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College of Computing and Informatics

Computer Engineering Laboratories

Lab Name	Location	Person in Charge
High Performance Cloud Computing	M12-108	Maha Alaa Eddin
Digital Logic Design	W12-104	Maha Alaa Eddin
Computer Communications and Networks	W12-116	Maha Alaa Eddin
Microprocessors and Assembly Language	W12-105	Maha Alaa Eddin
Senior Design Project I & II Laboratory (Female)	W12-115	Imtinan Attili
Senior Design Project I & II Laboratory (Male)	M12-126	Sol Andrew Domingo
Network Programming	W9 /Computer Labs	Dr. Ala' Altaweel
Engineering Modeling using Artificial Intelligence	W9 /Computer Labs	Dr. Ali Bou Nassif

Lab Staff and Teaching Assistant	ID	Email	Extension
Maha Alaa Eddin	201794	malaaeddin@sharjah.ac.ae	065053494
Hassan Vakani Tariq Muhammad	202740	htvakani@sharjah.ac.ae	065050460

DIGITAL LOGIC DESIGN LABORATORY

#	Lab in charge	Contacts	Location
1	Maha Alaa Eddin	065053494	W12-105

INTRODUCTION

The Digital Logic Design Laboratory is divided into two parts. The first part teaches the students how to write Verilog programs to implement and design simple combinational circuits. Students write programs to describe logic gates and simple sequential circuits like adders, sub tractors, encoders, decoders, multiplexers, comparators, flip-flops, counters and shift registers. In the second part of the lab, students get a hands on experience to build a real circuits on the breadboard. The students start from the Boolean expressions, going through building the logic circuit and testing it. During the lab, the students will gain a good understanding of the different tools and simulation software used in designing logic circuits. The students also have to do a project of their choice.

EQUIPMENT AND INSTRUMENTS

- PB-105 Digital Analog Training System
- Personal Computers Loaded with QuartusII Software
- ALTERA DE2 Boards
- Logic Pulser
- Logic Probe
- Digital IC Tester
- Simulator: Circuit Maker Simulator
- Wire Strippers and Pliers

EXPERIMENTS

- Introduction to Hardware Description Language and Synthesis
- Basic Gates Implementation in Verilog and Configuration
- Implementation in Verilog
- Introduction to Digital Logic Design Lab Using Basic Logic Gates
- Combinational Circuits Design Using Basic TTL Gates
- Arithmetic Logic Unit and Data path Utilizing Decoders and Encoders
- Sequential Circuits Design
- Registers and Counters with Design Applications
- Group Project to Build Real Life Application

TEST AND SERVICES

- Apply digital logic design procedures to implement digital logic circuits that meet certain specifications.
- Practice troubleshooting of the designed circuits to verify their behavior.
- Design digital circuits using Hardware Description Language.
- Ability to work in groups to conduct laboratory experiments.

COMPUTER COMMUNICATIONS AND NETWORKS LABORATORY

#	Lab in charge	Contacts	Location
1	Maha Alaa Eddin	065053494	W12-105

INTRODUCTION

This Laboratory provides hands-on experience essentials to the real understanding of computer networking and the devices used in building these networks. The goal is to teach students practical aspects of network topologies and network operating systems, including the setup of network services, DHCP, DNS, peer to peer and server based networking, switch setup and VLANs and the basics of IP addressing, sub netting and router configuration. In addition, students use the network monitor to capture and analyze data packets.

EQUIPMENT AND INSTRUMENTS

The lab consists of the following hardware and software required to meet the above objectives:

1. Hardware
   - Cables and RJ-45 Connectors
   - Repeater Hubs
   - TP-link Access Points
   - JUNOS Switches 2400 series
   - JUNOS Switches 3400 series
   - JUNOS Routers 240 series
   - Cisco Switches 2960
   - Cisco Routers series 4000
   - Cisco Router 2901
   - Wireless NIC Cards
   - Ethernet Cable Tester
   - TP-link Wireless Adapters
   - Personal Computers

2. Software
   - Packet Tracer Simulator
   - Sniffer Pro: used for Explaining the Packet Structure (Microsoft Network Monitor 3.4)
   - Windows 10/Advanced Server 2016: as Network Operating Systems

