Course #: Introduction to Computing

Course Description & Syllabus

Name of College or University
Semester Year

1. Overview

Title: Introduction to Computing
Credits/Units: 3-credit hours or 4-credit hours with a lab.
Pre-requisites: None

Institution LMS access: https://lms.univ-or-college.edu

Recitation:

1. **Tuesday, 8:00 AM – 8:50 AM ET, BLDG XYZ (Videotaped)**

Teaching Staff:
Prof. Best Faculty
faculty-email@xyz.edu
Office Number, +1-555-555-5555
Office hours: Tuesday, 3-4pm (time zone)

TAs typically hold office hours in building/room. The TA office hours are posted on the LMS:

- TA Name<ta-email@xyz.edu>

- TA Name<ta-email@xyz.edu>

2. COURSE DESCRIPTION

Students learn what computing is and what role it plays as well as the concepts, techniques, skills and tools needed for operating and managing computers in both, personal and enterprise environments. Students will be able to identify the role computing plays in a modern society in areas such as data analysis, automation, or Internet of Things (IoT). Topics include computing devices, operating systems, data representation, filesystems, networking, Internet, cloud services, Cybersecurity, database systems, computer programming and troubleshooting.

3. COURSE GOALS

In this course, students gain hands-on experience solving real world problems by completing projects in the areas of operating systems management, data handling, networking, cloud computing, and software development. It is our goal that students develop foundational knowledge and skills needed to become an IT professional. Specifically, students are exposed to various computing devices, real-world data and scenarios in order to learn how to:

1. Identify and suggest appropriate computing devices and operating systems for various workloads and use cases.
2. Process data stored in various binary or text file formats, load, access, and update data in enterprise database systems.
3. Recognize and configure different networking devices for local network and internet connection, and provision and access resources in the cloud.
4. Implement measures to secure networked computing devices and troubleshoot malfunctioning systems.

Through this process, we aspire for our students to become sophisticated, independent, and resilient problem solvers who are able to overcome challenges and learn.

4. LEARNING OUTCOMES

In this project-based course, we have project and conceptual learning objectives.

4.1. CONCEPTUAL LEARNING OBJECTIVES

The conceptual learning objectives (LOs) are the following. Students will be able to:

1. Describe the variety of computing devices and explain the functionality of the main hardware components and popular peripherals.

2. Define and describe the purpose and functionality of various operating systems and common software applications.

3. Explain data representation, describe data types, formats, files, and filesystems.

4. Discuss the functionalities, schema, queries, and other properties of database systems.

5. Describe networking concepts and how they relate to the Internet and connected devices such as Internet of Things (IoT).

6. Identify the core concepts of cloud computing.

7. Discuss the fundamentals of Cybersecurity, common threats and how to safeguard against them.

8. Identify popular programming languages, their types (e.g., compiled and interpreted), and their utilization, and describe the software development lifecycle.

9. Discuss the steps in troubleshooting methodology.

4.2. PROJECT LEARNING OBJECTIVES

The project learning objectives (LOs) are the following. Students will be able to:

1. Compare the capability and performance of different types of computing devices.

2. Install and configure different operating systems and/or their versions/distributions and perform system updates.

3. Compare a binary file to a text file, recognize different file formats, and perform compression on different file types.

4. Define a schema, load data into a relational database system, access the data and compare such database systems to data storage using tools such as spreadsheet.

5. Configure computing devices for networking.

6. Provision and access resources in the cloud.

7. Recognize and report email phishing and identity theft attempts, and experiment with a wi-fi scanner and interpret its output.

8. Experiment with small pieces of computer code (compile, run) written in different compiled and interpreted languages.

9. Troubleshoot malfunctioning systems and document the process.

4.3. COURSE ORGANIZATION

Your participation in the course will involve several forms of activity:

1. Reading the conceptual content for each unit.
2. Completing the graded weekly assessments after each unit.
3. Complete projects, which are hands-on training and automated feedback.

5. GETTING HELP

Students are encouraged to ask questions about content and projects through the Q & A forum. The course link for the forum is:

http://Q&A-forum.edu/

6. POLICIES

WORKING ALONE ON PROJECTS

Projects that are assigned to single students should be performed individually.

All assessments are due at 11:59 PM ET (one minute before midnight) on the due dates specified on the Sail() Platform. All hand-ins are electronic.

APPEALING GRADES

After each project module is graded, you have seven calendar days to appeal your grade. All your appeals should be provided by email to the professor.

