# Module (Course Syllabus) Catalogue

# 2024-2025

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| **College/ Institute** | **Erbil Technical Engineering** | |
| **Department** | **Information Systems Engineering** | |
| **Module Name** | **Internet of Things** | |
| **Module Code** | | |
| **Degree** | **Technical Diploma** ☐ **Bachler** x **High Diploma** **Master** ☐ **PhD** ☐ | |
| **Semester** | **8** | |
| **Qualification** | **PhD** | |
| **Scientific Title** | **Professor** | |
| **ECTS (Credits)** | **6** | |
| **Module type** | **Prerequisite** ☐ **Core** x **Assist.** ☐ | |
| **Weekly hours** | **4** | **Total Workload=(162) hrs** |
| **Weekly hours (Theory)** | **( 2 )hr Class** | **(24)Total hrs Workload** |
| **Weekly hours (Practical)** | **( 2 )hr Class** | **(24)Total hrs Workload** |
| **Number of Weeks** | **15 Week** | |
| **Lecturer (Theory)** | **Dr. Shavan Askar** | |
| **E-Mail & Mobile NO.** | **Shavan.askar@epu.edu.iq** | |
| **Lecturer (Practical)** | **Dr.Media Ali Ibrahim,Mr. Nihad Khalid Abdullah** | |
| **E-Mail & Mobile NO.** | Media.ibrahim@epu.edu.iq,nihad.abdullah@epu.edu.iq | |

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| **Websites** | **https://moodle.epu.edu.iq/enrol/index.php?id=600** |

# Course Book

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| **Course Description** | This course describes Internet of Things (IoT) technology and its challenges as well as its basic building parts. IoT is all about connecting smart things together, therefore, the course will start by firstly gives basic network and internet principles related to the IoT environments. Those principles include understanding the internet, understanding QoS parameters such as delay with all its types (transmission, propagation, processing), throughput, bandwidth, and enhancement of accessing servers using cost-effective methods. The assignments will be suggested to the students in the first lecture so that they have a sufficient time to prepare for it so that they do not lose grades unnecessarily.<br><br>The course will come with very nice and practical lab experiments, they are carefully selected to match the real-life experience of IoT devices. The latest and widely used IoT devices will be presented in the lab for students to have an experiment hands-on laboratory experience. Most of the experiment will be conducted utilizing the well-known Arduino device.<br><br>Then the architecture and layers of IoT network will be described with a deep explanation of each layer, and examples on each layer's protocols or device will be given with their functions and features. The addressing needs of IoT devices will be explained and this will lead to an understanding the current issue with IPv4, therefore, IPv6 will be explained with a practice on its subnetting scheme and its special features that distinguish it from the predecessor internet protocol.<br><br>Nowadays, IoT has been transferred from just a concept towards established and deployable technology, therefore, two key technologies that are the necessity for IoT will be explained that are namely, sensor-cloud and fog computing as they serve as a backbone for IoT sensing and computing. |
| **Course objectives** | 1) Students will learn the necessary network principles related to IoT paradigm.<br>2) Students will be able to specify the elements of edge and core networks and the difference among them. In addition, they will be able to describe different types of access network and their technology.<br>3) Students will understand the difference between WSN and sensor-cloud that considered one of the major parts of IoT technology.<br>4) Students will be able to understand the necessity for fog computing in the IoT environment. They will be able to understand the fog computing architecture, layers, elements and features. |

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| | 5) Students will be able to do subnetting with IP6, this will be a unique skills for them in the market when they apply for job apart from the importance of learning such knowledge.<br>6) Students will be fully understand industry V.4 and Industrial IoT (IIoT)<br>7) Students will fully understand different applications of IoT technology with its challenges such as smart city, E-Health, vehicular networks (such as Tesla).<br>8) Students will be able to describe machine to machine communication. |
| **Student's obligation** | Students take active role in their learning process during their study period at the university. They are accountable for their academic success through making their own choice and take actions that lead them toward their educations goals. Student responsibilities could be expressed by the following points:<br><br>1- Attend and participate in classes and labs prepared and on time. You are responsible for what you miss- "I was absent" is not an excuse for not understanding the material or not being prepared for an assessment.<br>2- Demonstrate academic integrity and honesty. No matter how much stress you are under, it is expected that you will do your work with integrity and honesty. The consequences of violating the academic integrity are very serious and could lead to expulsion or suspension from the college.<br>A- Plagiarism: trust your own ideas and conduct the work by yourself. Don't copy ideas or data without citing the source. It is not allowed to get someone do your work on your behalf.<br>B- Cheating is not allowed: You are not allowed to copy answers from another student or ask another student to do your own work. Results' fabrication is not permitted too. Changing graded exams and submit them for a regrading is not allowed.<br>C- Don't facilitate copying your answers, whether in an exam, project, or any sort of test to another student.<br>3- Do the home works, practice problems, re-solve all the examples and problems that were given in the class, submit your assignments\exercise problems on time with great attention to quality of work and intellectual property right (avoiding plagiarism).<br>4- Turn off your cell phone and put it away before class starts so you can focus on the class discussion and not cause a distraction for others.<br>5- Communicate in a careful and respectful manner with your instructors, colleagues, and other members of the college.<br>6- Respect diverse ideas and opinions. You will be exposed to a variety of viewpoints, values and opinions in the class that will differ from your own. All students in this class should feel comfortable expressing their viewpoints and concerns. You are an important part of creating an atmosphere that makes this possible.<br>7- Dedicate sufficient time to conduct self-study for the college work. |

