# ICT-INFO &COMMUNICATION TECH

**ICT 141. IT Essentials I: A+ Certification Training Focused on the Hardware Exam**
**3 Credits (3)**
Installing, configuring, troubleshooting, and maintaining personal computer hardware components and will assist in preparation for the CompTIA A+ Hardware certification.
**Learning Outcomes**
1. Configure and support PC, mobile, and IoT device hardware.
2. Perform basic computer diagnostic and maintenance operations.
3. Implement basic data backup and recovery methods.
4. Apply basic hardware maintenance best practices.
5. Demonstrate baseline security practices for hardware.

**ICT 145. Network Essentials: N+ Certification Training**
**3 Credits (3)**
Focuses on the installation and administration of network communication systems and will assist in preparation for the CompTIA N + Network certification.
**Learning Outcomes**
1. Explain basic networking concepts including network services, physical connections, topologies, and architecture.
2. Explain security concepts and network attacks in order to harden networks against threats.
3. Explain routing technologies and networking devices; deploy Ethernet solutions and configure wireless technologies.
4. Troubleshoot common cable, connectivity, and software issues related to networking.
5. Monitor and optimize networks to ensure business continuity.

**ICT 152. Java Programming**
**3 Credits (3)**
Programming in the Java language.
**Learning Outcomes**
1. Set up a rich programming environment.
2. Analyze existing code.
3. Create/modify/debug/test programs.
4. Employ software documentation and programming best practices.

**ICT 161. IT Essentials II: A+ Certification Training focused on the Software exam**
**3 Credits (3)**
Installing, configuring, troubleshooting, and maintaining personal computer operating systems and will assist in preparation for the CompTIA A+ Software certification.
**Prerequisite:** A grade of C- or better in ICT 141.
**Learning Outcomes**
1. Configure device operating systems, including Windows, Mac, Linux, Chrome OS, Android, and iOS.
2. Administer client-based and cloud-based software.
3. Troubleshoot and problem-solve core service and support challenges.
4. Apply best practices for documentation, change management, and scripting.
5. Support basic IT infrastructure and networking.

**ICT 220. Discrete Math and Its Relationship to Information Technology**
**3 Credits (3)**
Focuses on developing software coding skills using a programming language and its application to discrete mathematics, the use discrete structures in computer science. Topics included are logic, sets, relations, functions, methods of proof, recursion, combinatorics, graph theory, and algorithms
**Prerequisite:** A grade of C- or better in MATH 1220G or higher.
**Corequisite:** ICT 152.
**Learning Outcomes**
1. Explain the relationship between discrete math sets and coded arrays, finite and infinite, subsets, intersection, unions, and other set operations.
2. Explain binary Trees and know how to use demonstrate them using code.
3. Demonstrate the use of code applied to group and subgroup theory.
4. Demonstrate the use of code to create functions and algorithms.
5. Identify and explain logical operations and their application in coding.
6. Demonstrate the use of Probability Theory in code to predict random outcomes.

**ICT 267. Information Security+ Certification Preparation**
**3 Credits (3)**
The course covers the Sec+ exam objectives and detailed preparation for certification in information security.
**Prerequisite:** A grade of C- or better in both, ICT 141 and ICT 145.
**Learning Outcomes**
1. The student will select appropriate mitigation and deterrent techniques to address network attacks and vulnerabilities.
2. The student will examine how access control, identity management, and cryptography can secure a network and manage risk.
3. The student will identify privacy and policy issues.
4. The student will apply activities that an Information Systems Security specialist would normally carry out in the performance of his/her duties.

**ICT 280. Introduction to Web Development**
**3 Credits (3)**
Introduction to front-end web development including webpage design, structure, layout, positioning, responsiveness, and foundational layers of how the web works.
**Learning Outcomes**
1. Explain the Document Object Model of HTML5 web pages.
2. Organize web page contents with Lists, figures, and organizational elements.
3. Develop web page layout templates.
4. Implement style application inline, via style blocks, and using external resources.
5. Develop and apply javascript event-driven programming to web pages.
6. Explain the difference between client and server-side scripting and data processing.

**ICT 300. Special Topics**
**3 Credits (3)**
Directed study or project. Students must be in Junior standing and have the consent of department head to enroll. May be repeated up to 3 credits.

**Learning Outcomes**

1. Various.

**ICT 320. Introduction to Internet Protocols**
**3 Credits (3)**
Present a overview of Internet Protocols Applications. Students must be in Junior or Senior standing only.
**Learning Outcomes**

1. Students will apply an understanding of basic Networking.
2. Students will employ effective use of Packet analysis software to troubleshoot network issues.
3. Explain the RFC process for developing network protocols.
4. Explain network protocol security implications.