EXPERIMENTS

- Peer-to-Peer Local Area Network
- Network Applications
- Wired and Wireless LANs Network Topologies
- Layer II Switching - Part I
- Layer II Switching - Part II VLANs
- Network Services: DNS Service
- Network Services: DHCP Service
- Routing Basics – Part I
- Routing Basics – Part II
- Packet Format & Network Monitoring

TEST AND SERVICES

- Build and test different types of Network scenarios.
- Configure various network equipment such as switches, wireless access points and routers, for simple network implementation.
- Setup network services using a server operating system.
- Ability to work in groups to conduct laboratory experiments.

EMBEDDED SYSTEMS DESIGN LABORATORY

#	Lab in charge	Contacts	Location
1	Hassan Vakani	065050460	W12-105

INTRODUCTION

This Laboratory applies the theoretical principles of the Embedded System course. It gives hands-on experience with microcontroller applications and interfacing with basic solid state input/output devices, A/D and D/A converters, LCD displays and Multiplexing seven segment LED displays.

EQUIPMENT AND INSTRUMENTS

- Personal Computers with MikroCPro for PIC Compiler
- Multifunctional PIC Microcontroller Development Board (v7 DEVELOPMENT BOARD).

EXPERIMENTS

- Introduction to the v7 DEVELOPMENT BOARD and Software Development System
- Basic Digital Input and Output Programming
- LCD Display Interfacing
- Matrix Keypad Interfacing
- Analog to Digital Converter
- Hardware Delay using Timer
- Multiplexing Seven Segments LED Displays
- Interrupts

TEST AND SERVICES

- Design hardware and software for use in an embedded environment.
- Apply techniques needed for programming and interfacing the PIC family of microcontrollers.
- Ability to work in groups to conduct laboratory experiments.

MICROPROCESSORS AND ASSEMBLY LANGUAGE LABORATORY

#	Lab in charge	Contacts	Location
1	Hassan Vakani	065050460	W12-105

INTRODUCTION

The Microprocessor and Assembly Language Laboratory provides students with practical experience in programming while using the Assembly Language on x86 architecture microprocessors. The lab utilizes the latest personal model computers where the students practice the skills they have learned in the classroom and explore the backward compatibility of modern microprocessors all the way back to their x86 ancestor.

EQUIPMENT AND INSTRUMENTS

- Personal Computers
- Visual Studio 2019

EXPERIMENTS

- Visual Studio and MASM
- Writing an Assembly Language Program
- Addressing Modes
- Working with Arithmetic Instructions
- Working with Logic, Shift, and Rotate Instructions
- Loops
- Indexing
- 8087Floating Point Unit
- Floating Point Instructions
- Working with Procedures and MACROS

TEST AND SERVICES

- Ability to use assembly language development tools.
- Ability to program using a 16-bit microprocessor's assembly language using advanced features. 4.
- Ability to work in groups to conduct laboratory experiments.

ROBOTICS AND COMPUTER VISION LABORATORY

#	Lab in charge	Contacts	Location
1	Hassan Vakani	065050460	W12-105

INTRODUCTION

Robotics is generating significant interest among the leading Entrepreneurs and Governments across the globe. Companies are constantly innovating and patenting designs to create the world's first fully autonomous machine with capabilities that will forever transform the way we do business and how we manufacture goods. It is therefore essential that the UAE, the most technologically forward country in the Middle East & North Africa region, uses the opportunities that robotics advancements can present, to remain competitive and a front runner in the technological field. Analysts predict that the early adoption of robotics technology in the UAE would significantly increase the GDP of the country and create a more knowledge-based economy thus propelling UAE as the premier destination for leading companies worldwide. The Robotics and Computer Vision Lab at the University of Sharjah aims to empower students and researchers to work in a harmonious environment for research to develop the next generation of computer vision algorithms coupled with realistic articulated physics-based kinematics paradigms for the implementation and integration of autonomous robots for the purpose of interacting naturally with people and with each other by adapting their behavior to the requirements of the task they are given within the dynamic environment they are situated in.

