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**Department of Computer**

**College of Science**

**University of Salahaddin**

**Subject:**  **Microprocessor & Microcontroller**

**Course Book – (Year 2)**

**Lecturer's name: Sajida Hadi Baker**

**Academic Year: 2018/2019**

**Course Book**

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| **1. Course name** | **Microprocessor and Microcontroller** |
| **2. Lecturer in charge** | Sajda Hadi |
| **3. Department/ College** | **Computer/ science** |
| **4. Contact** | **e-mail:** sajda.baker@su.edu.krd |
| **5. Time (in hours) per week**  | **For example Theory: 2** **Practical: 2**  |
| **6. Office hours** | **Thursday 9- 10:30 am** |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | **BSc. From computer (system) and control engineering department/ university of Technology** **/Baghdad /Iraq/1987 with rank: 10th out of 57 graduates.****MSc. In control and instruments engineering from computer(system) and control engineering** **department/ university of Technology/Baghdad/Iraq/1996 with general average 76.61%.** **The title of thesis was "Tuning of PID controller using fuzzy algorithm in real time systems".****Worked in scientific research council/ space research center mainly in the field of computer** **programming, interfacing and backward engineering, from 1988-2001.****Worked as a Maintenance engineer for the Gamma knife/medical device in the ministry** **of Health from 2001-2003.****Worked as a lecturer in Salahaddin University/College of Education /Computer Science** **department, from 2004 then in College of science from 2014 until now.** |
| **9. Keywords** | **8086 microprocesser, Assembly language,Microcontroller** |
| **10. Course overview:** * Understand fundamental concepts of 8086 Microprocessor architecture and Microcontrollers.
* Studying assembly language 8086 instruction set and addressing mode.
* solve common problems using assembly language
* Be familiar with microcontroller types and how to work with it.
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| **11. Course objective:**To write programs in Law Level Language (processor language). And to know the different types of microcontrollers specification and architecture.  |
| **12. Student's obligation**Students should attend lectures and practice with EMU86 and do all tests, exams, and homework’s. |
| **13. Forms of teaching**The course consists of two parts; a theoretical part and practical or applied part, part I (theory) will be depend on lectures in the hall to explain the basic concepts associated with the course by using the Data show and white board.Part II (practical) is associated with training on EMU8086 version4 program . |
| **4. Assessment scheme**1st semester theory exam 7%1st semester practical exam 15%2nd semester theory exam 8%2nd semester practical exam 18%Quiz , Homework and attendance 2% 50%Final exam (Theory) 50% |
| **15. Student learning outcome:**Student at the end of course should know how to solve any problem by writing a program in assembly language and should know how it will be executed and run inside the processor also to choose the shortest program instructions to be faster to be executed. |
| **16. Course Reading List and References‌:**1- Abel P., "IBM PC Assembly Language and Programming", 4th Edition, Prentice Hall,1998..2- Thorne M., "Computer Organization and Assembly Language Programming", 2nd Edition, Benjamin/Cummings, 1990.3-“Microprocessors, PC Hardware and interfacing” by N.Mathivanan4-The 8086 Microprocessors Architecture,software and Interfacing techniquesBy: Walter A. Triebel5-The 8086/8088 MPU, Architecture,programming and interfacing . BY: Barry B. Brey 6-Singh ,A, The 8088 Microprocessor Programming , interfacing , software , hardware and applications, 19897-Http://www.arabteam2000.com مقدمه في لغة الأسيمبلي تأليف وأعداد أنس عبد لله كردي 8- www.article.5gigs.com مقالات في لغة الأسيمبلي من موقع9-Introduction to Microcontrollers, ,G¨unther Gridling, Bettina Weiss, February 26, 200710-Microcontroller and Embedded Systems Laboratory, **Authors:** Kileen Cheng, Patrick Frantz, CJ Ganier, October 25, 2012 |
| **17. The Topics: Lecturer's name** |  |
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| **Basic Tutorial Subject to be covered** |
| **Week1: Introduction of Microcomputer System:** Microprocessor Architecture. |
| **Week2:Microprocessor Bus organization:** Data Bus, Address Bus and Control Bus **,**Personal Computer (PC) Components ,The Processor and Operations of CPU (Data Transfer, fetch and Execute Cycles), |
| Weeek3: Memory (Definition, Basic Operations and Types), Input/Output Controllers (read and write cycle with timing diagram).Evolution of microprocessor and its types.Execution and Bus Interface unit. |
| **Week 4&5: Addressing data in memory:** Segments and Addressing,Specifying addresses, Registers of 8086 (Data Registers, Status and Control Registers). |
| **Week 6-7: Instruction Execution and Addressing**Machine language instruction format (Single byte, two byte, three byte instructions), Addressing Modes of 8086 and its Types. |
| **Week8-10: Instruction Sets**: Data transfer, Arithmetic, Logical, Shift and Rotate Instructions. |
| **Week 11-15:Advance instructions (Program and Control Instruction):**Flag control, Compare, Jump, and String instructions. |
| **Week 16-17: Implement Subroutines and Procedures:** Branch and Operations and instructions. |
| **Week 18-19 :Interrupts**, Interrupts Types (External Hardware, Software, Internal Hardware, Non-Maskable, and Reset).Input/Output: Accessing I/O Devices, I/O Address Space and Data Transfer |
| **Week 20-23:What is a microcontroller, History of microcontroller,** Microprocessor Vs. Microcontroller. **TYPES OF MICROCONTROLLER, Classification According to Instruction Set ; RISC & CISC Architecture. PIPELINING-UNIQUE FEATURE OF RISC, Classification for microcontroller According to Memory Architecture: 1. Havard architecture 2. Von Neuman architecture** |
| **Week 24-27: microcontroller Types based on vendor or provider ; AVR, PIC,Hitachi,Motorolla etc****-RISC Vs. CISC CPU ARCHITECTURES , HARVARD Vs. VON- NEUMANN CPU ARCHITECTURE**  |
| **Week 28-30:** **How Do We Right the Instructions and Tell the MPU What to Do?,Working with microcontroller, Memory selection of the microcontroller, , common communication peripherals on MC’s: UART, SPI, and I2C, Different microcontroller with applications****Week 31: Review** |

