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**Department of Software and Informatics**

**College of Engineering**

**University of …Salahaddin**

**Subject: Embedded System Software**

**Course Book for (Year 4) IT**

**BSc, MSc, Ammar Omar Hasan**

**Academic Year: 2022/2023**

**Course Book**

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| **1. Course name** | **Embedded System Software** | |
| **2. Lecturer in charge** | **Ammar Omar Hasan Muhammad Kadir** | |
| **3. Department/ College** | **Department of Software and Informatics/ College Of Engineering** | |
| **4. Contact** | **e-mail: ammar.hasan@su.edu.krd**  **Tel: (07501871610l)** | |
| **5. Time (in hours) per week** | **Theory: 4**  **Practical: 8** | |
| **6. Office hours** | **2 hours in Sunday 9:30- 10:30 Am**  **3 hour in Sunday 9:30- 01:30 Pm**  **2 hours in Thursday 8:30- 9:30 Am**  **2 hour in Thursday 9:30- 10:30 Am** | |
| **7. Course code** |  | |
| **8. Teacher's academic profile** | 1 Member of Iraqi Engineer union - Baghdad – 1998  2 Member of the Iraqi Computer Society - Baghdad – 2002  3 Member of the Iraqi Developer Society - Baghdad – 2004  4 Member of Kurdistan Engineer union - Erbil– 2007  5 Supervisor on three Laboratories in university of technology (Network lab. , Electronics Lab., Digital Electronics Lab.  6 Giving Courses in University of Technology/Computer Engineering Dpt. / Baghdad  7 Gain in first degree in Training Computer network in SCIS Baghdad – 1999 when the internet serves begun in Iraq  8 Training in Computer course University of Technology Baghdad – 2000  9 I am the General manager of Electronic Library University of technology  9 Have gain in (fist class) in training course , Radio Communications Iraqi radio society in scientific research center /Baghdad 1999.  10 Officially qualified (certificate) in English license / Baghdad University.  12 Gain in (Second Degree ) in attempting of local research conference in Iraq 1993  13 I am the General manager of ( NOON) center in computer system and Computer Networks services and supply in the most famous St. In Baghdad (Al – Sinaa St.) Information Technology street .  14 Supervisor in Computer Lab. In collage of medicine / Baghdad University.  15 Expect of Computer Services (maintenance) and office equipment’s like copiers and else.  16 Participate in many scientific fairs.  17 Having license of treading computers and its spare parts by the National Center of computers /Baghdad.  18 Carrying out many contracts with multiple variety in my field like computer networks and supporting , doing maintenance of computers, copiers, UPS’s , heavy duty printers 7-19 Implementations the first Computer Networks Lab. in the University of Technology for two times.  18 Implement the first communication Lab. In College of computer science Dpt. in Salahaddin university.  19 Implement the first Studio in E-Learning center in Salahaddin university.  20 Giving ( ICDL) and (IC3) Courses in University of Salahaddin/ Computer Dpt.  21 Giving Course of computer networking and win 2003 server in University of Salahadeen / software Engineering.  22 Assistant Lecturer in college of administration /computer department/ University.  23 Supervisor of Network lab in Computer Department/College of administration/ Salahadeen University.  24 Manager of maintenance unite in my college.  25 Implement the LAN for a local host in E-Learning center in to publish the lectures of Salahaddin University teachers.  -Knowledge of logic circuits and simulations engineering principles and practices.  -Knowledge of one or more of the following disciplines: Civil, Environmental, Structural, Architectural, Mechanical and/or Electrical engineering terminology and techniques. -Knowledge of construction, utility or other assigned disciplinary practices and techniques. -Knowledge of various phases of the plans review and inspection processes. -Knowledge of various computer software programs and design /implement all type of computer networks. -Skill in oral and written technical and/or general communication and instruments and implements it. -Ability to perform more complex engineering computations, calculus, geometry, and trigonometry, rapidly and accurately. -Ability to read and comprehend specifications, plans and shop drawings. -Ability to interpret and make decisions in conformance within established policies and practices. | |
| **9. Keywords** | **Computer networks, Embedded system, Logic design, Microprocessors, ES** | |
