional practices, and technological awareness to meet software industry requirements.

Intended Learning Outcomes:

After following this course, students should be able to

- Plan installation and configuration of GNU/Linux operating systems and related network services to fulfill application requirements.
- Build security controls for a given set of access and process control/management requirements.
- Explain the root cause of issues in operating systems and network services based on theoretical and practical aspects.
- Select optimal software infrastructure solution for a given problem based on hosting, storage, file systems, backup, automation, access control, logging, etc.
- Planning, configuring, and building web hosting solutions considering load, security, resource optimization, access control, etc.
- Build automation scripts for recurrent and trigger driven events and applications.
- Create operating system and network services best practices guidelines to manage and maintain resilient software infrastructure.
- Explain code of ethics to maintain professional practices in system administration.

Course Content: (Main Topics, Sub topics)

Topic	Theory (Hrs)	Practical (Hrs.)
1. Introduction to System & Network Administration	01	00
2. Installing an Operating System	03	02
3. Host Management	08	08
4. Network Administration	10	10
5. Automating System Administration	04	05
6. Virtualization and Cloud Computing	04	05
Total	**30**	**30**

Students are expected to have practical work to complete their learning in these topics.

The recommended operating system that should use for this module is CentOS 6 or better.

1. Introduction to System & Network Administration (1 hour) [Ref 1: Pg. (3-29)]

1.1. Essential duties of a System Administrator
1.2. Linux distributions
1.3. Man pages and Other on-line Documentation
1.4. Ways to find and Install Software
1.5. Specialization and Adjacent Disciplines
1.6. Ethics [Ref 2:]

2. Installing an Operating System (3 hours) [Ref 1: Pg. (30-64)]

2.1. The Boot Process and Boot Loaders
2.2. The Grand Unified Boot Loader
2.3. System Management Daemons
2.4. Reboot and Shutdown Procedure
2.5. Stratagems for a non-booting System
2.6. Drivers and the Kernel [Ref 1: Pg. (325-359)]

3. Host Management (08 hours)

3.1. Access Control and Rootly Powers [Ref 1: Pg. (65-89)]
  3.1.1. Standard UNIX Access Control
  3.1.2. Management of Root Account
  3.1.3. Extensions to the Standard Access Control Model
  3.1.4. Modern Access Control
3.2. Process Control [Ref 1: Pg. (90-119)]
  3.2.1. Components of a Process
  3.2.2. The Life Cycle of a Process
  3.2.3. Monitoring Processes
  3.2.4. Runaway Processes
  3.2.5. Periodic Processes

3.3. File System [Ref 1: Pg. (120-152)]
- 3.3.1. Introduction to File System – Pathnames, Mounting, unmounting and Organization
- 3.3.2. File Types
- 3.3.3. File Attributes
- 3.3.4. Access Control Lists

3.4. Software Installation and Management [Ref 1: Pg. (153-181)]
- 3.4.1. Managing Packages and Linux Package Management Systems
- 3.4.2. High-Level Linux Packages Management Systems
- 3.4.3. Software Localization and Configuration

3.5. User Management [Ref 1: Pg. (243-269)]
- 3.5.1. The /etc/passwd File
- 3.5.2. The /etc/shadow File
- 3.5.3. The /etc/group File
- 3.5.4. Adding Users – Manual and via Scripts
- 3.5.5. Removing Users
- 3.5.6. User Login Lockout
- 3.5.7. Risk Reduction with PAM
- 3.5.8. Centralized Account Management

3.6. Logging [Ref 1: Pg. (294-324)]
- 3.6.1. Log Locations
- 3.6.2. The system Journal
- 3.6.3. Syslog
- 3.6.4. Kernel and Boot-time Logging
- 3.6.5. Management and Rotation of Log Files
- 3.6.6. Logging Policies

3.7. Storage [Ref 1: Pg. (717-790)]
- 3.7.1. Storage Hardware and Interfaces
- 3.7.2. Disk Partitioning
- 3.7.3. Logical Volume Management
- 3.7.4. Redundant Arrays of Inexpensive Disks
- 3.7.5. Traditional File Systems
- 3.7.6. Next Generation File Systems
- 3.7.7. Data Backup Strategies

4. Network Administration (10 hours)

4.1. Networking [Ref 1: Pg. (417-458)]
- 4.1.1. Linux Networking
- 4.1.2. Network Troubleshooting
- 4.1.3. Network Monitoring
- 4.1.4. Firewalls and NAT
- 4.1.5. Cloud Networking

4.2. The Domain Name System [Ref 1: Pg. (498-551)]
- 4.2.1. DNS Architecture
- 4.2.2. DNS Namespace

4.2.3. How DNS Works
4.2.4. DNS Database
4.2.5. Bind Software Configuration
4.2.6. Zone File Updating
4.3. Single Sign-On [Ref 1: Pg. (578-593)]
4.3.1. Core SSO Elements
4.3.2. LDAP Service
4.3.3. Using Directory Service for Login
4.4. Web Hosting [Ref 1: Pg. (674-714)]
4.4.1. Hypertext Transfer Protocol (HTTP)
4.4.2. Web Software Basics
4.4.3. Web Hosting in the Cloud
4.4.4. Apache Configuration
4.4.5. NGINX Configuration
4.4.6. Load Balancing with HAProxy

5. Automating System Administration (4 hours) [Ref 1: Pg. (182-222)]
5.1. Scripting Philosophy
5.2. Shell Basics
5.3. Shell Scripting
5.4. Regular Expressions
5.5. Python Scripting
5.6. Revision Control with GIT [Ref 1: Pg. (235-240)]

6. Virtualization and Cloud Computing (4 hours)
6.1. Cloud Computing [Ref 1: Pg. (270-293)]
6.1.1. Cloud Platform Choices
6.1.2. Cloud Service Fundamentals
6.1.3. Clouds – Amazon, Google, Digital Ocean
6.1.4. Cost Control
6.2. Virtualization [Ref 1: Pg. (900-910)]
6.2.1. Virtual Vernacular
6.2.2. Virtualization with Linux
6.3. Containers [Ref 1: Pg. (915-948)]
6.3.1. Background and Core Concepts
6.3.2. The Open Source Container Engine – Docker
6.3.3. Containers in Practice
6.3.4. Container Clustering a Management

Teaching /Learning Methods:

You can access all learning materials and this syllabus in the VLE: http://vle.bit.lk/, if you are a registered student of the BIT degree program.

Assessment Strategy:

Continuous Assessments/Assignments:

In the course, case studies/Lab sheets will be introduced, and students have to participate in the learning activities.

Final Exam:

The final exam of the course will be held at the end of the semester. This course is evaluated using a two-hour question paper consisting of 4 Structured Questions.

References/ Reading Materials:

- **Ref 1.** Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley and Dan Mackin "UNIX and Linux System Administration Handbook" (5th Edition), Pearson Education, Inc., 2018.
- **Ref 2.** https://lopsa.org/CodeOfEthics

IT5506 - Mathematics for Computing II

Program Content

Semester	V	
Course Code:	IT5506	
Course Name:	Mathematics for Computing II	
Credit Value:	3 (3L)	
Core/Optional	Optional	
Hourly Breakdown	Theory	Independent Learning
	45 Hrs	105 Hrs

Course Aim:

- To cover mathematical concepts required to understand and successfully complete the other courses in the degree program, and strengthen the mathematical foundation required in solving problems.

Intended Learning Outcomes:

After following this course, students should be able to

- apply mathematical concepts to solve problems in the areas of matrices, vector spaces, linear and integer programming.
- solve statistical problems involving discrete & continuous probability distributions.

Course Content: (Main Topics, Sub topics)

Topic		Theory (Hrs.)
1.	Theory of Matrices, Vector spaces and Linear Transformations	22
2.	Linear Programming and Integer Programming	11
3.	Basic Statistics	12
	Total	**45**

1. Theory of Matrices, Vector spaces and Linear Transformations (22 hours)

1.1 Different ways of looking at system of n linear equations in n unknowns (1 hour) [Ref 5: Pg. (1-5)] [Ref 6: Pg. (1-4)]

- 1.1.1 Geometric way (row picture)
- 1.1.2 linear combination of column vectors (Column picture)
- 1.1.3 Representing in matrix form

1.2 Matrices (2 hours) [Ref 3: Pg. (79-110, 115-123)] [Ref 5: Pg. (6-27)] [Ref 6: Pg. (91-132)]

- 1.2.1 Defining various types of matrices
- 1.2.2 Addition and scalar multiplication of matrices
- 1.2.3 Different ways of defining (or understanding) matrix multiplication
- 1.2.4 Special type of matrices and their properties.
- 1.2.5 Inverse of a square matrix (if it exists) and related results.