7. ASSESSMENT

Inline activities ("Learn by Doing" and "Did I Get This"), which are available in most pages in the OLI course, are simple, non-graded activities to assess your comprehension of the material as you read through the course material. You are advised to complete all of the inline activities before proceeding through to the next page or module. If you missed many of the activities, it is recommended that you review the material again.

The conceptual units consist of modules of content on OLI, each week has a Checkpoint Quiz that you must complete before the deadline posted on OLI. Each weekly Checkpoint Quiz will be worth N% of your total grade. It is your responsibility to ensure that the quiz is submitted prior to the deadline. You will have only a single attempt to complete each Checkpoint Quiz on OLI.

This course includes several individual projects. Each project module has to be completed based on the deadlines posted on Sail(). The write-up required to complete each project module is available on Sail(). Each module has a submission process that is specific to the project module that is due. It is the students' responsibility to make sure that all project work is completed and that the project module is submitted prior to the deadline. Students typically have multiple attempts to submit the project module on Sail().

Type	Number	Weight
Conceptual Content Quizzes	8	XX%
Projects	8	YY%
Total Grade		100%

8. CHEATING

We urge each student to carefully abide by the course policy on academic integrity, which outlines the policy on cheating, plagiarism or unauthorized assistance. It is the responsibility of each student to produce her/his own original academic work. Collaboration or assistance on academic work to be graded is not permitted unless explicitly authorized by the course instructor. Each unit checkpoint quiz or project module submitted must be the sole work of the student turning it in. Student work on the cloud is logged, submitted work will be closely monitored by automatic cheat checkers, and students may be asked to explain any suspicious similarities with any piece of code available. The following are guidelines on what collaboration is authorized and what is not:

WHAT IS CHEATING?

1. Sharing a solution, code or other electronic files by either copying, retyping, looking at, or supplying a copy of any file. Copying any solution, code from the internet (stackoverflow.com or github or others). Do not use other students' solutions or code to "test" the auto-grader. Anything you submit to the auto-grader must be your work.

2. Copying answers to any checkpoint quiz from another individual, published or unpublished written sources, and electronic sources.
3. Collaborating with another student or another individual on checkpoint quizzes or project modules.
4. Sharing written work, looking at, copying, or supplying work from another individual, published or unpublished written sources, and electronic sources.
5. Collaboration in team projects is strictly limited to the members of the team.

WHAT IS **NOT** CHEATING?

1. Clarifying ambiguities or vague points in class handouts.
2. Helping others use computer systems, networks, compilers, debuggers, profilers, or system facilities.
3. Helping others with high-level design issues.
4. Guiding others through code debugging but not debugging for them.

Cheating in projects will also be strictly monitored and penalized. Be aware of what constitutes cheating (and what does not) while interacting with students. You cannot share or use solutions, written code, and other electronic files from students. If you are unsure, ask the teaching staff.

Be sure to store your work in protected directories. The penalty for cheating is severe, and might jeopardize your career – cheating is simply not worth the trouble. By cheating in the course, you are cheating yourself; the worst outcome of cheating is missing an opportunity to learn. In addition, you will be removed from the course with a failing grade. We also place a record of the incident in the student's permanent record.

9. CONCEPTUAL TOPICS

The course content will be structured into the following modules:

Module	Title	Learning Objectives
1	Computing Devices	- List example computing devices. - Describe different types of computing devices (personal computers, servers, mobile, internet of things). - Identify common hardware components of various computing devices and describe their uses. - Describe the commonly used architecture of computing devices. - Explain the functionality of the main hardware components of a personal computer, including a processor, random access memory, motherboard, persistent storage, and power supply. - Compare and contrast common storage, throughput, and processing speed units. - Explain the characteristics of various input and output devices, such as pointing devices, digital cameras, scanners, monitors, printers, and speakers. - Discuss differences in features and functionality of a variety of mobile computing devices. - Identify various networking hardware devices. - Classify common types of input/output devices.
2	Operating Systems	- Differentiate between hardware and software. - Define the role of an operating system in a computing device. - List examples of operating systems. - Differentiate between desktop, server, and mobile operating systems.