| **9. Course overview:**  In this section the lecturer shall write an overview about the subject he/she is giving. The course overview must cover:  ▪ The importance of studying this subject is to get information's about what is Embedded system, how its work, how its implemented ,the benefits and applications of using these ones and finally how to design it. Also Understanding of the fundamental concepts of Embedded system. what is the construction of these Embedded systems in which the student must get brief information about electronics and logic electronic in addition of little knowledge about electrical engineering Principles of this knowledge is very important like ohm law .  How each for example robot arm be constructed and the components' used for that like servo motors, Arduino microcontrollers, bases, sensors, actuators, connections, power sources, rotation components' finally the way these components' be assembled together in order to do a particular mechanical task.  To control these parts , smart devices should be used , these devices must be easy to program and reprogram.  The specifications of all these components and programmable devices is very important , in this year information's should given to the students to make them able to design and implement robot arms , vehicles Embedded system ...ext  This should not be less than 200 words | | |
| **10. Course objective:**  Learning the principles of Embedded system from electrical and mechanical view  An important feature of the Arduino is that you can create a control program on the host PC, download it to the Arduino and it will run automatically. Remove the USB cable connection to the PC, and the program will still run from the top each time you push the reset button. Remove the battery and put the Arduino board in a closet for six months. When you reconnect the battery, the last program you stored will run. This means that you connect the board to the host PC to develop and debug your program, but once that is done, you no longer need the PC to run the program.  This should not be less than 90 words | | |
| **12. Student's obligation**  In this section the student do 2 main exams each of 20% in order to get 40 before entering into the final exam in witch of 60 marks throughout the academic year in addition of auxiliary seminars and reports done by the students, for example the attendance and completion of all tests, exams, assignments, reports , essays…etc  لێره‌ مامۆستا به‌رپرسیارێتی قوتابی خوێندکار ڕوونده‌کاته‌وه‌ سه‌باره‌ت به‌ کۆرسه‌که‌ بۆ نموونه‌ ئاماده‌بوونی قوتابیان له‌ وانه‌کاندا، له‌ تاقیکردنه‌وه‌کاندا، راپۆرت و ووتار نووسین... هتد. | | |
| **13. Forms of teaching**  لێره‌ مامۆستا ڕێگه‌ی وانه‌‌ ووتنه‌وه‌ ده‌نووسێت، بۆ نموونه‌:‌ داتاشۆ و پاوه‌رپۆینت، ‌سه‌ر ته‌خته‌ڕه‌ش، ته‌خته‌ی سپی، سمارتبۆرد یان‌ مه‌لزه‌مه‌... هتد  The student get power point sheets online sent by the lecturer in addition of electronic and electrical instrument and devices  Data show and board also used around the year | | |
| **14. Assessment scheme**  Breakdown of overall assessment and examination  لێره‌ مامۆستا جۆری هه‌ڵسه‌نگاندن (تاقیکردنه‌وه‌کان یان ئه‌زموونه‌کان) ده‌نووسێت بۆ نموونه‌ تاقیکردنه‌وه‌ی مانگانه‌، کویزه‌کان، بیرکردنه‌وه‌ی ڕه‌خنه‌گرانه (پریزه‌نته‌یشن)، ڕاپۆرت نووسین، ووتار نووسین‌ یان ئاماده‌نه‌بوونی خوێندکار له‌ پۆلدا...هتد. ئامانه‌ چه‌ند نمره‌ی له‌سه‌رده‌بێت و مامۆستا چۆن نمره‌کان دابه‌شده‌کات؟‌ | | |
| **15. Student learning outcome:**  In the end of this course there is an importance for the student by he or she going to be able to understand the knowledge in which and how the Embedded system designed and implemented for the three fields mechanical, electrical and electronical fields the ability of doing the construction by them and finally the ability of putting the specific source codes in order to control these robot parts The Arduino programming language is a simplified version of C/C++. If you know C, programming the Arduino will be familiar. If you do not know C, no need to worry as only a few commands are needed to perform useful functions.  For more details:   1. Introduction to embedded systems (ES), HW & SW components of embedded systems. 2. Signal conditioning, OPAMPs, ADC/DAC. 3. Embedded processor architectures. 4. GSM, GPS, IoT. 5. Introduction to hardware-software co-design. 6. Pulse Width Modulator (PWM) 7. Common use: control average voltage to electric device. 8. Special Microprocessor and Microcontroller. 9. The 8051 Microcontroller and Embedded Systems 10. Embedded System applications. 11. Communications and data transfer. 12. Model, languages and tools 13. Hardware/software co-design and synthesis 14. Reconfigurable Computing. 15. Real time Operating systems 16. Serial & Parallel Communication 17. Input and output devices. 18. Analog I/O Interfacing 19. Digital to Analog Conversion DAC, ADC 20. ES Design. 21. FPGA design for embedded Systems. 22. PIC Microcontroller 23. ARM & x86 Processors | | |