1.3 Solving systems of linear equations using elementary row operations (Gaussian Elimination) and backward substitution in matrix form considering different cases (2 hours) [Ref 3: Pg. (1-17, 41-72)] [Ref 5: Pg. (3-27)] [Ref 6: Pg. (1-46)]
- 1.3.1 existence of unique solution
- 1.3.2 existence of infinitely many solution
- 1.3.3 no solution

1.4 Elementary row operations and their corresponding matrices (2 hours) [Ref 3: Pg. (1-17, 41-72)] [Ref 5: Pg. (3-27)] [Ref 6: Pg. (1-46)]
- 1.4.1 Finding row-echelon form of a matrix (Gaussian Method)
- 1.4.2 Finding row reduced-echelon form of a matrix (Gauss - Jordan Method)
- 1.4.3 Defining row rank and column rank of a matrix
- 1.4.4 Computing the inverse of a square matrix (if it exists) using Gauss - Jordan Method.

1.5 The Determinant of a square matrix (2 hours) [Ref 3: Pg. (459-482)] [Ref 6: Pg. (163-184)]
- 1.5.1 Defining the determinant of a square matrix through its basic properties (through elementary operation).
- 1.5.2 Calculating the determinant of any square matrix using elementary operations
- 1.5.3 Properties of determinant.
- 1.5.4 The big formula for calculating the determinant and inverse of a square matrix (if it exists).

1.6 Vector spaces (6 hours) [Ref 3: Pg. (159-201)] [Ref 5: Pg. (28-66)] [Ref 6: Pg. (189-242)]
- 1.6.1 Axiomatic definition of a vector space and a subspace with suitable examples.
- 1.6.2 Identifying all possible subspaces of $\mathbb{R}^2$and R^3.
- 1.6.3 linear combination and linear span
- 1.6.4 Finite dimensional vector space, fundamental subspaces associated with a matrix
- 1.6.5 Linear independence and dependence, linear independence and the rank of a matrix.
- 1.6.6 Basis of a finite dimensional vector space and constructing basis.

1.7 Linear transformations (4 hours) [Ref 3: Pg. (238-245)] [Ref 5: Pg. (49-54, 67-73, 86-89)] [Ref 6: Pg. (62-77, 203-205)]
- 1.7.1 Examples of linear transformation in finite dimensional spaces.
- 1.7.2 The matrix representation of a linear transformation
- 1.7.3 The rank-nullity theorem and its applications.
- 1.7.4 Ordered bases, matrix of a linear transformation and similarity of matrices.

1.8 Orthogonality (2 hours) [Ref 3: Pg. (269-299, 307-310, 429-439)] [Ref 5: Pg. (270-286)] [Ref 6: Pg. (329-382)]
- 1.8.1 Dot/Inner product in a vector space
- 1.8.2 Orthogonal Vectors and Subspaces
- 1.8.3 Projections onto Lines
- 1.8.4 Orthogonal Bases and Gram-Schmidt orthogonalization process and the QR- decomposition.
- 1.8.5 Least square solution of a non-consistent linear system and the orthogonal projections.

2. Linear Programming and Integer Programming (11 hours)

2.1 Introduction to Linear Programming (7 hours) [Ref 7: Pg. (24-308)]
- 2.1.1 Assumptions
- 2.1.2 Graphical method and Simplex algorithm with standard and general linear programming problems
- 2.1.3 Duality

2.2 Introduction to Integer Programming (5 hours) [Ref 7: Pg. (576-653)]
- 2.2.1 Assumptions
- 2.2.2 Graphical method
- 2.2.3 Cutting plane algorithm
- 2.2.4 Branch and bound algorithm
- 2.2.5 Knapsack problems

3. Basic Statistics (12 hours)

Prerequisite(s): Need the basic knowledge on integration.

3.1 Random variables (1 hour) [Ref 2: Pg. (34-39)], [Ref 8: Pg. (45-73, 108-185)], [Ref 9: Pg. (97-140)]
- 3.1.1 Discrete random variables
- 3.1.2 Continuous random variables

3.2 Cumulative Distribution Function (1 hour) [Ref 2: Pg. (34-39)], [Ref 8: Pg. (45-73, 108-185)], [Ref 9: Pg. (97-140)]

3.3 Probability distribution of a discrete random variable (1 hour) [Ref 2: Pg. (34-39, 75-78)], [Ref 8: Pg. (45-73, 108-185)], [Ref 9: Pg. (97-140)]
- 3.3.1 Definition
- 3.3.2 Mean and Variance

3.4 The Binomial probability distribution (1 hour) [Ref 2: Pg. (108-150)], [Ref 8: Pg. (45-73, 108-185)], [Ref 9: Pg. (97-140)]

3.5 The Poisson probability distribution (1 hour) [Ref 2: Pg. (108-150)], [Ref 8: Pg. (45-73, 108-185)], [Ref 9: Pg. (97-140)]

3.6 Probability distribution of a continuous random variable (1 hour) [Ref 2: Pg. (34-39, 75-78)], [Ref 8: Pg. (45-73, 108-185)], [Ref 9: Pg. (97-140)]
- 3.6.1 Definition
- 3.6.2 Mean and Variance

3.7 The Uniform probability distribution (1 hour) [Ref 2: Pg. (108-150)], [Ref 8: Pg. (45-73, 108-185)], [Ref 9: Pg. (97-140)]

3.8 The Normal probability distribution (2 hours) [Ref 2: Pg. (108-150)], [Ref 8: Pg. (45-73, 108-185)], [Ref 9: Pg. (97-140)]

3.9 The Exponential distribution (1 hour) [Ref 2: Pg. (108-150)], [Ref 8: Pg. (45-73, 108-185)], [Ref 9: Pg. (97-140)]

3.10 Normal approximation of the Binomial distribution (1 hour) [Ref 2: Pg. (108-150)], [Ref 8: Pg. (45-73, 108-185)], [Ref 9: Pg. (97-140)]

Teaching /Learning Methods:

You can access all learning materials and this syllabus in the VLE: http://vle.bit.lk/, if you are a registered student of the BIT degree program.

Assessment Strategy:

Continuous Assessments/Assignments:
In the course, case studies/Lab sheets will be introduced, and students have to participate in the learning activities.

Final Exam:
The final exam of the course will be held at the end of the semester. This course is evaluated using a two-hour question paper consisting of 4 Structured Questions.

References/ Reading Materials:

- **Ref 1:** Business Mathematics by Qazi Zameeruddin,V.K Khanna and S.K Bhambri (vikas publishing house)
- **Ref 2:** Schaum's Outline Probability and Statistics, by Murray R. Spiegel, J. Schiller, R. A. Srinivasan, 2rd edition, 2000, Mc Graw Hill
- **Ref 3:** Meyer, C.D., 2000. Matrix analysis and applied linear algebra (Vol. 2). SIAM.
- **Ref 4:** Schuam's Outline Series, Theory and Problems of Matrices by Frank Ayres, JR, McGraw-Hill
- **Ref 5:** Linear Algebra (2nd edition) by Hoffman, K. and Kunze, R., 1971. Englewood Cliffs, New Jersey
- **Ref 6:** Linear Algebra and Its Applications (4th edition) by David C. Lay, 2012. Addison Wesley, Pearson
- **Ref 7:** Introduction to Operations Research (7th edition), F S Hillier and G L Liebermann, 2001, McGraw-Hill.
- **Ref 8:** Probability and mathematical statistics, Prasanna Sahoo.
- **Ref 9:** Applied statistics and probability for engineers, Douglas C. Montgomery and George C. Runger.

