**Course Syllabus**

|  |
| --- |
| **2021 CNU International Summer Session** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Title** | | | Internet of Things and Stream Date (From Silicon to Smart Cities) | | | | | | | | | | | | | | | | | | |
| **Course Type** | | | Lecture/ Experiment /Project based Learning/ | | | | | | | | **Credits**  **(hours)** | | | 3 (3hrs/day)  Total 45 hours | | | | | | | |
| **Department** | | | Electrical & Computer Eng. /Computer Science/  Software Engineering | | | | | | | | **Professor** | | | Venkatesan Muthukumar | | | | | | | |
| **Classification**  **(year in school)** | | | Year III & Year IV | | | | | | | | **Course Code** | | |  | | | | | | | |
| **Class room** | | | TBD | | | | | | | | **E-mail** | | | venkatesan.muthukumar@ unlv.edu | | | | | | | |
| **Prerequisite(s)** | | |  | | | | | | | | | | | | | | | | | | |
|  | | |  | | | |  | | |  |  | | |  | | | | | | | |
| **Course objectives** | | | The main goal of this course is to provide students with the broad knowledge needed to understand the current technology in Internet of Things (IoT) and hands-on skills needed to develop an array of applications in various technology markets like Wearables, Smart City, Smart grids, Industrial internet, Connected cars, etc. | | | | | | | | | | | | | | | | | | |
| **Course Summary** | | | The course instruction starts by introducing the students to fundamentals of processors, how human “thought process” is converted to logic and how logic is implemented in processors. Next, we look how processor revolution has transformed the embedded systems industry. We discuss the current trends in embedded systems, hardware and software tools that are used to develop embedded systems. Next, we discuss the wireless revolution in embedded systems and the emergence of IoT to connect systems. Students will be introduced to basics in wireless communication and protocols used in IoT. Students will also be introduced to storing data and performing data analytics (time series analysis and machine learning) both using online (cloud) and offline (local) tools. Next, students will understand how to manage and scale for big data applications. The course will include a 1.15 hr lecture and 1.45 hr hands on laboratory session every day. The course will also conclude with students developing a complete IoT project with the skill gained during this course. The main hardware development board ESP32-AZURE IOT KIT will need to be purchased by the students before the commencement of this course. | | | | | | | | | | | | | | | | | | |
| **Teaching Methods** | | | **Teaching Methods** | | | | | | | | | | | | | | | | | | |
| Lecture | Presentation/Discussion | | | | Problem Based Learning | | | | Project Based Learning | Flipped Learning | | | Experiment/ Practices | | | | Others  (Describe) | |
| X |  | | | |  | | | | X |  | | |  | | | |  | |
| Lecture: *Online lectures on concepts of Computer Architectures, IoT Devices, Protocols, and Standards.*  Project Based Learning: *Hands on labs for each concepts, programming and validation of code on microcontrollers.* | | | | | | | | | | | | | | | | | | |
| **Grading** | | | Mid-Term | Final | | Individual Tasks | | | Team Projects | | | Class participation | | | Attendance | | Others  (Describe) | | | | **Total** |
| 10% | 30% | | 50% | | |  | | | 5% | | | 5% | |  | | | | 100% |
| ※ Pursuant Section 28 of the Guidelines on Class Management, grading methods can be adjusted for the physically impaired.  ※ Under Section 29 of the University Regulations on Academic Affairs, a student automatically fails a course in case of failure to attend more than 3/4 classes. (More than four(4) times absence) | | | | | | | | | | | | | | | | | | |
| **Accommodations for Handicapped** | | | - Visually impaired: provision of course related materials in audio, note taking helper, permission to record the lecture  - Audibly impaired: provision of course related materials in visual, note taking helper, permission to have e-learning lectures in sign language or shorthand  - Physically or mentally challenged: provision of course related materials, note taking helper, permission to record the lecture   * Any other requests that are considered necessary: provision of assisted   ingress and egress to the classrooms and other supports | | | | | | | | | | | | | | | | | | |
| **Textbooks & References** | | | | | | | | | | | | | | | | | | | | | |
| Category | Title | | | | Author | | | | | | | Publisher | | | | | | | Year of publication | | |
| Main textbook |  | | | |  | | | | | | |  | | | | | | |  | | |
| Others |  | | | |  | | | | | | |  | | | | | | |  | | |
| Reference | All lectures, instruction, lab notes will be provided online. | | | | | | | | | | | | | | | | | | | | |
| **Daily Course Schedule** | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Day**  **(3hurs)** | **Lecture Topic** | **Hours per day** | **Method of Instruction** | **Class Materials & Assignments** |
| 1 | Introduction to the course.  Whats is IoT?  How did we get here? | 3 | Lecture | Quiz |
| 2 | Introduction to Logic, Digital and Computer Design | 3 | Lecture  Software Simulations | Quiz |
| 3 | Introduction to Embedded Systems: | 3 | Lecture  Software Simulations | Quiz |
| 4 | Programming Embedded Systems: Programming ESP32 using Arduino IDE | 3 | Lecture,  Programming | Programming Assignment |
| 5 | Programming Embedded Systems: Programming ESP32 using Micro-Python | 3 | Lecture,  Programming | Programming Assignment |
| 6 | Connected Systems: Wired to Wireless | 3 | Lecture,  Programming | Programming Assignment |
| 7 | Sensor and Interfaces | 3 | Lecture  Programming | Programming Assignment |
| 8 | Midterm Project | 3 | In class | Programming Assignment |
| 9 | Cloud - Data Visualization and Analytics - Azure | 3 | Lecture  Programming | Programming Assignment |
| 10 | Working with Apps and Devices: IFTTT & Evothings | 3 | Lecture  Programming | Programming Assignment |
| 11 | Connected Devices with MQTT | 3 | Lecture  Programming | Programming Assignment |
| 12 | Time Series for IoT Data | 3 | Lecture  Programming | Programming Assignment |
| 13 | Machine Learning for IoT Data | 3 | Lecture  Programming | Programming Assignment |
| 14 | Final Project | 3 | Programming | Programming Assignment |
| 15 | Final Project | 3 | Programming | Programming Assignment |

|  |
| --- |
| **References** |
| Please describe the daily course contents, teaching methods, assignments, and student evaluation methods.  Attendance (5 Points): 0.5 Points Deduction/Absence of Lecture, More than four (4) unexcused absences may result in an automatic failure of this course.  Individual Assignment (25 Points = 5 Points X 5 Times) - Marked in Schedule  Individual Quizzes (25 Points = 5 Points X 5 Times) - Marked in Schedule  Consultation with a professor and Participation in class (5 Points = 0.5 Points X 10 Time)  Midterm & Final Project (30 Points) = (15% Midterms + 15% Finals) |