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| **18. Practical Topics**  |  |
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| **Week1: Review of numbering system** |
| **Week2: Registers in 8086 microprocessor** |
| **Week3-5: Addressing modes in 8086 MP*** **Register**
* **Immediate**
* **Memory**
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| **Week6-9: Port and String addressing** |
| **Week10-11: 8086 instruction set -Data transfer instructions** |
| **Week 11-13:Arithmetic instructions & Logical instructions** |
| **First Mid Exam** |
| **Week 14-15: String instructions** |
| **Week 16-17: Jump instructions** |
| **Week 17-18:Iteration instructions** |
| **Week19-20: Interrupt instructions** |
| **Week 21-22: Procedures** |
| **Week 23-24: solving problems** **Week 25-28: working with Microcontroller****Week 29: review.** |

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| **19. Examinations:*****1. Compositional:*** Q:Explain the 5 Steps in a typical read cycle?:typical answers :1- Place the address of the location to be read on the address bus.2- Activate the memory read control signal on the control bus.3- Wait for the memory to retrieve the data from the address memory location.4- Read the data from the data bus.5- Drop the memory read control signal to terminate the read cycle.Q1:write instructions to Read the value of variables A and B from arrays of bytes and store the Y value into array of words as in the following equation:If A positive then Y=A-B/2If A negative then Y=A\*A/BQ2:write instrctions to send 16 bytes starting from 2000:0000h to output port 00h.***2.******True or false type of exams:***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. |
| **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. |
| **21. Peer review** 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. |