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| **Required Learning Materials** | You can expect your instructors to:<br>• Attend every class period and arrive to class on time.<br>• Learning tools will be data shows, lecture hand-outs and ppt. presentations, whiteboard explanation.<br>• Online tools such as the university Moodle for submitting the reports and communicating with students.<br>• Come to class with a good attitude. |

**Evaluation**

| Task | | Weight (Marks) | Due Week | Relevant Learning Outcome |
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| Paper Review | | | | |
| Assignments | Homework | | | |
| | Class Activity | 2 | continuous | |
| | Report | 8 | 13 | |
| | Seminar | | | |
| | Essay | | | |
| | Project Presentation | 5 | 14,15 | |
| Quiz | | 10 | Expected any time | |
| Lab. | | 10 | | |
| Theory Midterm<br>Practical Midterm | | 10<br>15 | 8 | |
| Final Exam(theory)<br>Final Exam (Practical) | | 20<br>20 | 15 | |
| Total | | 100 | | |

**Course References:**

1- Foundations of Modern Networking SDN, NFV, QoE, IoT, and Cloud. By William Stalling
2- IoT Fundamentals: Networking technologies, protocols, and use cases for the internet of things. David Hanes et. al.

| Course topics (Theory) | Week | Learning Outcome |
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| Introduction to IoT, Architecture, Sensing, Actuation, Basic of Networking<br>Internet architecture, access, core networks, communication protocols<br>Decide assignments | 1,2 | Students will learn the necessary network principles related to IoT paradigm. |

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| | | Students will be able to specify the elements of edge and core networks and the difference among them. In addition, they will be able to describe different types of access network and their technology. |
| IoT addressing, IoT QoS parameters , Intro. sensor networks | 3,4 | Students will be able to do subnetting with IP6, this will be a unique skills for them in the market when they apply for job apart from the importance of learning such knowledge.<br><br>Students will be able to specify the QoS parameters such as delay with all its types (transmission, propagation, processing), throughput, bandwidth, enhancement of accessing servers using cost effective methods. |
| IoT and cloud computing<br>WSN and sensor-cloud networks | 5, 6, 7 | Be able to understand the concept of sensor-cloud including its background, sensor virtualization, and applications. Be able to discuss practical examples that support the shift of the sensing paradigm from WSNs to sensor-cloud. |
| IoT Fog Computing, smart cities, smart homes | 8, 9, 10 | Students will be able to understand the necessity for fog computing in the IoT environment.<br><br>Students will be able to understand the fog computing architecture, layers, elements and features.<br><br>Student will be able to specify different IoT application along with their challenges, features, and characteristics. |
| Machine to machine communications | 11 | Student will understand the most important concept of IoT function, that is device to device or machine to |

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| | | machine communication in which machine communication and interact without any human interaction. |
| Connected vehicles VANET (Tesla auto-pilot), industrial IoT | 12,13 | Student will be able to understand the concept of VANET and autonomous vehicle, Tesla auto-pilot will be given as an example.<br>Student will be able to differentiate between IIoT and Industry V.4.<br>Student will be able specify the function of industry V.4 such as self-configuration, self-optimization, self-diagnosis |
| SDN for IoT | 14,15 | Student will be able to understand the benefits of SDN in IoT environment that will make networks more adaptable and flexible<br>Student will understand that Software-defined Networking in IoT is an architecture that easily abstracts many different layers of a network.<br>Student will be able to describe aims of SDN aims to improve network control by enabling enterprises and service providers to respond quickly to changing business requirements. |
| **Practical Topics** | **Week** | **Learning Outcome** |
| Introducing the lab components | 1 | |
| Analog output | 2,3 | |
| Reading digital inputs | 4,5 | |
| Reading analog | 6 | |
| LCD | 7 | |
| Serial communication | 8 | |
| Ultrasonic sensor | 9 | |
| Ultrasonic alarm | 10 | |

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| Servo motor | 11 | |
| DC motor | 12 | |

## Questions Example Design

## Extra notes:

**Signature**

shavan