EN6106 - Emerging Topics in Information Technology

Program Content

Semester	VI		
Course Code:	EN6106		
Course Name:	Emerging Topics in Information Technology		
Credit Value:	2 (1L + 1P)		
Core/Optional	Core		
Hourly Breakdown	Theory	Practical	Independent Learning
	15 Hrs	30 Hrs	55 Hrs

Course Aim:

- This module will provide an overview of some emerging Information Technology topics.

Intended Learning Outcomes:

Upon completion of this course, students will be able to do the following:

- LO1. Identify the range of disciplines to which Information Technology is applicable
- LO2. Develop new skills related to the topics covered in this module.
- LO3. Apply newly learned skills and develop IT applications related to those topics.

Course Content: (Main Topics, Sub topics)

Topic	Theory (Hrs)	Practical (Hrs.)
1. Microservices	2	6
2. Data Science with Python	3	4
3. Artificial Intelligence	4	8
4. Social Network Analysis	2	4
5. Digital Forensics	2	4
6. Extended Reality	2	4
Total	**15**	**30**

1. Microservices (2 hours) [Ref1]

1.1. Monolithic Systems, Service Oriented Architecture
1.2. Introduction to Micro Services
1.3. Key Benefits and Challenges
1.4. Design Patterns
Practical - Simple Microservice Application using Spring Boot

2. Data Science with Python (3 hours) [Ref 2]

2.1. Introduction to Data Science and Data Engineering
2.2. Data Engineering Pipeline and Infrastructure
2.3. How Data Driven Insights can be Applied in Different Fields
2.4. Using Data Science to Extract Meaning from Data
2.5. Data Visualization
Practical – Data Science Tutorial Using python

3. Artificial Intelligence (4 hours) [Ref 3]

3.1. What is Artificial Intelligence
3.2. Usages of AI in Society
3.3. Software Based AI Applications
3.4. AI in Hardware based Applications
3.5. Future of AI
Practical - Agent Based modeling using NetLogo

4. Social Network Analysis (2 hours) [Ref 4]

4.1. Introduction to Social Networks
4.2. Goals of Analysis
4.3. Variables and Relations
4.4. Mathematical Foundations
4.5. Data Collection
4.6. Data Management
4.7. Multivariate Analysis
4.8. Visualizations
Practical - Social Network Analysis using Python and NetworkX Library

5. Digital Forensics (2 hours) [Ref 5]

5.1. Forensic Science
5.2. Introduction to Digital Forensics
5.3. Identification Phase
5.4. Collection Phase
5.5. Examination Phase
5.6. Analysis Phase
Practical – Digital Forensics tutorial with Python

6. Extended Reality (2 hours) [Ref 6]

6.1. Introduction to Extended Reality
6.2. Reality Virtuality Continuum
6.3. Comparison between AR/VR/AV
6.4. Applications of Augmented Reality
6.5. Applications of Virtual Reality
6.6. Applications of Augmented Virtuality
Practical - Web-based AR app development tutorial with WebXR

Teaching /Learning Methods:

You can access all learning materials and this syllabus in the VLE: http://vle.bit.lk/, if you are a registered student of the BIT degree program.

Assessment Strategy:

Continuous Assessments/Assignments:
In the course, case studies/Lab sheets will be introduced, and students have to participate in the learning activities.

Final Exam:
The final exam of the course will be held at the end of the semester. This course is evaluated using a one-hour written question paper which consists of 25 MCQs AND an online assessment given in the VLE for two weeks soon after the written examination. In order to pass this enhancement course (a compulsory requirement to obtain the BIT degree), you will need to pass the online assessment AND the written examination paper in one sitting.

References/ Reading Materials:

- Teacher's notes on each topic will be provided as a reference material.
- **Ref 1.** Spring Microservices, https://spring.io/microservices
- **Ref 2.** W3School Data Science Tutorial, https://www.w3schools.com/datascience/default.asp
- **Ref 3**. NetLogo multi-agent programmable modeling environment.**,** http://ccl.northwestern.edu/netlogo/index.shtml
- **Ref 4.** Aric Hagberg, Dan Schult, Pieter Swart, 2021**,** NetworkX Reference, https://networkx.org/documentation/stable/_downloads/networkx_reference.pdf
- **Ref 5.** Swathi Sree, Python Digital Forensics Tutorial, https://www.scribd.com/document/393851066/Python-Digital-Forensics-Tutorial
- **Ref 6.** Marius Noreikis, 2020, Web-based AR app development tutorial with WebXR, https://www.devbridge.com/articles/ar-app-development-tutorial/

IT6206 - Software Quality Assurance

Program Content

Semester	VI		
Course Code:	IT6206		
Course Name:	Software Quality Assurance		
Credit Value:	3 (2L+ 1P)		
Core/Optional	Core		
Hourly Breakdown	Theory	Practical	Independent Learning
	30 Hrs	30 Hrs	90 Hrs

Course Aim:
This course is aimed at delivering the fundamentals of software quality assurance and testing and their practical aspects. Students will learn how software testing and quality assurance tasks are performed in different stages of the software development life cycle. Further the students will learn about how continuous integration and continuous delivery mechanisms are being used in software testing.

Intended Learning Outcomes:
After following this course, students should be able to:

- explain fundamental concepts in software quality (e.g., internal / external quality, as well as quality in use)
- describe and explain definitions and activities related to software testing, such as faults, failures levels of testing and test automation
- explain the concept of continuous integration and relate them to software development processes
- write a successful systems test plan
- formulate a traceability matrix
- use selenium, TestNG and Java based tools to automate simple web application testing process
- integrate testing process with Continuous Integration (CI) and Continuous Delivery (CD)
- develop a suitable mobile testing strategy
- use Appium for testing native mobile applications
- use test report generation tools to create test reports

Course Content: (Main Topics, Sub topics)

Topic	Theory (Hrs)	Practical (Hrs.)
1. Introduction to Software Testing	2	-
2. Software Testing Process	2	-
3. Test Techniques and their Characteristics	2	-
4. Test Case Design	3	-
5. Levels of Testing	2	-
6. Software Testing Life cycle	2	-
7. Quality Control	2	-
8. Test Automation	2	-
9. XML Based Test Automation	3	4
10. Automated Testing Suites for Web Applications (e.g Selenium)	2	4
11. Javabased Test Automation (e.g TestNG)	3	8
12. Continuous Integration (CI) and Continuous Delivery (CD)	2	4
13. Mobile Test Automation (e.g Appium)	2	8
14. Test Reporting	1	2
Total	**30**	**30**

1 Introduction to Software Testing (2 hours)

1.1 Introduction to Software Quality Assurance and Testing [Ref 1: pg. 1 - 5]
1.2 Typical Objectives of Testing [Ref 1: pg. 3 - 4]
1.3 Testing and Debugging [Ref 1: pg. 4 - 5]
1.4 Errors, Defects, and Failures [Ref 1: pg. 7 - 9]
1.5 Defects, Root Causes and Effects [Ref 1: pg. 9 - 10]
1.6 Manual vs Automation Testing [Ref :Teacher's Note]
1.7 Seven Testing Principles [Ref 1: pg. 10 - 15]
1.8 Software Quality Assurance Models and Standards [Ref :Teacher's Note]

2 Software Testing Process(2 hours)

2.1 Testing Process [Ref 1: pg. 15 - 27]
2.2 Test Activities and Tasks [Ref 1: pg. 17 - 27]
2.3 Traceability between the Test Basis and Test Work Products[Ref 1: pg. 27]
2.4 Software Development and Software Testing [Ref 1: pg.36 - 46]
2.5 Software Testing Methodologies
  2.5.1 White Box Testing, Black Box Testing, Gray Box Testing [Ref 1: pg. 65, - 68]
  2.5.2 Functional Testing, Non-functional Testing, Change-related Testing [Ref 1: pg. 63 - 67]
  2.5.3 Test Types and Test Levels [Ref 1: pg. 47 - 68]
2.6 Static vs Dynamic Testing [Ref :Teacher's Note]