EQUIPMENT AND INSTRUMENTS

- Mobile Robot Pioneer P3DX
- Robai Cyton Gamma 1500, 7 dof Manipulator
- Qbot2 Mobile Robot
- RGB-Depth Kinect Sensor
- Humanoid Nao Robot
- Qbo Robot
- ASUS RGB- Depth Sensor
- Robotis OP-2

EXPERIMENTS

- A Vision-Based Kinematic Tracking Control System Using Enhanced-PRM for Differential Wheeled Mobile Robot
- Vision-Based Robotic Velocity Tracking Control System using Reduced-PRM
- Progressively Trainable and Adaptable Intelligent Humanoid Robots for Autism Spectrum Disorders (Completed May 2016).
- Investigating Different Vision Techniques for Parasite Auto-Detection
- Real-time Object Recognition using Improved Color Histogram Techniques
- Self-Learning Robot Senior Student Project
- Autonomous Adaptive Highway-Lanes Distribution to Solve Traffic Congestions using Vision Techniques
- A Technical Solution to Enhance the Visual Perception for Color-Blind Disorders

TEST AND SERVICES

- Demonstrate an ability to solve a practical problem of robot-vision control through software tools (e.g. Robot Programming).
- Ability to work in groups to conduct laboratory experiments.

HIGH PERFORMANCE CLOUD COMPUTING LABORATORY

#	Lab in charge	Contacts	Location
1	Mohammad Saad Sulieman	065050449	M12-108

INTRODUCTION

The High-Performance Cloud Computing Laboratory provides students with practical experience in both the hardware and the software of the massively parallel processing platforms as well as the basic concepts of cloud computing. In terms of hardware, the lab utilizes a computer cluster consist of one main server and a group of processing nodes connected to build a computing farm. In terms of software, the cluster has the Message Passing Interface (MPI) parallel programming standard library as well as the multi-threaded programming POSIX thread library. Students can explore how to build a computing farm as well as get a practical programming experience with the parallel and distributed processing environment. Programming with shared-address space parallel paradigm is explored through the multi-core/multi-threaded computing nodes in the lab using the POSIX thread library. The system is built on top of an OpenStack Cloud Computing environment which allows the students to get their hands on the latest technologies in the HPC .

EQUIPMENT AND INSTRUMENTS

- Couple of Server Machines
- Group of Computing Node PCs
- High-Speed Switch and Ethernet to Connect the Machines
- File Server, DNS Server and Job Scheduler
- MPI Standard Library for Distributed System Programming
- POSIX Thread Library for Shared-Address Space Programming
- OpenStack Cloud Computing OS

EXPERIMENTS

- How to Configure PC Cluster
- Basic MPI Program Structure (Parallel Hello World Program(
- Blocking and Non-Blocking Point-to-Point Communication Functions and their Prototype
- Develop Parallel Program for Matrix Multiplication using MPI
- Collective Communication Functions and their Prototype
- Develop MPI Program using Collective Communication Functions
- Develop the First Multithreaded Program
- Using the Open MP Library
- Using Cloud Computing Environment

TEST AND SERVICES

- The ability to explore different Parallel Processing designs.
- The ability to evaluate the Parallel and distributed processing system through analytical modeling.
- Ability to work in groups to conduct laboratory experiments.

Year 2022- 2023

SENIOR DESIGN PROJECT I & II LABORATORY

#	Lab in charge	Contacts	Location
1	Imtinan Basem Attili & Sol Andrew	065053493/065052938	W12-115/M12-107

INTRODUCTION

The Department of Electrical and Computer Engineering offers a project room reserved for senior and junior students for their projects. This room may also be used by students for their course projects. The department provides the needed equipment for various projects and meets student requests for any additional equipment as needed .
Subjects of students ‹projects are usually linked to research interests in the department or technical problems offered by local industries. In both cases, small groups of students work together to design, build, refine and test complete hardware and/or software systems.

EQUIPMENT AND INSTRUMENTS

- Digital Multimeters
- ETS-7000 Digital Analog Training System
- Rigol DG1032Z Arbitrary Function Generator 2 Channel /30MHz / 200MSa/s
- Rigol DS4012 Digital Oscilloscope 2 Channel / 100MHz / 4GSa/s
- Simulators: Microsim, ORCAD Cadence PSpice Circuit Simulator
- TTi 354T Triple Power Supply 2 x 0-35VDC / 3.3-5.5 VDC 4A
- ESCORT Dual Display LCR Meter
- Soldering Machine
- Hardware Tools

TEST AND SERVICES

- Ability to apply engineering principles to design a component or a system.
- Ability to develop the management skills to oversee the design of complex systems.

