**Course Specification**

**(**IT 311 Computer Architecture**)**

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| **University:** | Helwan University |
| **Faculty:** | Faculty of Computers & Information |
| **Department:** | Information Technology |

**1. Course Data**

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| --- | --- |
| **Code:** |  **IT 311**  |
| **Course title:** |  Computer Architecture |
| **Level:** | 3 |
| **Specialization:** | Information Technology |
| **Credit hours:** | 3 hours |
| **Number of learning units (hours):**  | ( 3) theoretical (2 ) tutorial |

**2. Course Objective**

This course is a fundamental course for any computer science student. The aim of this course is to introduce the students to computer architecture and the factors influencing the design and organization of hardware and software elements of computer systems. It gives an overview of main computer system components: CPU, main memory, secondary memory, input/output, Data representation, Digital logic, PC Architecture, CISC and RISC, RAM and cache memories, Instruction set design, Basic concepts in assembly language programming, including logic, comparing and branching, interrupts, computer structure; fetch-execute cycles, clocks and timing

**3. Intended Learning Outcomes:**

1. **Knowledge and Understanding**

A2. Recognize fundamentals of Computer Architectures.

A28. Describe the foundations of computer science: Hardware, Software and Networking.

1. **Intellectual Skills**

B22. Negotiate advanced technologies.

1. **Professional and Practical Skills**

C7. Operate IT equipment efficiently.

1. **General and Transferable Skills**

D14. Support Engineering skills.

**4. Course contents**

The course will include the following contents:

|  |  |
| --- | --- |
| **Week(s)** | **Topic** |
| 1 | Data Representation1. number systems
2. complements
3. fixed point representation
4. floating point representation
5. binary codes
 |
| 2 | Register Transfer and Microoperations1. register transfer and register transfer language
2. bus and memory transfer
3. arithmetic microoperations
4. logic microoperations
5. shift microoperations
 |
| 3- 4 | Basic Computer Organization and Design1. instruction codes
2. computer registers
3. computer instructions
4. timing and control
5. instruction cycle
6. memory reference instruction
7. input- output and interrupt
8. complete computer description
9. design of basic computer
 |
| 5- 6  | Programming the Basic Computer1. introduction to machine language
2. assembly language and assembler
3. program loops
4. programming arithmetic and logic operations
5. subroutines
6. input output programming
 |
| 7  | Midterm Exam |
| 8 | Microprogram Control1. control memory
2. address sequencing
3. subroutines
4. microprogram example
 |
| 9 – 10 | Central Processing Unit1. general register organization
2. stack organization
3. instruction formats
4. addressing modes
5. data transfer and manipulation
6. program control
7. reduced instruction set computer (RISC)
 |
| 11 – 12 |  Pipeline and vector processing1. pipelining
2. instruction pipelining
3. RISC pipeline
 |

 **Mapping contents to ILOs**

|  |  |
| --- | --- |
| Topic | Intended Learning Outcomes (ILOs) |
| Knowledge and understanding | Intellectual Skills | Professional and practical skills | General and Transferable skills |
| Data Representation  | A2 |  |  |  |
| Register Transfer and Microoperations | A2 |  |  |  |
| Basic Computer Organization and Design | A28 |  |  | D14 |
| Programming the Basic Computer | A2 |  |  |  |
| Microprogram Control | A2 |  |  |  |
| Central Processing Unit | A28 |  |  |  |
|  Pipeline and vector processing | A28 |  |  |  |
| Internet and Extranet | A2 | B22 |  |  |
| Multimedia communication over Internet | A2 | B22 |  |  |
| Internet, Audio, Video streaming Website design and application | A2 | B22 | C7 | D14 |

**5. Teaching and Learning Methods**

* Lectures
* Labs
* Tutorial

**6. Teaching and Learning Methods for students with limited capability**

* Using data show
* e-learning management tools

**7. Students Evaluation**

1. **Used Methods**
2. **Time**

Assessment 1 First Quiz, week 4

Assessment 2 Mid-term

Assessment 3 Self-study case study

 Assessment 4 Small project

1. **Grades Distribution**

Mid-Term Examination 20%

Final-term Examination 60%

Oral Examination. %

Practical Examination 10%

Semester Work and Project 10%

Other types of assessment %

Total 100%

**List of Books and References**

**a) Notes**

* Course Notes

**b) Mandatory Books**

* M. Morris Mano, “computer system architecture”, Third Edition, Prentice Hall.

**c) Suggested Books**

**d) Other publications**

 - Periodicals, Web Sites … etc

**Course Coordinator: A. Prof. Dr. Mohamed Belal**

**Chairman of the Department: Prof. Dr.**