3 Test Techniques and Their Characteristics (2 hours)

3.1 Black-box Test Techniques [Ref 1: pg. 112 - 132]
  3.1.1 Equivalence Partitioning [Ref 1: pg. 113 - 115]
  3.1.2 Boundary Value Analysis [Ref 1: pg. 115 - 121]
  3.1.3 Decision Table Testing [Ref 1: pg. 121 - 127]
  3.1.4 State Transition Testing [Ref 1: pg. 127 - 130]
  3.1.5 Use Case Testing [Ref 1: pg. 130 - 132]

3.2 White-box Test Techniques [Ref 1: pg. 132 - 140]
- 3.2.1 Statement Testing and Coverage [Ref 1: pg. 136 - 137]
- 3.2.2 Decision Testing and Coverage [Ref 1: pg. 138 - 139]
- 3.2.3 The Value of Statement and Decision Testing [Ref 1: pg. 139 - 140]

3.3 Experience-based Test Techniques [Ref 1: pg. 140 - 142]
- 3.3.1 Error Guessing [Ref 1: pg. 140 - 141]
- 3.3.2 Exploratory Testing [Ref 1: pg. 141 - 142]
- 3.3.3 Checklist-based Testing [Ref 1: pg. 142]

4 Test Case Design (3 hours)

4.1 Static Methods [Ref 1: pg. 75 - 99]

4.2 Benefits of Static Testing [Ref 1: pg. 77 - 78]
- 4.2.1 Informal Reviews [Ref 1: pg. 88 - 89]
- 4.2.2 Walkthroughs [Ref 1: pg. 88 - 89]
- 4.2.3 Technical Reviews [Ref 1: pg. 89 - 90]
- 4.2.4 Inspection [Ref 1: pg. 90 - 91]

4.3 Dynamic Methods
- 4.3.1 Black Box Techniques [Ref 1: pg. 112 - 132]
- 4.3.2 Experience-based Techniques [Ref 1: pg. 140 - 142]

5 Levels of Testing (2 hours)

5.1 Functional Testing
- 5.1.1 Component/Unit Testing [Ref 1: pg. 48 - 50]
- 5.1.2 Integration Testing [Ref 1: pg. 50 - 53]
- 5.1.3 System Testing [Ref 1: pg. 53 - 55]
- 5.1.4 User Acceptance Testing [Ref 1: pg. 55- 59]

5.2 Non-functional Testing
- 5.2.1 Interoperability Testing [Ref 3: pg. 208 - 209]
- 5.2.2 Performance Testing [Ref 3: pg. 209 - 210]
- 5.2.3 Scalability Testing [Ref 3: pg. 210 - 211]
- 5.2.4 Stress Testing [Ref 3: pg. 211- 213]
- 5.2.5 Security Testing [Ref 3: pg. 203 - 204]
- 5.2.6 Load and Stability Testing [Ref 3: pg. 213 - 214]
- 5.2.7 Reliability Testing [Ref 3: pg. 214]
- 5.2.8 Regression Testing [Ref 3: pg. 214 - 215]
- 5.2.9 Documentation Testing [Ref 3: pg. 215 - 216]

6 Software Testing Life Cycle (2 hours)

6.1 Requirements Analysis/Design[Ref 14, 16]

6.2 Entry Criteria and Exit Criteria [Ref 14]

6.3 Test Planning [Ref 2: pg. 65 - 66][Ref 14, 16]

6.4 Test Case Design and Development [Ref 2: pg. 66] [Ref 14, 16]

6.4 Test Environment Setup [Ref 14, 16]

6.5 Defect Life Cycle [Ref 14]

6.6 Defects Classification [Ref 14]

6.7 Test Execution [Ref 14, 16]

6.8 Test Closure [Ref 14, 16]

7 Quality Control (2 hours)

7.1 Test Monitoring and Control [Ref 2: pg. 110 - 111]
7.2 Metrics Used in Testing [Ref 2: pg. 156 - 169]
7.3 Purposes, Contents, and Audiences for Test Reports [Ref 2: pg. 112 - 114]

8 Test Automation (2 hours)

8.1 Introduction to Test Automation [Ref :Teacher's Note]
8.2 Choosing the Right Tool [Ref :Teacher's Note]
8.3 Effective Use of Tools [Ref :Teacher's Note]
8.4 Test Automation Environments [Ref :Teacher's Note]
8.5 Manual Testing vs Test Automation [Ref :Teacher's Note]
8.6 Benefits and Risks of Test Automation [Ref :Teacher's Note]
8.7 Test Tool Considerations [Ref :Teacher's Note]

9 XML Based Test Automation (e.g XPath) (3 hours)

9.1 Introduction to XML Path in Selenium [Ref 08]
9.2 Absolute XPath [Ref 08]
9.3 Relative XPath [Ref 08]
9.4 Finding Elements using Attributes with XPath [Ref 08]

**** Guided practical 1**

At the end of the section, students are guided to complete the following practical;

- *Visit any web page your choice and open the source view. Capture at least five of the following html elements using absolute and relative xpath definitions.*
- *An anchor tag with a hyperlink*
- *Second list item in an unordered/ ordered list*
- *A button using its caption text*
- *Second last item of an item list*
- *A label using its text*
- *Identify a link using link text*
- *Capture the third table row of a table*

10 Automated Testing Suites for Web Applications (e.g Selenium) (2 hours)

10.1 Introduction to Automated *Testing* Suite for Web Applications [Ref. 5, 15]
10.2 Architectures of Automated *Testing* Suite for Web Applications [Ref. 5, 15]
10.3 Recorders in Automated *Testing* Suite for Web Applications (e.g Selenium IDE, Katalon) [Ref. 5, 12]
10.4 Working with Selenium API [Ref 15]

**** Guided practical 2**

A*t the end of the section, students are guided to complete the following practical;*

Use Katalon recorder/ Selenium IDE to record a test case. Ideally you can use an online calculator (Eg: https://www.calculator.net/). Complete the following steps to record the test case.

- *Open the online calculator site*
- *Click on the appropriate calculator link to open the calculator (Eg: Percentage calculator)*

- *Insert value and the percentage you want to calculate. (IF you choose another calculator, input whatever the relevant values*
- *Click on the button to calculate*
- *Assert the result/value*
- *Stop recording*

Finally,student should have a test case recorded using Katalon recorder/Selenium IDE

11 Javabased Test Automation (e.g TestNG) (3 hours)

11.1 Introduction to Test Automation Frameworks for the Java Programming Language (e.g TestNG) [Ref 6, 17]
11.2 Classes Handling in Test Automation(e.g TestNG) [Ref 6, 17]
11.3 Use of XML in Test Automation(e.g TestNG) [Ref 6, 17]
11.4 Use of Annotations in Test Automation(e.g TestNG) [Ref 6, 17]

**** Guided practical 3**

At the end of the section, students are guided to complete the following practical;

- *Use Eclipse IDE to complete the following practical.*
- *Configure eclipse with TestNG library*
- *Create a new TestNG class*
- *Export previously recorded (Guided Practical 2) test case to TestNG web driver format*
- *Copy the code into TestNG class*
- *Resolve the dependencies (You need to add browser driver (Eg: chrome) to the project build path*
- *At the end you should be able to execute the recorded test case from the TestNG class you created*

12 Continuous Integration (CI) and Continuous Delivery (CD) (2 hours)

12.2 Introduction to CI and CD tools(e.g Jenkins) [Ref. 19]
12.3 Setting up Jenkins [Ref. 20]
12.3 Jenkins Pipeline Process [Ref. 21]
12.4 Introduction to Version Control Systems (e.g Git) [Ref. 7]

13 Mobile Test Automation (e.g Appium) (2 hours)

13.1 Introduction to Mobile Applications and Architectures [Ref. 4: pg]
13.2 Types of Mobile Applications
    13.2.1 Native Applications [Ref. 4: pg 9 - 11]
    13.2.2 Browser-based Applications [Ref. 4: pg 11 - 13]
    13.2.3 Hybrid Applications [Ref. 4: pg 13 -15]
13.3 Test Strategy for Mobile Applications [Ref. 18]
13.4 Mobile Application Testing Fundamentals [Ref. 18]
13.5 Mobile Testing Tools and Frameworks [Ref. 10, 11, 12, 13]
13.6 Appium Architecture [Ref. 4: pg 15 - 18]
13.6 Native Type Mobile Application Testing using Appium [Ref. 4: pg 45 - 88]

**** Guided practical 4**

At the end of the section, students are guided to complete the following practical;

Develop a simple Android demo application with login feature
Automate testing simple login interface on Android application.