**ICT 339. Introduction to Digital Forensics and Incident Response**
**3 Credits (3)**
Introduction to the skills required to perform digital forensics and incident response on Windows operating systems. Topics include: live response, evidence acquisition, Windows operating system artifacts, documentation and reporting.
**Prerequisite:** A grade of C- or better in ICT 141 or ICT 161.
**Learning Outcomes**

1. To understand Digital Forensics terms and definitions and why digital forensics is needed.
2. To study what is required and how to perform digital forensics.
3. To become familiar and aware of the hindrances/obstacles that affects effective digital/computer forensic operations.
4. To learn about the tools and procedures for how deleted data is recovered during digital forensic operations.
5. To use forensic tools and procedures to perform digital forensic operations on Windows operating systems, Emails, Mobile devices, and Communication networks (Computer, wireless, cellular networks).
6. To learn about incident response and procedures.

**ICT 350V. Introduction to Personal Computer Security and Privacy**
**3 Credits (3)**
Introduction to Information Security and Privacy – Have you ever wondered what happens to all of your browsing history or data you fill out on websites go? Who has this data? What do they do with this data? How do you stop sharing your private information? This class will answer those questions and provide steps to make your online presence more secure.
**Learning Outcomes**

1. Classify security issues
2. Classify Privacy protections
3. Evaluate threats and countermeasures based on personal security breaches.
4. Formulate a real-time privacy response
5. Assess international privacy protections through a multicultural focus.

**ICT 352. Software Technology I**
**3 Credits (3)**
This course focuses on reading, writing, debugging, testing, and documenting computer programs. May be repeated up to 3 credits.
**Learning Outcomes**

1. Set up a rich programming environment
2. Analyze existing code
3. Create/modify/debug/test programs
4. Employ software documentation and programming best practices

**ICT 355. Linux System Administration**
**3 Credits (3)**
Operating systems applications and interfacing with an introduction to systems administration. Topics include Shell Programming, Programming Tools, Database Management, System Backups, Security, Setup, and Maintenance of Linux Servers.
**Learning Outcomes**

1. Create a virtual environment on a host system using VirtualBox.
2. Develop single and multiple Linux Operating Systems within The VirtualBox Virtual Environment.
3. Select applications on production Linux Operating systems.
4. Support the operation of the Linux Operating system using System Administration Techniques.

**ICT 360. Operating Systems for ICT**
**3 Credits (3)**
Fundamentals of operating systems with Windows and Linux including installation and configuration using the GUI as well as the command line, text editors, file systems, scripting and operating system management.
**Learning Outcomes**

1. Create a virtual environment on a host system using VirtualBox.
2. Create multiple Operating Systems in a Virtual Environment.
3. Manage error codes in Virtual Machines.
4. Support the operation of the CentOS GUI and Windows Operating Systems.

**ICT 362. Software Technology II**
**3 Credits (3)**
Topics include problem analysis, object-oriented programming (OOP), structured logic, and development concepts. May be repeated up to 3 credits.
**Prerequisite:** A grade of C- or better in ICT 152 or ICT 352 or E T 262 or OECS 195 or C S 152 or C S 172.
**Learning Outcomes**

1. Set up and use a rich programming environment for programming with Python.
2. Analyze existing code.
3. Employ effective use of basic programming and basic troubleshooting.
4. Employ effective use of Object-Oriented Programming (OOP) and troubleshooting.
5. Apply testing and documentation best practices.

**ICT 364. Windows Enterprise Administration**
**3 Credits (3)**
Installation, configuration, and maintenance of Windows Enterprise services which includes Active Directory, distributed file systems, SQL Server, Web Server, Authentication Procedures, and enterprise elasticity. Topics covered include: Server Maintenance and Troubleshooting Methodologies.
**Prerequisite:** A grade of C- or better in ICT 152.
**Learning Outcomes**

1. Set up and use a Windows Enterprise environment with Active Directory.
2. Use best practices to design an organizational structure and define AD DS Objects.

3. Deploy an AD DS embedded DHCP server with IPv4, IPv6, and Failover.
4. Analyze and use PowerShell code for process automation.
5. Deploy security and user settings using Group Policy.
6. Apply version updates and establish an intra-forest trust relationship.

**ICT 372. Software Engineering and Design**
**3 Credits (3)**
Topics include the software development lifecycle, problem analysis, and implementing software testing routines to improve the quality, integrity, and security of code.
**Prerequisite:** A grade of C- or better in ICT 362.
**Learning Outcomes**
1. Identify, explain, and apply the phases of the SDLC.
2. Identify different Agile methodologies and practices for software project management.
3. Use different development tools and apply best practices.
4. Apply best practices in the creation of business objects, data storage and access, testing, and debugging.
5. Configuring, handling, testing, and deploying services.