MICROCONTROLLER BASED DESIGN LABORATORY

#	Lab in charge	Contacts	Location
1	Hassan Vakani	065050460	W12-105

INTRODUCTION

This Laboratory applies the theoretical principles of the microcontroller-based design course. It gives hands-on experience with microcontroller applications and interfacing with basic solid-state input/output devices, A/D and D/A converters, LCD displays and Multiplexing seven segment LED displays.

EQUIPMENT AND INSTRUMENTS

- Personal Computers with MikroCPro for PIC Compiler
- Multifunctional PIC Microcontroller Development Board (v7 DEVELOPMENT BOARD)

EXPERIMENTS

- Introduction to the v7 DEVELOPMENT BOARD and Software Development System
- Basic Digital Input and Output Programming
- LCD Display Interfacing
- Matrix Keypad Interfacing
- Analog to Digital Converter
- Hardware Delay using Timer
- Multiplexing Seven Segments LED Displays

TEST AND SERVICES

- Writing programs for a microcontroller in C and Assembly languages.
- Utilize the on-chip peripherals of the microcontroller to implement a complex operation.
- Ability to work in groups to conduct laboratory experiments.

ENGINEERING MODELING USING ARTIFICIAL INTELLIGENCE LABORATORY

#	Lab in charge	Contacts	Location
1	Eng. Maha Alaa Eddin	065053494	W9-001

INTRODUCTION

Artificial Intelligence Laboratory is a part of the Computer Engineering Department at the University of Sharjah. This Lab will focus on employing computer models to solve engineering problems. Such models are developed using Artificial Intelligence and advanced statistical techniques such as fuzzy logic, neural networks and advanced regression analysis. These models will be evaluated empirically using real data and appropriate statistical tests. MATLAB, Weka, Minitab, RStudio, Python and similar tools will be used in this course.

EQUIPMENT AND INSTRUMENTS

- Personal Computers
- RStudio Software
- MATLAB Software
- Weka Software
- PHSTAT Tool
- Minitab Statistical Software

EXPERIMENTS

- Working with data in MATLAB
- Neural networks nftool
- Neural networks nntool for Regression Problems
- Introduction to PHStat
- Introduction to Minitab (Regression)
- Introduction to Minitab (Logistic Regression)
- Introduction to WEKA (Regression)
- Introduction to WEKA (features selection / Classification)
- Introduction to R Language
- Introduction to R (Classification)
- Introduction to MATLAB (Classification)
- Mamdani fuzzy logic
- Sugeno fuzzy logic

TEST AND SERVICES

- Apply and evaluate machine Learning techniques to model engineering problems

NETWORK PROGRAMMING LABORATORY

#	Lab in charge	Contacts	Location
1	Eng. Mahs Alaa	065053494	W9-001

INTRODUCTION

Network Programming Laboratory is a part of the Computer Engineering Department at the University of Sharjah. In this lab, students will analyze the networking software for the various layers, assess the various network programming paradigms and implement UDP and TCP connections using sockets and implement single and multi-threaded peers, clients and servers.

EQUIPMENT AND INSTRUMENTS

- Personal Computers
- Oracle VM Virtual Box
- Ubuntu Operating System run as host or guest OS (over VM)
- Python 2.7.x Interpreter
- Unix networking utilities: netstat, tcpdump, Wireshark, etc.

EXPERIMENTS

- Development Environment Setting up
- Python Data Structures: Strings, Lists and Dictionaries
- Python Functions and Files
- Python: Object Oriented Programming
- Python: Network Addresses and TCP/UDP Sockets
- Python: Single and Multi-Threaded Applications
- Network Application Protocol – Part1
- Network Application Protocol – Part2
- Network Application Protocol – Part3

Test and Services

- Analyze the networking software for the various layers
- Assess the various network programming paradigms.
- Implement single and multi-threaded peers, clients and servers.