14 Test Reporting (1 hour)

14.1 Test Reporting Process [Ref :Teacher's Note]
14.2 Test Reporting Frameworks [Ref :Teacher's Note]
14.3 Software Tools for Test Reporting [Ref: 9]

**** Guided practical 5**

At the end of the section, students are guided to complete the following practical;

Refer to the test cases used in guided practical 2, 3 and 4 to generate test reports. Use Cucumber reports engine or Maven surefire plugin to generate the test reports.

Mini Project: A mini project covering wider topics already covered will be given to apply the practical knowledge gained.

Teaching /Learning Methods:

You can access all learning materials and this syllabus in the VLE: http://vle.bit.lk/, if you are a registered student of the BIT degree program.

Assessment Strategy:

Continuous Assessments/Assignments:

In the course, case studies/Lab sheets will be introduced, and students have to participate in the learning activities.

Final Exam:

The final exam of the course will be held at the end of the semester. This course is evaluated using a two-hour question paper consisting of 4 Structured Questions.

References/ Reading Materials:

[1] Foundations of Software Testing ISTQB Certification,Rex Black, Erik van Veenendaal, Dorothy Graham, ISBN 978-1473764798
[2] Concise guide to Software Testing, Gerard O'Regan, Springer Nature Switzerland AG, ISBN 978-3-030-28494-7
[3] Software Testing and Quality Assurance Theory and Practice, KSHIRASAGAR NAIK and PRIYADARSHI TRIPATHY, John Wiley & Sons, Inc., ISBN 978-0-471-78911-6
[4] Mobile Test Automation with Appium - comprehensive guide to build mobile test automation solutions using Appium (2017), Nishant Verma, Packt Publishing Ltd., ISBN 978-1-78728-016-8

Supplementary Materials:

[5] https://www.selenium.dev/documentation/

[6] https://testng.org/doc/documentation-main.html

[7] https://git-scm.com/docs

[8] https://www.guru99.com/xpath-selenium.html

[9] https://testng.org/reportng/

[10] http://appium.io/docs/en/about-appium/intro/

[11] https://support.smartbear.com/testcomplete/docs/index.html

[12] https://docs.katalon.com/katalon-studio/docs/index.html

[13] https://www.ranorex.com/resources/

[14] https://www.tutorialspoint.com/stlc/index.htm

[15] https://artoftesting.com/selenium-tutorial

[16] https://artoftesting.com/difference-between-sdlc-and-stlc

[17] https://artoftesting.com/testng-tutorial

[18] https://developer.android.com/training/testing/fundamentals

[19] https://www.jenkins.io/doc/

[20] https://www.jenkins.io/doc/book/installing/

[21] https://www.jenkins.io/doc/book/pipeline/

IT6306 - Mobile Application Development

Program Content

Semester	VI		
Course Code:	IT6306		
Course Name:	Mobile Application Development		
Credit Value:	4 (2L + 2P)		
Core/Optional	Core		
Hourly Breakdown	Theory	Practical	Independent Learning
	30 Hrs	60 Hrs	110 Hrs

Course Aims:

- Develop an understanding of contemporary mobile development platforms and skills required to develop applications for mobile devices
- Explore a range of technical problems and solutions inherent in developing software applications for mobile devices including connectivity, security, and data storage.
- Explain the key challenges in creating usable and effective interactive mobile applications and design techniques to address them
- Develop an understanding of the unique features of contemporary mobile devices and how they can be used in interactive mobile application

Intended Learning Outcomes:

After following this course, students should be able to

LO1: Explain the major milestones in the evolution of mobile devices
LO2: Compare multiple mobile application development approaches
LO3: Develop interactive mobile applications using a modern mobile development environment.
LO4: Identify solutions to problems relating to interactive mobile applications.
LO5: Design a moderately complex native mobile application in Android.
LO6: Develop mobile applications for distribution on the Google Play Store.

Course Content: (Main Topics, Subtopics)

Topic		Theory (Hrs.)	Practical (Hrs.)
1.	Introduction to Mobile Applications	02	-
2.	Comparison of Mobile Application Development Platforms	03	-
3.	Designing for Mobile Applications	04	08
4.	Native Application Development with Android	12	30
5.	Android Architecture Components and Room Database	06	14
6.	Deployment and Monetization	03	08
	Total	**30**	**60**

1. Introduction to mobile applications (02 hours)

1.1. The term "Mobility" in general [Ref 1: Pg. (19-28)]
1.2. History of Mobile devices [Ref 3: pg 1-3]
1.2.1. The brick era [Ref 3: pg 3-4]
1.2.2. The candy bar era [Ref 3: pg 5]
1.2.3. The feature phone era [Ref 3: pg 6-7]
1.2.4. The smart phone era [Ref 3: pg 8-9]
1.2.5. The touch era [Ref 3: pg 10-12]
1.3. Layers of mobile eco system [Ref 3: pg 13]
1.3.1. Operators [Ref 3: pg 14-16]
1.3.2. Networks [Ref 3: pg 17]
1.3.3. Devices [Ref 3: pg 18-19]
1.3.4. Platforms [Ref 3: pg 20-21]
1.3.5. Operating systems [Ref 3: pg 13]
1.3.6. Application Frameworks [Ref 3: pg 22-25]
1.3.7. Applications [Ref 3: pg 25]
1.3.8. Services [Ref 3: pg 26]
1.4. Developing a mobile strategy [Ref 3: pg 57-67]

2. Mobile application development platforms (03 hours)

2.1. Introduction to mobile application development platforms [Ref 2: pg.109-110]
2.2. Android development platform [Ref 2: pg.151-153]
2.3. iOS development platform [Ref 2: pg.183-187]
2.4. Selecting the proper development platform [Ref 2: pg. 2-6]

3. Design for mobile applications (04 hours)

3.1. Introduction to mobile design [Ref 3: pg 109-115]
3.2. Elements of mobile design [Ref 3: Chap 8, 4]
3.2.1. Context [Ref 3: pg 116]
3.2.2. Message [Ref 3: pg 117]
3.2.3. Look and feel [Ref 3: pg 118-120]
3.2.4. Layout [Ref 3: pg 121-124]
3.2.5. Color [Ref 3: pg 125-128]
3.2.6. Typography [Ref 3: pg 129-133]
3.2.7. Graphics [Ref 3: pg 134-136]
3.3. Popular prototyping platforms (e.g., Proto.io, Figma, etc.) [Ref 4]

4. **Native Application Development with Android (12 hours)**

4.1. Getting started with Android development
4.1.1. Introduction to Android development [Ref 1]
4.1.2. Setting up the tools and environment [Ref 1]
4.2. Working with User Interfaces
4.2.1. App manifest and resources [Ref 1]
4.2.2.Activities and Fragments (Activity Life Cycle, Fragment Life Cycle) [Ref 1]
4.2.3.Layouts, Adapters, Action bar, Dialogs and Notifications [Ref 1]
4.3. Data and App interaction

4.3.1.Intents and Broadcast Receivers [Ref 1]
4.3.2.Preferences and Saving State [Ref 1]
4.3.3.Content Providers and Services [Ref 1]
4.3.4. AsyncTask and AsyncTaskLoader [Ref 1]
4.4. Sensors and Communication
4.4.1.Sensors (Sensor Identification and Registration) [Ref 1]
4.4.2.Orientation and Movement (Pitch, roll and yaw, Natural Device Orientation, Reference frame remapping) [Ref 1]
4.4.3.Sending and Receiving SMS [Ref 1]

5. Android Architecture Components and Room Database (06 hours)
5.1. Introduction to Android Architecture Components
5.1.1.Activity / Fragment [Ref 1]
5.1.2.ViewModel [Ref 1]
5.1.3.Repository [Ref 1]
5.2. Room Database
5.2.1.Room Overview [Ref 1]
5.2.2.Components of Room
3.1.1.1. Entity [Ref 1]
3.1.1.2. DAO (Data Access Object) [Ref 1]
3.1.1.3. Database [Ref 1]
5.3. Lifecycle-aware Components
5.3.1.Usecases and Lifecycle library [Ref 1]
5.3.2.Lifecycle Events and Observers [Ref 1]
5.3.3.LiveData [Ref 1]

6. Deployment and Monetization (03 hours)
6.1. Deploying the Android App
6.1.1. App releasing strategies [Ref 1]
6.1.2.Prepare for release [Ref 1]
6.1.3. Versioning the app [Ref 1]
6.1.4. Sign the app [Ref 1]
6.1.5. Uploading the app [Ref 1
6.1.6. Choosing the right monetization strategy [Ref 1]
6.1.7. Google Play's subscription platform [Ref 1]
6.1.8. Using Google AdMob [Ref 1]

Teaching /Learning Methods:
You can access all learning materials and this syllabus in the VLE: http://vle.bit.lk/ if you are a registered student of the BIT degree program.