**ICT 377. Computer Networking I**
**3 Credits (3)**
Computer network design and applications for LAN, TCP/IP networks, routing and switching technologies, VLANs, and the OSI layers from physical to transport.
**Prerequisite/Corequisite:** A grade of C- or better MATH 1220G or higher.
**Learning Outcomes**
1. Define and distinguish the role of a network administrator (from other roles in the IT world).
2. Identify the OSI model, its layers, and the relationship to the TCP/IP model.
3. Identify different cable media and networking devices and their use.
4. Design, configure and troubleshoot basic networks.
5. Identify MAC, IPvfour, and IPvsix addressing.
6. Apply different techniques for IP allocation and subnet design (IPvfour).
7. Use the Cisco IOS software for basic switch and router configurations.
8. Configure and troubleshoot basic setup for static and dynamic routing protocols.

**ICT 380. Web Design and Multimedia**
**3 Credits (3)**
Introduction to front-end web development including webpage design, structure, layout, positioning, responsiveness, and foundational layers of how the web works. Video, audio, and other digital presentation tools are covered.
**Learning Outcomes**
1. Create multiple front-end development micro-components.
2. Create single and multi-page websites.
3. Use flexbox, grid, and media queries and different design patterns.
4. Employ effective use of web development and basic troubleshooting.
5. Build small web site projects.

**ICT 400. Special Topics**
**1-3 Credits (1-3)**
Directed study or project. Students must be in Senior standing and have the consent of department head to enroll. May be repeated up to 6 credits.
**Learning Outcomes**
1. Various.

**ICT 435. Senior Project**
**3 Credits (3)**
Capstone course. Practical application of student's cumulative knowledge to an assigned design project. Design principles, teamwork, and project management skills are stressed. Demonstration of written and oral communication skills via project documentation and presentation of results. Must be graduating senior. Consent of Instructor required. Restricted to ICT Majors.
**Prerequisite:** A grade of C- or better in the following: ICT 364 and ICT 377 and (ICT 462 or ICT 355).
**Learning Outcomes**
1. Demonstrate ability to manage a complex technical project.
2. Demonstrate the ability to create an engineering project timeline.
3. Demonstrate the ability to self-motivate and organize project.
4. Demonstrate the ability to work in teams and execute project.
5. Goal setting, skills assessment and portfolio development included.

**ICT 439. Advanced Digital Forensics and Incident Response**
**3 Credits (3)**
Advanced topics in digital forensics and incident response. Topics include network analysis and advanced cybersecurity concepts.
**Prerequisite:** A grade of C- or better in both, (E T 339 or ICT 339 or ICT 450) and (E T 377 or ICT 377).
**Learning Outcomes**
1. Demonstrate the use of forensic tools and procedures to perform digital forensic operations on Windows operating systems, Emails, Mobile devices, and Communication networks (Computer, wireless, cellular networks).
2. Demonstrate proper incident response procedures and proper chain of custody when handling digital evidence.
3. Students will become familiar with tools and processes to analyze and detect memory resident processes that include malware, rootkits, and user recoverable data.
4. Students will also have exposure to methods and processes used by hackers to penetrate and compromise targets.

**ICT 450. Ethical Hacking**
**3 Credits (3)**
Ethical Hacking and Penetration testing techniques. Students must be in senior standing to enroll.
**Prerequisite:** A grade of C- or better in ICT 350V.
**Learning Outcomes**
1. Analyze networking concepts as they relate to hacking vulnerabilities.
2. Define contract requirements necessary to avoid legal liability during Ethical Hacking.
3. Employ tools and techniques to scan and do reconnaissance on potential targets.
4. Demonstrate use of vulnerability testing tools to identify vulnerabilities and exploits.
5. Identify the role of sniffers and session Hijacking in Ethical Hacking.
6. Demonstrate the use of Social Engineering tools and techniques used in Ethical Hacking.

**ICT 457. Information Security Principles**
**3 Credits (3)**
This course provides an overview of security challenges and strategies of countermeasure in the information systems environment. Topics include definition of terms, concepts, elements, and goals incorporating industry standards and practices with a focus on availability, vulnerability, integrity and confidentiality aspects of information systems.
**Prerequisite:** A grade of C- or better in ICT 350V.
**Learning Outcomes**
1. Demonstrate an understanding of the information security concepts.
2. Demonstrate an understanding of the diversity of potential attacks against an organization.
3. Demonstrate an understanding of cryptographic techniques.
4. Demonstrate an understanding of authentication methods.
5. Demonstrate an understanding of access control systems.
6. Demonstrate an understanding of various network security controls.
7. Demonstrate an understanding of the legal, ethical, and professional issues in information security.

**ICT 458. Web Development and Database Applications**
**3 Credits (3)**
Design, plan, and build interactive and dynamic web applications. Topics include relational databases, object-oriented programming, and the application of backend frameworks.
**Prerequisite/Corequisite:** A grade of C- or better in ICT 362.
**Learning Outcomes**
1. Build knowledge of Web Servers.
2. Plan, design, and create code for backend web development.
3. Design, create, and access databases that support web applications.
4. Implement adequate security and authentication for the deployment of Web applications.

