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| Internet of Things CS-339  Spring 2018 | C:\Users\Numan\Desktop\GIFT\logo.png |

## Instructor Information

Name M Junaid Malik

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Website: ~

## Course Information

Class Days & Timings Monday and Friday 13:30

Location/ Lectures Rooms Monday F-10, Friday F-4

Office hours Thursday 10:40 -13:15

## Course Description and objectives:

## The Internet of Things (IoT) is a course about the new paradigm of objects interacting with people, with information systems, and with other objects. The course will focus on creative thinking and on hands-on project development. The students will learn:

## IoT concepts

## IoT technologies

## Creative thinking techniques

## Co-creation techniques.

## The focus will be more on the possibilities offered by the different technologies, and on the creative thinking techniques to find innovative applications of combinations of such technologies in real-life scenarios. Several presentations will also be scheduled in which people from industry will make presentations about selected topics related to the IoT.

**The objective of this course is to provide an introduction to the newly emerging field of Internet of Things.**

## Learning Outcomes:

Upon Successful completion students will have a clear

1. Vision and Introduction to IoT.
2. Understanding of the IoT Market perspective.
3. Understanding of Data and Knowledge Management and use of Devices in IoT Technology.
4. Understanding of State of the Art – IoT Architecture.
5. Vision about the Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

## Policies

### General Policies

* **Mobile phone usage is strictly prohibited in class, Please switch off your phones during class.**
* Attendance is expected and failure to attend regularly will have an adverse impact on your grade.
* 100% attendance is strongly recommended for this course.
* We may have extra Quizzes that can be announced or un-announced.
* Interactive class sessions are preferred. Therefore, class participation will be much appreciated.
* Students must retain copies of all quizzes, assignments and exams, submitted in paper form or electronically. Grade changes will not be made without proof of submission of all relevant work.

### Academic Dishonesty

Academic dishonesty will not be tolerated. Copying materials from other sources (your peers, books, internet) without proper referencing and acknowledge of the source is a serious offense and will be dealt with severely, and may result in an F grade.

## Recommended Books

## To be added shortly

## Grading

This is a tentative grading policy, the detailed policy, as well any changes to this policy will be announced on the course webpage. There will be surprise in-class quizzes, a Midterm Exam and a Final exam. Grades for the course will be based on the following weightage.

Quizzes / Practical 20%

Midterm Examination 20%

Project 20%

Final Examination 40%

# Detailed Course Outline

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| 1 | **IOT:: Introduction** Scenarios, Background Knowledge analysis and roadmap discussion |
| 2 | Internet of people / machine / thing |
| 3-4 | **Communication systems, Buses** Serial, UART, I2C, SPI, PWM, USB (Wired, Wireless) |
| 5 | **Communication models**  Client Server  Per to Peer Communication Publisher Subscriber |
| 6-7 | **Communication Protocols:** TCP and UDP  IP  IPv4 vs IPv6  BTLE,COAP,MQTT **IOT Protocol Stack**  **Basic Introduction to :** LORA, ZWAVE, ZIGBEE, 6LowPA |
| 8-9 | **PLATFORMS:** Putty (Connectivity /interfacing options) Adruino (Interfacing and Firmware Development)  Basics of Arduino and ESP8266 programming. |
| 10 | **Mid Term** |
| 11 | **Project Identification and allocation** |
| 11 | **Firmware Types:**  Readymade: github based  On-demand builds: Firmware clouds  Custom Builds: Ant, make, nmake, cmake package managers: yum, apt, npm, rpm |
| 12-13 | **FIRMWARE /OS:** Embedded OS, (Real Time OS) Free RTOS, Espressif-IDF  **Components of Firmware (boot loader and System Units)** **MBR: Loading: (**grub, lilo, Chain loading, device up linking / down linking) |
| 14 | Programming ESP8266 and Arduino for sensors |
| 15 | **Firmware OS:**  Build Process single and multistage build  Complete and partial rebuilds  SERIAL, USB, OTA. |
| 16 | First Project Presentation (prototype definitions) |
| 17-18 | **Frameworks:**   * ThingSpeak * Services, * Model * Backend Infrastructure * Utility |
| 19 | * IBM Watson * Kaa by CyberVision |
| 20 | Data Analytics in IoT |
| 20-21 | Security threats in IoT Physical Security  Information Security Credential Security |
| 22 | Security Frameworks |
| 23 | Big Data, What is Big Data and why do we need to think about it? |
| 24 | Big Data How can we treat the Big Data |
| 25 | Data Flood, Threats , Concerns, and prevention |
| 26 | IoT in our life: (Case Studies.) Libellium Smart World Concept.   * Health care * Agriculture * Power Infrastructure * Transit Systems |
| 27 | High Performance / Edge Computing |
| 28 | Fog Computing |
| 29-30 | Projects Demos Presentation |
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