Assessment Strategy:

Continuous Assessments/Assignments:
In the course, case studies/Lab sheets will be introduced, and students have to participate in the learning activities.

Final Exam:
The final exam of the course will be held at the end of the semester. This course is evaluated using a two-hour question paper consisting of 4 Structured Questions.

References/ Reading Materials:

- **Ref 1.** Android Official Documentation. 2021. [online]
  Available at: <https://developer.android.com/>

- **Ref 2.** McWherter, J., & Gowell, S. (2012). Professional mobile application development. John Wiley & Sons, Incorporated.

- **Ref 3.** Brian Fling, (2009). Mobile Design and Development (Practical techniques for creating mobile sites and web apps. O'Reilly Media, Inc.

Supplementary resources:

Ref 4. https://help.figma.com/hc/en-us/articles/360040314193-Guide-to-prototyping-in-Figma

IT6406 - Network Security and Audit

Program Content

Semester	VI		
Course Code:	IT6406		
Course Name:	Network Security and Audit		
Credit Value:	3 (2L + 1P)		
Core/Optional	Core		
Hourly Breakdown	Theory	Practical	Independent Learning
	30 Hrs	30 Hrs	90 Hrs

Course Aim/Intended Learning Outcomes:

Aim

Develop network security and auditing skills such as explaining basic concepts behind network security protocols and services, network security applications and implementations, and conceptual and practical knowledge of discovering, reporting and solving network compliance/security issues.

Intended Learning Outcomes

After following this course, students should be able to

- Describe examples of the types of threats and attacks that apply to different categories of computer and network assets.
- Design remote user authentication solutions using symmetric and asymmetric encryption.
- Discuss the principle concepts of a network access control system and access enforcement methods.
- Analyze different transport layer security protocols and integrate them into network solutions.
- Describe the technical details of email security implementations.
- Analyzing the security concepts of network protocols (DNSSEC, HTTPS, SSH).
- Analyze security requirements and apply Secure Virtual Private Networking (IP Security) solutions.
- Analyze computer networks and compile audit reports.
- Apply network auditing tools on both wired and wireless networks.
- Describe security concepts in cloud computing.
- Analyze perimeter security requirements and design solutions to minimize risks.

Course Content: (Main Topics, Sub topics)

Topic	Theory (Hrs)	Practical (Hrs.)
1. Computer and Network Security Concepts	1	0
2. Transport Layer Security	2	3
3. User authentication and Network Access Control	5	5
4. Virtual Private Networks	3	5
5. Network Perimeter Security	4	5
6. Email security and Domain Name System Security	2	4
7. Wireless Network Security	2	4
8. Cloud Security	2	0
9. IT Infrastructure Auditing Concepts	5	0
10. IT Infrastructure Auditing and Remediation	4	4
Total	**30**	**30**

1. Computer and Network Security Concept (1 hours)

1.1. Computer Security Concepts [Ref 1: Pg. (21-25)]
1.2. The OSI Security Architecture [Ref 1: Pg. (26)]
1.3. Security Attacks [Ref 1: Pg. (27-28)]
1.4. Security Services [Ref 1: Pg. (29-31)]
1.5. Security Mechanisms [Ref 1: Pg. (32-33)]
1.6. Fundamental Security Design Principles [Ref 1: Pg. (34-36)]
1.7. Attack Surfaces and Attack Trees [Ref 1: Pg. (37-40)]
1.8. A Model for Network Security [Ref 1: Pg. (41-42)]
1.9. Standards [Ref 1: Pg. (43)]

2. Transport Layer Security (2 hours)

2.1. Web Security Considerations [Ref 1: Pg. (547-548)]
  2.1.1.Web Security Threats
  2.1.2.Web Traffic Security Approaches
2.2. Transport Layer Security [Ref 1: Pg. (549-565)]
  2.2.1.TLS Architecture
  2.2.2.TLS Record Protocol Change Cipher Spec Protocol Alert Protocol
  2.2.3.Handshake Protocol Cryptographic Computations Heartbeat Protocol
  2.2.4.SSL/TLS Attacks
  2.2.5.TLSv1.3
2.3. HTTPS [Ref 1: Pg. (566)]
  2.3.1.Connection Initiation
  2.3.2.Connection Closure
2.4. Secure Shell (SSH) [Ref 1: Pg. (567-577)]
  2.4.1.Transport Layer Protocol
  2.4.2.User Authentication Protocol
  2.4.3.Connection Protocol

3. User Authentication and Network Access Control (5 hours)

- 3.1. Remote User-Authentication Principles [Ref 1: Pg. (474-477)]
- 3.2. Remote User-Authentication Using Symmetric Encryption [Ref 1: Pg. (478-481)]
- 3.3. Kerberos [Ref 1: Pg. (482-499)]
- 3.4. Remote User-Authentication Using Asymmetric Encryption [Ref 1: Pg. (500-501)]
- 3.5. Federated Identity Management [Ref 1: Pg. (502-507)]
- 3.6. Network Access Control [Ref 1: Pg. (520-522)]
- 3.7. Extensible Authentication Protocol [Ref 1: Pg. (523-526)]
- 3.8. IEEE 802.1X Port-Based Network Access Control [Ref 1: Pg. (527-528)]

4. Virtual Private Networks (3 hours)

- 4.1. Introduction to Virtual Private Networks
  - 4.1.1.Requirement of Remote Access and Private Communication
  - 4.1.2.Private Communication Technologies and Evolution
  - 4.1.3.VPN vs Secure VPN
- 4.2. IP Security Overview [Ref 1: Pg. (75-77)]
- 4.3. IP Security Policy [Ref 1: Pg. (668-672)]
- 4.4. Encapsulating Security Payload [Ref 1: Pg. (673-680)]
- 4.5. Internet Key Exchange [Ref 1: Pg. (684)]
- 4.6. Cryptographic Suites [Ref 1: Pg. (692)]

5. Network Perimeter Security (4 hours)

- 5.1. Intruders [Ref 1: Online Chapter 22.1]
- 5.2. Intrusion Detection [Ref 1: Online Chapter 22.2]
  - 5.2.1.Audit Records
  - 5.2.2.Statistical Anomaly Detection Rule-Based Intrusion Detection
  - 5.2.3.The Base-Rate Fallacy
  - 5.2.4.Distributed Intrusion Detection Honeypots
  - 5.2.5.Honeypots
- 5.3. Intrusion Prevention [Teachers Note]
- 5.4. Need for Firewalls [Ref 1: Online Chapter 23.1]
- 5.5. Firewall Characteristics and Access Policy [Ref 1: Online Chapter 23.2]
- 5.6. Types of Firewalls [Ref 1: Online Chapter 23.3]
- 5.7. Firewall Basing [Ref 1: Online Chapter 23.4]
- 5.8. Firewall Location and Configurations [Ref 1: Online Chapter 23.5]
- 5.9. Unified Threat Management [Teachers Note]
  - 5.9.1.Data Leakage Prevention (DLP)
  - 5.9.2.Deep Packet Inspection (DPI)

