Internet of Things-IO4041
Spring 2022
Internet of Things (IO4041)
Course Outline

Instructor: Dr. Arshad Ali
Email: arshad.ali@lhr.nu.edu.pk
Office location: Faculty Office (C-140) Civil Building
Office Timings: Monday & Wednesday: 2:00 to 3:30 pm

TA Name: Muhammad Faraz Javed
Email: 1181810@lhr.nu.edu.pk

Course Information

Program: BS
Credit hours: 3
Type: Elective
Class meeting time: Sec 8A: Tuesday, Thursday 02:30 pm – 03:50 pm
Sec 8B: Tuesday, Thursday 0400 pm – 05:20 pm

Course website: Google Classroom
Class Venue: CS-7 / Google Meet
Pre-requisites: CS3001 Computer Networks

Objective of the Course

The course is designed to provide students with a solid technical introduction to the Internet of Things (IoT). When students complete this course, they will be able to:
- ✓ describe the concepts underlying the Internet of Things (IoT).
- ✓ provide overview of popular protocols and standards helping power IoT devices, apps and applications.
- ✓ introduce devices including sensors, low power processors, hubs/gateways and cloud computing platforms.

Course Description

The Internet of Things (IoT) stands to be the next revolution in computing and it is transforming the way we interact with the physical world. The module is designed to provide students with a solid technical introduction to the Internet of Things (IoT) and teaches a deep understanding of IoT technologies from the ground up.
Students will learn IoT device programming, sensing and actuating technologies, IoT protocol stacks (Zigbee, 5G, NFC, MQTT, etc), networking backhaul design and security enforcement, data science for IoT, and cloud-based IoT platforms such as AWS IoT. Students will be guided through laboratory assignments designed to give them practical and real world experience, where they will deploy a distributed wifi monitoring service, a cloud-based IoT service platform serving tens of thousands of heartbeat sensors, and more.

Text Book (MB)

Interconnecting Smart Objects with IP: The Next Internet	Jean-Philippe Vasseur and Adam Dunkels

Reference book (RB)

Computer Networking: A Top Down approach featuring the Internet, 6th Edition	James F. Kurose and Keith W. Ross

Course Outline

Module	No. Of Lectures	Reference Text
Introduction and Overview Introduction to the course Introduction to Internet of Things and importance Elements of IoT Ecosystem IoT: Vision and growth Enablers of IoT	5	**MB: Chapter 1** **RB: Chapter 1** **& Slides**

Basics of Computer Networks: OSI and TCP/IP Introduction to Arduino Programming Linkage of IoT with different technologies and scientific disciplines Challenges: node-level, network-level		
IP Protocol Architecture Design principles of Internet architecture Design principles of IoT architecture Why IP for IoT?	**2**	**MB: Chapter 2, 3 & Slides**
IoT hardware and software **Hardware**: Communication device, Microcontroller, Sensor and Actuators, power sources **Software**: OS, Contiki, Tiny OS Embedded systems Wireless Sensor Network RFID	**3**	**MB: Chapter 11 & Slides**
Communication mechanism for IoT Communication patterns, Communication standards : IEEE 802.15.4, IEEE 802.11 and WiFi, Power Line Communication	**2**	**MB: Chapter 12 & & Slides**
Network Layer IP and IPv6 6LoWPAN Routing in the Internet RPL and its variants	**10**	**MB: Chapter 4, 5, 15-17** **RB: Chapter 4 & Slides**
Transport Layer Why TCP and UDP for IoT?	**3**	**MB: Chapter 6** **RB: Chapter 3 & Slides**
Application Layer Application layer in the Internet and HTTP CoAP vs MQTT	**3**	**RB: Chapter 2 And Slides & Slides**
Applications Smart grid, Smart Cities, Industrial automations, Smart homes, Healthcare	**4**	**MB: Chapter 20-23, 25 & Slides**
Non-IP IoT: Zigbee		**Slides**

Evaluation (Subject to change)

Assignments	(4 to 5)	10%
Quizzes	(4 to 5)	10%
Mid Exams	(2)	30% (15% + 15%)

Final Exam	(1)	50%
Total:		**100 %**

<u>Grading Policy</u>

Absolute Grading Scheme

<u>Course Policies</u>

- Course outline may change 10-20% as we proceed in the semester
- Assignment deadlines are hard.
- Quizzes might be announced or unannounced.
- There will be **<u>no re-take</u>** of quizzes or exams. Special consideration may be given only for mid or final exam for an emergency on per case basis subject to approval from the department administration & the instructor. In approved circumstances, percentage of mid will be awarded for final or vise versa.
- Integrity in the assignments/quizzes is expected; otherwise result would be an F grade in the course or the case may be forwarded to the Disciplinary Committee.
- The lectures will be of 1.5 hours duration.
- (80%) Attendance for the student is a MUST which needs to be ensured according to the University policy to avoid disqualification.
- You may request an appointment according to my schedule by emailing me on the aforementioned email.