**ICT 460. Advanced Software Development Concepts**
**3 Credits (3)**
This course focuses on advanced software development concepts to help embed security into code, protecting software applications.
**Prerequisite:** A grade of C- or better in ICT 362.
**Learning Outcomes**
1. Application of best practices against software vulnerabilities.
2. Identification of code defects, bugs, and logic flaws.
3. Assessment and testing of code.
4. Utilization of secure code alternatives.
5. Code refactoring to improve design and structure and prevent vulnerabilities.

**ICT 462. Linux System Administration**
**3 Credits (3)**
Operating system applications and interfacing with an introduction to systems administration. Topics include Shell Programming, Programming Tools, Database Management, System Backups, Security, Setup and Maintenance of Linux Servers.
**Learning Outcomes**
1. Create a virtual environment on a host system using VirtualBox.
2. Develop single and multiple Linux Operating Systems within The VirtualBox Virtual Environment.
3. Select applications on production Linux Operating systems.
4. Support the operation of the Linux Operating system using System Administration Techniques.

**ICT 463. Enterprise Linux Network Administration Tools**
**3 Credits (3)**
Advanced methods and tools used to deploy, manage, and administer networked devices.
**Prerequisite:** A grade of C- or better in ICT 377.
**Learning Outcomes**
1. Demonstrate the ability to use Software Versioning systems using Windows and Linux.
2. Apply best practices with versioning repositories when creating software.
3. Deploy single and clustered microservice containers to support a web application.
4. Use script-based code to deploy and configure a full stack web server.
5. Use infrastructure management software to deploy defined roles in multiple environments.

**ICT 467. Communication Network Security**
**3 Credits (3)**
The course provides a technical perspective on maintaining the security of communication network systems. It covers a wide range of technical issues, including wired, wireless and Internet communication fundamentals, communication network security mechanisms and configuration, standards and protocols, vulnerabilities, attacks and countermeasures.
**Prerequisite:** A grade of C- or better in both, ICT 320 and ICT 377.
**Learning Outcomes**
1. Demonstrate an understanding of key and basic communication network security concepts, terminologies, standards, issues, and policies.
2. Apply the principles of network security techniques such as Cryptography, Cryptanalysis, Biometrics, Watermarking, and Stenography.
3. Implement security techniques with commonly available network security software.
4. Examine the fundamentals of Wired and Wireless communication network systems including Cellular, Bluetooth, Wi-Fi, Internet, Cloud Networking, and the Internet of Things.
5. Explain the TCP/IP security protocols that pertain to communication network systems.
6. Explain the security attacks, threats, risks, mechanisms, and tools associated with and used for securing network devices especially mobile devices.
7. Demonstrate an understanding of the operation and countermeasures against Malwares in network systems and the implementation of intrusion detection and prevention, and firewall technologies.

**ICT 477. Computer Networking II**
**3 Credits (3)**
Advanced concepts in computer network design and applications including managing the campus network infrastructure (LANs and virtual LANs), network services (DNS and DHCP), network security as well as network monitoring.
**Prerequisite:** A grade of C- or better in either ICT 377 or E T 377 or CTEC 285.
**Learning Outcomes**
1. VLSM, Summarization, and the TCP/IP model.
2. Understanding of IPvsix basics
3. Configuration of routing protocols using IPvsix
4. Configuration of advanced router configurations

5. Configuration of route redistribution, DHCP, DNS, NAT and PAT
6. Configure network security and Access Control Lists (ACLs)
7. Perform basic analysis of network data traffic
8. Create, test and troubleshoot software simulations (Cisco Packet Tracer)

**ICT 487. Data Security**
**3 Credits (3)**
Delving into the realm of advanced data security is the essence of this senior-level undergraduate course. Students will immerse themselves in the intricacies of safeguarding digital information by covering an array of topics, from encryption to secure data transmission, and extending to secure data storage and data security in use. The course takes a comprehensive approach, encompassing three key domains of data security: data in motion, data at rest, and data in use. Throughout the journey, students will grasp the technical and theoretical underpinnings of data security and cultivate practical, hands-on expertise in fortifying data against vulnerabilities.
**Prerequisite:** A grade of C- or better in both, ICT 320 and ICT 360.
**Learning Outcomes**

1. Understand the fundamental concepts of data security, including data in motion, data at rest, and data in use.
2. Explore encryption algorithms and their applications in data security.
3. Evaluate the importance of secure communication protocols in data transmission.
4. Develop skills in secure data storage and backup techniques.
5. Analyze various security architectures, such as network security, cloud security, and mobile security.