6. Email Security and Domain Name System Security (2 hours)

- 6.1. Email Security [Ref 1: Pg. (613-639)]
  - 6.1.1.Internet Mail Architecture [Ref 1: Pg. (613-616)]
  - 6.1.2.Email Formats [Ref 1: Pg. (617-624)]
  - 6.1.3.Email Threats and Comprehensive Email Security [Ref 1: Pg. (625-626)]
  - 6.1.4.S/MIME [Ref 1: Pg. (627-638)]
  - 6.1.5.Pretty Good Privacy (PGP) [Ref 1: Pg. (638-639)]
- 6.2. Domain Name System Security [Ref 1: Pg. (639-658)]
  - 6.2.1.DNSSEC [Ref 1: Pg. (639-642)]

6.2.2.DNS-Based Authentication of Named Entities [Ref 1: Pg. (643-644)]
6.2.3.Sender Policy Framework [Ref 1: Pg. (645-647)]
6.2.4.DomainKeys Identified Mail [Ref 1: Pg. (648-653)]
6.2.5.Domain-Based Message Authentication, Reporting, and Conformance [Ref 1: Pg. (654-658)]

7. Wireless Network Security (2 hours)
7.1. Wireless Security [Ref 1: Pg. (582-584)]
7.2. Mobile Device Security [Ref 1: Pg. (585-588)]
7.3. IEEE 802.11 Wireless LAN Overview [Ref 1: Pg. (589-594)]
7.4. IEEE 802.11i Wireless LAN Security [Ref 1: Pg. (595-609)]

8. Cloud Security (2 hours)
8.1. Cloud computing [Ref 1: Pg. (529-535)]
8.1.1.Cloud Computing Elements
8.1.2.Cloud Computing Reference Architecture
8.2. Cloud Security Risks and Countermeasures [Ref 1: Pg. (535-537)]
8.3. Data Protection in the Cloud [Ref 1: Pg. (537-541)]
8.4. Cloud Security as a Service [Ref 1: Pg. (541-544)]
8.5. Addressing Cloud Computing Security Concerns [Ref 1: Pg. (544)]

9. IT Infrastructure Auditing Concepts (5 hours)
9.1. The Need for Information Systems Security Compliance [Ref 2: Pg. (19-32)]
9.2. Auditing Standards and Frameworks [Ref 2: Pg. (83-106)]
9.3. Planning an IT Infrastructure Audit[Ref 2: Pg. (109-127)]
9.4. Conducting and IT Infrastructure Audit [Ref 2: Pg. (130-151)]
9.5. Writing IT infrastructure audit report [Ref 2: Pg. (155-165)]

10. IT Infrastructure Auditing and Remediation (4 hours)
10.1. Scope of an IT compliance audit
10.1.1. Compliance basics[Ref 2: Pg. (63-70)]
10.1.2. Introduction to IT Infrastructure auditing [Ref 2: Pg. (70-75)]
10.1.3. Maintaining IT compliance [Ref 2: Pg. (75-79)]
10.1.4. Compliance within user domain [Ref 2: Pg. (168-184)]
10.1.5. Compliance within workstation domain [Ref 2: Pg. (187-205)]
10.1.6. Compliance within LAN domain [Ref 2: Pg. (208-225)]
10.1.7. Compliance within LAN-to-WAN domain [Ref 2: Pg. (228-251)]
10.1.8. Compliance within the WAN domain [Ref 2: Pg. (255-271)]
10.1.9. Compliance within the remote access domain [Ref 2: Pg. (274-291)]
10.2. Network Auditing and Assessment Tools [Ref 3, Ref 4]
10.3. Network Security Issue Remediation and Infrastructure Hardening [Teachers Note]

Teaching /Learning Methods:
You can access all learning materials and this syllabus in the VLE: http://vle.bit.lk/, if you are a registered student of the BIT degree program.

Assessment Strategy:

Continuous Assessments/Assignments:
In the course, case studies/Lab sheets will be introduced, and students have to participate in the learning activities.

Final Exam:
Final examination of the course will be held at the end of the semester. The course is evaluated using a two hour question paper which consists of 4 Structured Questions.

References/ Reading Materials:

- **Ref 1.** Cryptography and Network Security, Principles and Practice, 7th Edition, William Stallings.
- **Ref 2.** Auditing It Infrastructures for Compliance, 2nd Edition, Martin Weiss; Michael G. Solomon
- **Ref 3.** https://nmap.org/docs.html
- **Ref 4.** https://www.wireshark.org/docs/

IT6506 - e-Business Technologies

Program Content

Semester	VI		
Course Code:	IT6506		
Course Name:	e-Business Technologies		
Credit Value:	3 (2L + 1P)		
Core/Optional	Optional		
Hourly Breakdown	Theory	Practical	Independent Learning
	30 Hrs	30 Hrs	90 Hrs

Course Aim/Intended Learning Outcomes:

On successful completion of this module, the students will be able to,

- Identify the concepts of eCommerce and eBusiness.
- Describe the eCommerce and eBusiness infrastructure and trends.
- Analyse different types of technologies and deployment methodologies.
- Analyse real business cases with respect to their eBusiness strategies.
- Follow eTransformation processes and methodologies.
- Integrate theoretical frameworks with business strategies.

Course Content: (Main Topics, Sub topics)

	Topic	Theory (Hrs)	Practical (Hrs.)
1.	Introduction to eBusiness and eCommerce	02	-
2.	Evolution of eMarketplaces	04	-
3.	eBusiness Applications & Success Stories (Case Studies from few industries)	03	-
4.	Development of eBusiness Strategies	05	01
5.	eBusiness Models and Revenue Models	05	01
6.	Digital Marketing Strategies	02	05
7.	eBusiness Transformation	04	01
8.	e-Supply Chain Management (eSCM)	02	05
9.	e-Customer Relationship Management (eCRM)	02	05
10.	Entrepreneurial Opportunities in eBusiness	01	12
	Total	**30**	**30**

1. Introduction to eBusiness and eCommerce (2 hours) [Ref: Teacher's note]

1.1. Introduction to eBusiness
1.2. Classification of eBusiness (B2C, B2B, C2C, B2G,…)
1.3. Advantages and disadvantages of eBusiness
1.4. The eBusiness Environment
1.5. Customer business interaction in eBusiness

2. Evolution of eMarketplaces (4 hours) [Ref: Teacher's note]

2.1. Identify traditional business models and new business models
2.2. Describe the technologies enabling new business models
2.3. Direct-to-customer interaction
2.4. Mass customisation
2.5. Virtual organisation

3. eBusiness Applications & Success Stories (3 hours) [Ref: Teacher's note]

3.1. Ride-Hailing Apps
  3.1.1.Uber
  3.1.2.PickMe
3.2. Online Ordering
  3.2.1.Uber Eats
  3.2.2.PickMe Food
3.3. Online Education
3.4. Online Banking

4. Development of eBusiness Strategies (5 hours) [Ref: Teacher's note]

4.1. The business environment
4.2. Driving forces for change
  4.2.1.Technical forces
  4.2.2.Business-driven forces
  4.2.3.External forces
  4.2.4.Internal forces
4.3. Customer disruption
4.4. Product disruption
4.5. Price disruption
4.6. Intelligent agents

**Guided Practical: See Annex A

5. eBusiness Models and Revenue Models (5 hours) [Ref: Teacher's note]

5.1. Direct-to-customer model
5.2. Supply chain model
5.3. Full-service provider model
5.4. Revenue sharing model
5.5. Digital value hub
5.6. Global trade platform

**Guided Practical: See Annex B

6. Digital Marketing Strategies (2 hours)

6.1. Theories related to Digital Marketing and Social Media Marketing [Ref 1: Page 7 - 12]
6.2. Facebook [Ref: Teacher's note]
6.2.1.Creating a Facebook page
6.2.2.Creating a targeted ad in Facebook
6.2.3.Facebook business suite
6.3. Instagram [Ref: Teacher's note]
6.3.1.Creating a business account on Instagram
6.3.2.Creating a targeted ad on Instagram
6.4. Twitter [Ref: Teacher's note]
6.4.1.Twitter Ads

**Guided Practical
At the end of the section, students are guided to complete the following practical;

- Create a Facebook Page, Instagram business account and a Twitter account for your small business (This can be real or hypothetical.)