		● Describe the main properties of the common operating systems, such as Linux, Windows, MacOS, Android, or iOS. ● Describe the most prominent functions of the common operating systems, focusing on how they control a network and administer security, various system utilities. ● Differentiate between operating systems and application software. ● List examples of common application software. ● Describe several categories of application software. ● Explain typical use cases of various categories of application software.
3	Data Representation, Formats, Filesystems	● Explain the difference between binary and text files. ● Explain how to calculate conversions among various numbering systems: binary, octal, decimal, and hexadecimal. ● Explain the main idea behind character encoding. ● Describe the main characteristics of ASCII and Unicode. ● Explain the binary representation in ASCII. ● Discuss the key considerations of working with binary and text files. ● State what data is and give examples of the kinds of information data holds. ● Describe how different data types, such as images, sounds, texts, or tables, are represented. ● Describe fundamental properties of data, such as images, sounds, texts, or tables. ● Describe typical file management concepts, including directories, files, file types and extensions, and permissions. ● Compare and contrast different file systems and their features (NTFS, FAT32, HFS, Ext4). ● Define compression. ● Describe common compression formats and tools. ● Discuss various mechanisms to share files with other users.
4	Database Systems	● Compare and contrast structured, semi-structured, and unstructured data. ● Define basic relational database terms such as fields, data types, records, record types, cardinality, keys, constraints, schema, and tables. ● Describe the CRUD operations. ● Describe database transactions and the ACID properties. ● Compare and contrast storing data in flat files, such as Excel sheets, to storing data in database systems, focusing on concurrent users, scalability, speed, and data variety. ● Describe the basic characteristics of different types of non-relational databases, such as key-value and document stores. ● Compare and contrast different database management systems.
5	Networking and Internet	● Describe basic concepts of network communication, network devices, and device addressing.

		• Describe the two fundamental network architectures (client/server, peer-to-peer). • Explain how different kinds of networks are connected. • Explain basic concepts related to the Internet and its structure. • Compare and contrast common Internet service types, such as fiber optic, cable, DSL, or wireless. • List and briefly describe the fundamental networking and Internet protocols. • Explain the Internet of Things (IoT).
6	Cloud Computing	• Explain the concept of cloud computing. • Briefly recall the recent history of cloud computing, illustrating its evolution. • Recognize cloud service models such as IaaS, PaaS, and SaaS and differentiate between them. • List some of the common cloud providers and the features offered in their cloud stacks. • Articulate the economic benefits of the cloud paradigm for cloud users and cloud service providers. • Discuss some of the advantages and disadvantages of the cloud paradigm. • Recall popular cloud use case scenarios.
7	Cybersecurity	• Explain the concerns related to the confidentiality, integrity, and availability of data/information. • Compare and contrast authentication and authorization. • Describe best practices for creating and managing passwords. • Discuss how to protect computing devices from various threats, such as malware or social engineering, by securing the devices and adopting best practices when using them. • Describe encryption focusing on data at rest and data in transit. • Explain business continuity concepts, such as fault tolerance and disaster recovery.
8	Computer Programming and Software Development	• Compare and contrast various types of programming languages, such as interpreted, compiled, high-level, or low-level languages. • Identify the uses of various programming languages and development tools. • Describe software development cycle. • Explain the purpose of basic programming constructs, such as variables, types, expressions, assignments, functions, data containers, or flow control mechanisms (branching, looping). • Compare and contrast common primitive data types of a programming language.

10. PROJECTS

The projects are geared towards providing hands-on experience. Students will learn to develop all projects using various public cloud services. For each project, students are expected to work within a specified budget otherwise they risk being penalized, and fulfill the following learning objectives.

10.1.   PROJECT 1: COMPUTING DEVICES, CAPABILITIES, PERFORMANCE, AND COST

- Examine different types of computing devices and their hardware components.
- Make informed choices about what computing devices are the most appropriate in various use cases.
- Compare the capability and performance of different types of computing devices.
- Identify the storage media appropriate for specific tasks.
- Discuss advantages and limitations of various mobile computing devices.
- Set up and install common peripheral devices to a personal computer using various installation types.
- Assemble a personal computer.

10.2.   PROJECT 2: OPERATING SYSTEMS, INSTALLATION, OPERATION, MAINTENANCE

- Examine various operating systems and their interfaces.
- Explore and configure an operating system's graphic user interface.
- Demonstrate the use of primary functions of operating system and utility software.
- Demonstrate basic usage of command line interface, including basic file and directory management.
- Use the capabilities of operating system tools to manage files and applications.
- Use operating system utilities to obtain information about hardware and installed software.
- Access various operating system settings.
- Use system utility programs to identify running processes and their usage of computing resources.
- Install, configure, upgrade, and maintain the operating system.
- Demonstrate the ability to install and configure software applications.

10.3.   PROJECT 3: BINARY AND TEXT FILES, STRUCTURED AND UNSTRUCTURED DATA FORMATS, COMPRESSION

- Explore file systems, directories and files as well as searching and editing capabilities in the mainstream operating systems.
- Use a graphical user interface to manage files, directories, and disks.
- Perform basic file management commands using command line interface for creating, saving, deleting and locating files on a personal computer.
- Inspect and manipulate attributes of files and directories.
- Create, open, and manage compressed files.
- Create, save, edit, move, and manage networked files.

