Course Title	Computer Interfacing and System Integration				
Course Code	ACOE453				
Course Type	Elective				
Level	Bachelor (1st Cycle)				
Year / Semester	4th Year/ 7th Semester				
Teacher's Name	Prof Costas Kyriacou				
ECTS	6	Lectures / week	2	Laboratories / week	2
Course Purpose and Objectives	This is a laboratory/project based course that aims to introduce students to computer interfacing techniques, with emphasis on both the hardware and the software issues. The theoretical part of the course covers the computer I/O interface buses and standards, including both on-board (PCI) and peripheral interfaces (USB), wireless communication means such as WiFi and Bluetooth, data transfer and synchronization mechanisms, as well as switching electronics characteristics and drivers. The laboratory part includes the use of high level languages such as C# in computer interfacing applications and the use of computer interfacing boards to control the operation of devices like keypads, displays and motors, as well as the communication and control of single board systems and single board computers such as Arduino, Raspberry-Pi or ESP32. The project component of the course concerns the design, contraction and programming of a board that includes a single board computer and peripheral devices, interfaced with a computer through the USB port, as well as the development of an integrated application which includes a computer, a single board computer, peripheral devices and the processing of recorded data through a web server.				
Learning Outcomes	By the end of the course, the students are expected to: 1. Describe the operation of transistors circuits that implant the function of the basic logic gates, and distinguish between the types of outputs in logic gates (open collector, totem pole, and three-state). 2. Outline the characteristics of the standard ports and on-board slots of a personal computer such as the COM, USB and PCI and select the most suitable port for a given application. 3. Design hardware to be interfaced on the standard ports and slots of a personal computer such as the USB port, and develop computer programs for the communication with such devices. 4. Describe the basic characteristics of common I/O devices, and how these devices can be interfaced with a microcontroller or a computer. 5. Develop programs to control the operation of I/O devices such as displays, motors and analogue data converters. 6. Built, program and test the operation of integrated applications which include a single board computer interfaced with a computer though wired and/or wireless connections, and provide data storage and				

	processing through a web server.		
Prerequisites	ACOE201, ACSC183	Co-requisites	ACOE343
Course Content	**Computer Interfacing:** Switching electronics and common TTL devices. Microprocessor bus interfacing, interfacing standards (ISA, PCI) as well as interfacing through wired ports (COM, USB and Ethernet) and wireless connections (WiFi and Low Energy Bluetooth, Zigbee and Lora). Interfacing with digital Input/Output devices, Digital-to-analog and analog-to-digital converters. Programmed controlled, interrupt, and DMA data transfer. **Software Interfacing:** Human-Computer interfacing and visual displays using C#, use of threads for real-time applications, development of device drivers, connections to databases and web servers. **Laboratory Work:** Individual or small group experiments performed with the use of special hardware attached on the computer's ports. Experiments include serial and parallel data transfer, interfacing with 2-state devices, interfacing with analog-to-digital and digital-to-analog converters, serial communication through wired and wireless connections, access of microcontroller systems to databases and web servers. **Project Work:** Students are expected to design, built, program and test the operation of integrated applications which include a single board computer interfaced with a computer though wired and/or wireless connections, and provide data storage in databases and processing through a web server.		
Teaching Methodology	The underlining theory of the course is delivered to the students during lecture sessions, through electronic presentations. After acquiring the theoretical background, students carry out laboratory work that includes the implementation of a predefined procedure and the completion of a design task. Typically, a 2-hour lecture session proceeds a 2-laboratory session. To further develop their practical/professional skills, students undertake a group project. This is an integrated project which includes the assembly and testing of an electronic board, connected on a computer, as well as the development of software that implements a real life application. Project work includes also a project report and a presentation.		
Bibliography	Textbook: • No specific textbook will be used for this course. The bibliography to be used in this course will include a selection of relevant tutorials available through the internet.		
Assessment	The assessment of the course includes two tests with problem solving questions, the laboratory work assessment, based on the students' lab reports and the assessment of the class project. The weights for each assessment component are:		

	• Tests: 20% • Laboratory Work: 50% • Project work: 15% • Project Report and Presentation: 15%
Language	English