7. eBusiness Transformation (4 hours) [Ref 2]

7.1. Stage 1: Environmental Analysis
7.2. Stage 2: e-Business Goals/ Strategies
7.3. Stage 3: eReadiness (Internal/External)
7.4. Stage 4: eTransformation Roadmap
7.5. Stage 5: eTransformation Methodology
7.6. Stage 6: eSystems
7.7. Stage 7: Evolution Change Management

**Guided Practical: See Annex C

8. e Supply Chain Management (2 hours)

8.1. SCM applications and their features and functionalities [Ref 1: Page 247 - 291]
8.2. Case Study - Ebay [Ref 1 : Page 34 - 37]
8.3. Ebay [Ref : Teacher's note]
8.4. Daraz [Ref : Teacher's note]

**Guided Practical
At the end of the section, students are guided to complete the following practical;

- Create an eBay account and list an item for selling
  Note - Use appropriate measures to ensure students do not incur any monetary loss (e.g. - Using appropriate shipping costs, checking legal regulations on shipping the listed item etc.)

9. e Customer Relationship Management (2 hours)

9.1. CRM applications and their features and functionalities [Ref1: Page 387 - 465]
9.2. Search Marketing [Ref: Teacher's note]
9.3. Google Analytics [Ref: Teacher's note]
9.4. Google My Business [Ref: Teacher's note]

**Guided Practical
At the end of the section, students are guided to complete the following practical;

- Create a WordPress website (Can use a FREE domain and hosting)
- Connect Google Analytics account to the created website

10. Entrepreneurial Opportunities in eBusiness (1 hour) [Ref: Teacher's note]

10.1. Fiverr
10.2. Google AdSense and AdMob
10.3. Dropshipping
10.4. Affiliate marketing
10.5. Cryptocurrency

**Guided Practical
At the end of the section, students are guided to complete the following practical;

- Create a Fiverr account and post a Gig

**Guided Practical
At the end of the section, students are guided to complete the following practical;

- Sign up for AliExpress affiliate marketing program.
- Generate an affiliate URL

**Guided Practical
At the end of the section, students are guided to complete the following practical;

- Install NiceHash and start mining a cryptocurrency

Teaching /Learning Methods:
You can access all learning materials and this syllabus in the VLE: http://vle.bit.lk/, if you are a registered student of the BIT degree program.

Assessment Strategy:

Continuous Assessments/Assignments:
In the course, case studies/Lab sheets will be introduced, and students have to participate in the learning activities.

Final Exam:
The final examination of the course will be held at the end of the semester. The course is evaluated using a two-hour question paper consisting of 4 Structured Questions.

References/ Reading Materials:

- **Ref 1.** Digital Business and e-Commerce Management: Strategy, Implementation and Practice, 6th Edition, Dave Chaffey. Available from https://www.pdfdrive.com/digital-business-and-e-commerce-management-strategy-implementation-and-practice-e181134696.html

Additional Material

- **Ref 2. The Seven E's in eTransformation – A strategic eTransformation Model** https://www.researchgate.net/publication/266472644_THE_SEVEN_E'S_IN_eTRANSFORMATION_-_A_STRATEGIC_ETRANSFORMATION_MODEL

Further Reading

- Digital Marketing for dummies by Ryan Deiss and Russ Henneberry (2nd Edition) https://www.pdfdrive.com/digital-marketing-for-dummies-e158039029.html

Annex A - Guided Practical for Section 4 - Development of eBusiness Strategies

Use the following case study to carry out the activity given below.

"BabyLove" is a day-care centre for preschoolers (ages 1-5 years).. It has been in operation for the last five (5) years and has the capacity to look after 25 children in their childcare centre located in Rajagiriya. It has a spacious garden and a wall around the entire premises. They have 8 female assistants to look after the children, 1 nurse to attend to sick babies, 1 labourer to clean the premises and a security person working at BabyLove at any given moment. The assistants have diplomas in childcare or have followed Montessori courses. Therefore, they are highly skilled and are capable of nurturing kids and toddlers. The owner Mrs. Joy Perera had been working in a Montessori in Australia for the last 15 years before she commenced the childcare centre at Rajagiriya.

The classrooms are tidy, have a lot of educational toys, activities and have utmost care for the security of the children. There are many outdoor activities as well, such as a sandpit, play area, climbers, swings, see-saw, gardening space and a play area as well. Babysitters and carers are all trained in first aid as well. Although the childcare centre is open from 7.30 am to 1.30 pm, there are many requests to keep it open till 6 pm till the parents finish their work and pick up the children. This needs additional facilities and will incur additional fees. Furthermore, there are other requests coming from parents for after school care for 5 – 8 years old and that request is also being considered. Parents are also very demanding, wanting more and more facilities and learning activities for their children compared with other childcare centres.

Mrs Joy wants to expand the childcare centre to include parents' requests and wishes to carry out marketing electronically using web-based solutions and social media marketing. She also wants to open another centre in Dehiwala to care for another 20 children. She wishes to include the children's progress, messages to parents, monthly payments, reminders to parents and many more activities through their web-based system. Furthermore, BabyLove wants to market to the higher income group of the society as well as to people living not only in and around the centre but also to people who travel along that route to work. Since there are many Monitories and Day Care centres in these areas, there is heavy competition to get new admissions from affluent parents. There are also strict government guidelines to be followed by Child Care providers to ensure the safety of the children.

The IT company you work in as a software engineer has been hired to eTransform the company. You are asked to identify the business opportunities for this venture and develop a plan to eTransform the company to do most of their business, marketing/ administrative tasks online.

Activity :

1. Carry out a Situational Analysis (SWOT Analysis) for "BabyLove". Identify the Strengths, Weaknesses, Opportunities and Threats for this company.
2. Carry out Michael Porter's Five Forces analysis on this company and propose two (2) eBusiness strategies to deal with the situation to minimise the forces.

Annex B - Guided Practical for Section 5 - eBusiness Models and Revenue Models

Activity:

State whether the following statements are 'true' or 'false'? Justify your answer using illustrations and an example each.

1. "When the 'bargaining power of suppliers is high and 'the rivalry among the competitors' is low, a company can use the 'revenue-sharing eBusiness model' to lower the power of suppliers."
2. "When the 'threat of new entrants is high in industry and 'the rivalry of competitors' is high, the existing companies could use the 'Digital Value Hub' ebusiness model to lower the competitiveness faced by the company.
3. "When the 'bargaining power of customers' are high, an airline ticketing company can use the 'full-service provider model' to lower the power of customers."
4. "When the 'rivalry among existing companies' are high in an industry, companies could use the 'digital value hub model' to deal with the situation and lower the competition."

Annex C - Guided Practical for Section 7 - eBusiness Transformation

<u>Use the following case study and help the company to eTransform using the methodology - 7Es in eTransformation.</u>

"Chocos" is the market leader in the chocolate industry in Sri Lankathat has been operating in the market for the last thirty (30) years. It had a market share of over 70% in the 1990s and lost its share to foreign chocolate brands and currently has a share of 52% but is still maintaining the position of a market leader with some difficulty. The market seems saturated with many local and foreign competitors and importers with many products.

Their factory uses state-of-the-art machinery and 100% cocoa butter from the cocoa produced entirely in Sri Lanka. Their raw materials depend entirely on Sri Lankan suppliers who have a strong united association. It has a well-trained labour workforce of over 500 in 3 factories situated in different parts of the country. "Chocos" does their own research and development to come up with new products and has over 50 distributors island-wide with a fleet of sales representatives working for them.

"Chocos" used to market and sell their products outside Sri Lanka. However, their market is shrinking in the global market due to heavy competition. Their local and international marketing strategy seems to be not very focused as it has not given exposure to their range of products. They have a B2C web-based solution that the company uses to market their products to customers. It has the facility to view the products and link up with the 3 factories. However, other interactivity such as online ordering, supplier management, and customer management is not incorporated. They hardly use Internet-based marketing to promote their products in the local/global market.

As a newly recruited Management Trainee, you are expected to properly analyse and develop strategies to market the products in the local/global market. You are expected to strengthen the online collaborations you can establish with customers, suppliers, partners, corporate customers, regions, other products and other industries that deal with chocolate-based products.

Activity

1. There are many aspects that an organisation should look into when eTransforming from a traditional business to an eBusiness. Illustrate and briefly discuss how the above company would use the 7Es in eTransformation methodology and its stages to achieve its business expansions and goals.