| **16. Course Reading List and References‌:**  ▪ references:   1. Jagadeesh Babu, LECTURE NOTES ON Embedded systems, 2018 2019 IV B. Tech I Semester (JNTUA-R15) Mr. M.. 2. Peter Marwedel, Embedded System Design Embedded Systems Foundations of Cyber-Physical Systems, and the Internet of Things Fourth Edition. 3. Jonathan W. Valvano, [Embedded systems: introduction to ARM® Cortex(TM)-M microcontrollers](https://www.pdfdrive.com/embedded-systems-introduction-to-arm-cortextm-m-microcontrollers-e176014882.html). | | |
| **17. The Topics:** | | |
| |  |  | | --- | --- | |  | Ammar Omar (3 hrs) | | *Week 1: Sunday 2nd of October 2022* |  | | *Introduction: course outline, how to study Embedded Systems.* | 1/9/2022 | | *Week 2: Sunday October 2022 Embedded System fundamentals logic design* | 2/9/2022 | | *Week 3: Sunday October 2022 Sensors. With logic design as sequential circuits* | 9/9/2022 | | *Week 4: Sunday October 2023 Embedded System Sensors. logic design combinational circuit design* | 16/9/2022 | | *Week 5: Sunday October 2022 Embedded System controlling by logic system* | 23/9/2022 | | *Week 6: Sunday November 2022 Embedded System Applications* | 30/9/2022 | | *Week 7: Sunday November 2022 Embedded System actuators* | 6/10/2022 | | *Week 8: Sunday November 2022 Embedded System light and sound sensors* | 13/10/2022 | | *Week 9: Sunday November 2022 Embedded System Power Design* | 20/10/2022 | | *Week 9: Sunday December 2022 Embedded System CPU Design* | 27/10/2022 | | *Week 10: Sunday December 2022 Embedded System CPU Design* | 6/11/2022 | | *Week 12: Sunday December 2022 Embedded System topologies* | 13/11/2022 | | *Week 13: Sunday December 2022 Embedded System Applications* | 20/11/2022 | | *Week 14: Sunday December 2022 Embedded System Application* | 27/11/2022 | | *Week 15: Sunday January 2023 Embedded System Application* | 4/12/2023 | | *Week 16: Sunday January 2023Embedded System Application models* | 10/12/2023 | | *Week 17: Sunday January 2023 Embedded System Actuators* | 18/12/2023 | | *Week 18: Sunday January 2023 Embedded System Actuators &torques* | 25/12/2023 | | |  |
| **18. Practical Topics (If there is any)** | |  |
| In this section The lecturer shall write titles of all practical topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture.  Arduino programming: the student should be able to act with or deal with the hardware devices like Arduino  Implementing the robot arm  Soldering the links  Calculating the robot mechanical and electrical loads | | Ammar Omar  ex: (3 hrs)  ex: 14/9/2022 |
| **19. Examinations:**  ***1. Compositional:*** In this type of exam the questions usually starts with Explain how, What are the reasons for…?, Why…?, How….?  With their typical answers  Examples should be provided ALL typical questions like any scientific subjects.  ***2.******True or false type of exams:***  *The Embedded system doesn't need a mechanical thought.*  In this type of exam a short sentence about a specific subject will be provided, and then students will comment on the trueness or falseness of this particular sentence. Examples should be provided  ***3. Multiple choices:***  In this type of exam there will be a number of phrases next or below a statement, students will match the correct phrase. Examples should be provided.  ......... motors can rotate by any electrical source applied to it . a- dc motor, b- Stepper motor, mechanical motor. | | |
| **20. Extra notes:**  Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks. Lab is needed | | |
| **21. Peer review پێداچوونه‌وه‌ی هاوه‌ڵ**  This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.  *(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).*  ئه‌م کۆرسبووکه‌ ده‌بێت له‌لایه‌ن هاوه‌ڵێکی ئه‌کادیمیه‌وه‌ سه‌یر بکرێت و ناوه‌ڕۆکی بابه‌ته‌کانی کۆرسه‌که‌ په‌سه‌ند بکات و جه‌ند ووشه‌یه‌ک بنووسێت له‌سه‌ر شیاوی ناوه‌ڕۆکی کۆرسه‌که و واژووی له‌سه‌ر بکات.  هاوه‌ڵ ئه‌و که‌سه‌یه‌ که‌ زانیاری هه‌بێت له‌سه‌ر کۆرسه‌که‌ و ده‌بیت پله‌ی زانستی له‌ مامۆستا که‌متر نه‌بێت.‌‌ | | |