10.4.   PROJECT 4: LOAD, ACCESS, AND UPDATE DATA IN A DATABASE SYSTEM

- Create databases and manage data with database software by defining schema, tables, relationships, indexes, keys, and views.
- Update and delete data from a database system.
- Load data into a database system from various flat file sources (e.g., Excel sheet).
- Export data from a database system.
- Create a backup of a database.
- Access and filter data stored in a database system using various access methods, such as manual queries, programmatic access, or graphical user interface.
- Generate reports using data retrieved from a database.

10.5.   PROJECT 5: NETWORKING DEVICES CONFIGURATION

- Configure computing devices to connect to local networks and to the Internet.

- Demonstrate proficiency in using applications based on the Internet (e.g., email, video conferencing software, instant messaging, document sharing).
- Install, configure, and secure a basic wireless network.
- Operate and configure web browsers (cache, client-side scripting, add-ons, private browsing, certificates, blockers).

10.6. PROJECT 6: CLOUD RESOURCE PROVISIONING AND ACCESS

- Set up an account with a cloud service provider.
- Experiment with the cloud service provider web interface.
- Practice to provision a virtual machine with the web interface.
- Experiment with hosting a web service on a virtual machine.
- Provision Azure virtual machine to host a database server.
- Update security rules of network security groups to modify access to a virtual machine.

10.7. PROJECT 7: PHISHING, IDENTITY THEFT, WI-FI SCANNER

- Recognize and report email phishing and identity theft attempts.
- Secure a computing device to protect it from various threats.
- Experiment with a wi-fi scanner and interpret its output.
- Configure firewall rules.

10.8. PROJECT 8: COMPILE AND RUN CODE, TROUBLESHOOT MALFUNCTIONING SYSTEM

- Use an integrated development environment (IDE) to compile, run, and trace execution of a high-level language computer program.
- Run a simple program that accepts input from a user, processes the input, and displays the result.
- Given a description of a small computer program use pseudo-code and/or flow-charts to express the program.

11. SCHEDULE

The tentative schedule is as follows (specific deadlines are posted on OLI and Sail()):

15-WEEK OPTION:

Week	Conceptual Content on OLI	Quiz	Hands-on Projects on Sail()
1	M1: Computing Devices	Quiz 1	P1: Computing Devices, Capabilities, Performance, and Cost
2-3	M2: Operating Systems	Quiz 2	P2: Operating Systems, Installation, Operation, Maintenance
4-5	M3: Data Representation, Formats, Filesystems	Quiz 3	P3: Binary and Text Files, Structured and Unstructured Data Formats, Compression
6-7	M4: Database Systems	Quiz 4	P4: Load, Access, and Update Data in a Database System
8-9	M5: Networking and Internet	Quiz 5	P5: Networking Devices Configuration
10-11	M6: Cloud Computing	Quiz 6	P6: Cloud Resource Provisioning and Access
12-13	M7: Cybersecurity	Quiz 7	P7: Phishing, Identity Theft, Wi-fi Scanner

| 14-15 | M8: Computer Programming and Software Development | Quiz 8 | P8: Compile and Run Code, Troubleshoot Malfunctioning System |

8-WEEK OPTION:

Week	Conceptual Content on OLI	Quiz	Hands-on Projects on Sail()
1	M1: Computing Devices	Quiz 1	P1: Computing Devices, Capabilities, Performance, and Cost
2	M2: Operating Systems	Quiz 2	P2: Operating Systems, Installation, Operation, Maintenance
3	M3: Data Representation, Formats, Filesystems	Quiz 3	P3: Binary and Text Files, Structured and Unstructured Data Formats, Compression
4	M4: Database Systems	Quiz 4	P4: Load, Access, and Update Data in a Database System
5	M5: Networking and Internet	Quiz 5	P5: Networking Devices Configuration
6	M6: Cloud Computing	Quiz 6	P6: Cloud Resource Provisioning and Access
7	M7: Cybersecurity	Quiz 7	P7: Phishing, Identity Theft, Wi-fi Scanner
8	M8: Computer Programming and Software Development	Quiz 8	P8: Compile and Run Code, Troubleshoot Malfunctioning System

12. ACCOMMODATIONS FOR STUDENTS WITH DISABILITIES

If you have a disability and have an accommodations letter from the Disability Resources office, I encourage you to discuss your accommodations and needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at access@xyz.edu.

13. TAKE CARE OF YOURSELF

Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress.

All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful.