T-104
2022

# Course Specification
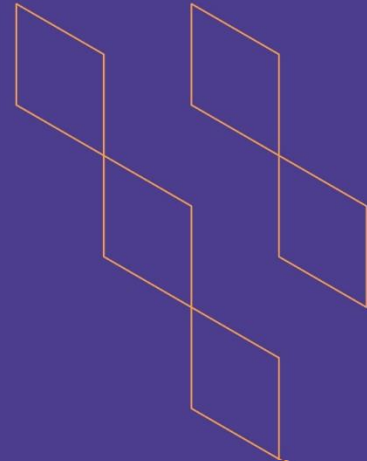
| |
|---|
| Course Title: **Computer Architecture** |
| Course Code: **COMP 332** |
| Program: **Bachelor in Computer Science** |
| Department: **Computer Science** |
| College: **College of Computer Science and Information Technology** |
| Institution: **Jazan University** |
| Version: **V2** |
| Last Revision Date: **26-August-2022** |

# Table of Contents:

# A. General information about the course:

| Course Identification | |
|---|---|
| **1. Credit hours:** | 3 |

**2. Course type**

| a. | University ☐ | College ☐ | Department ☒ | Track☐ | Others☐ |
|---|---|---|---|---|---|
| b. | Required ☒ | Elective☐ | | | |

| **3. Level/year at which this course is offered** | **Level 7/ Year 3** |
|---|---|

**4. Course general Description**

This course is about the structure and basic function of computers. Its purpose is to present, as clearly and completely as possible, the nature and characteristics of modern-day computer systems. This course cover all aspects of computer, from the underlying integrated circuit technology used to construct computer components, to the increasing use of parallel organization concepts. This course also focuses on different elements of Computer Organization and Major components which include processor, memory, I/O, control unit, registers, ALU, and instruction execution unit. It also discusses control signals for the operation and coordination of all processor components.

**5. Pre-requirements for this course (if any): None**

**6. Co- requirements for this course (if any): None**

**7. Course Main Objective(s)**

1. Explain the architecture and organization of computing systems
2. Describe the major components of a computer and their interconnections, both with each other and the outside world.
3. Demonstrate the program execution, instruction format and instruction cycle.
4. Illustrate various internal architectures and organizations of the processor

## 1. Teaching mode (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1. | Traditional classroom | 52 | 100 |
| 2. | E-learning | | |
| 3. | Hybrid <br> • Traditional classroom <br> • E-learning | | |
| 4. | Distance learning | | |

## 2. Contact Hours (based on the academic semester)

| No | Activity | Contact Hours |
|----|----------|---------------|
| 1. | Lectures | 22 |
| 2. | Laboratory/Studio | 22 |
| 3. | Field | |
| 4. | Tutorial | |
| 5. | Others (Revision + Exam) | 8 |
| | Total | 52 |

# B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Code of CLOs aligned with program | Teaching Strategies | Assessment Methods |
|------|--------------------------|-----------------------------------|---------------------|--------------------|
| 1.0 | Knowledge and understanding | | | |
| 1.1 | **Explain** the various concepts related with evolution of computers and technologies involved. | K1 | Visual &Verbal [Lectures / Presentations] | Exam 1, Assignment(s), Final Exam |
| 1.2 | **Relate** various components, functions and interconnection structure and I/O module techniques of a computer system. | K2 | Visual &Verbal [Lectures / Presentations] | Exam 1, Assignment(s), Final Exam |
| … | | | | |
| 2.0 | Skills | | | |
| 2.1 | **Analyze** various memory storage and access techniques based on various performance criteria. | S1 | Visual &Verbal [Lectures / Presentations] | Exam 1, Assignment(s), Final Exam |
| 2.2 | **Evaluate** different page replacement algorithms based on page fault calculations. | S2 | Visual &Verbal [Lectures / Presentations] | Assignment(s), Final Exam |
| 2.3… | **Design** programs based on various microprocessor concepts in Assembly language. | S3 | Visual &Verbal [Lectures / Presentations] | Internal Lab Exam, Final Lab Exam |

| Code | Course Learning Outcomes | Code of CLOs aligned with program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| 3.0 | Values, autonomy, and responsibility | | | |
| 3.1 | **Demonstrate** the ability to work as a team member and take responsibility for successful completion of group assignment on recent trends of subject area. | V2 | Visual &Verbal [Lectures / Presentations] | Group Assignment |
| 3.2 | | | | |
| ... | | | | |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1. | **Chapter1-Introduction to Computer Organization & Architecture**<br><br>• Introduction to computer Organization and Architecture<br>• Structure and function<br>• Structural components of computer<br>• History and generations of computers<br>• Moore's Law and consequences of it.<br>• General and Expanded structure of computers<br>• IAS Memory formats and structure of IAS computer | **4T + 4P** |
| 2. | **Chapter 2-Computer functions and interconnections**<br><br>• Computer components<br>• Instruction fetch and execute<br>• Interrupts<br>• Multiple Interrupts<br>• Interrupt Instruction Cycle<br>• Interconnection building<br>• Bus Interconnection | **4T + 4P** |
| 3. | **Chapter 3 -Cache memory**<br><br>• Computer Memory System<br>• Characteristics of memory system<br>• Memory hierarchy<br>• Characteristics of memory hierarchy<br>• Cache memory principles | **2T + 2P** |

| # | | |
|---|---|---|
| | • Elements of cache design<br>• Cache memory Mapping<br>• Replacement algorithms | |
| 4. | **Chapter-4- Internal memory**<br><br>• Semiconductor main memory<br>• Main Memory Cell Organization<br>• Semiconductor memory types<br>• RAM<br>• DRAM and SRAM<br>• ROM<br>• Types of ROM | **3T + 3P** |
| 5. | **Chapter 5-External memory**<br><br>• Magnetic disc<br>• Data organization and formatting<br>• Disk performances<br>• Raid<br>• Different RAID levels<br>• RAID comparison<br>• Optical storages | **4T + 4P** |
| 6. | **Chapter 6- Input-output**<br><br>• Peripheral devices<br>• Input-Output Technique<br>• Programmed I/O<br>• Interrupt driven I/O<br>• Direct memory access<br>• DMA Operation<br>• I/O modules | **3T + 3P** |
| 7. | Revision and Exam discussion | 2T+2P |
| 8. | Lab Exam + Final Exam | 2T+2P |
| Total | | **52** |

## D. Students Assessment Activities

| No | Assessment Activities * | Assessment timing (in week no) | Percentage of Total Assessment Score |
|---|---|---|---|
| 1. | **Assignment-1** | 3rd -4th week | 10% |
| 2. | **Mid Exam** | 5th-6th week | 15% |
| 3. | **Assignment-2 (Group Assignment)** | 6th -7th week | 10% |
| 4. | **Quiz** | 9th week | 5% |
| 5. | **Final Lab Exam + Lab Assignment** | As per schedule | 20% |
| 6. | **Final Theory Exam** | As per schedule | 40% |
| | **Total** | | 100% |

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.)

## E. Learning Resources and Facilities

### 1. References and Learning Resources

| | |
|---|---|
| Essential References | William Stallings, "Computer Organization and Architecture-Designing for Performance", Pearson Publication, 9th edition, 2012, ISBN-13: 978-0132936330 |
| Supportive References | M. Morris R. Mano**, "Computer System Architecture"**, Pearson Publication, 3rd edition, 1992, ISBN-13: 978-0131755635 |
| Electronic Materials | http://williamstallings.com/ComputerOrganization/ |
| Other Learning Materials | Emulator emu8086 |

### 2. Required Facilities and equipment

| Items | Resources |
|---|---|
| facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.) | Classroom and Lab equipped with workstation Computers and Seating Capacity for 30-40 students along with projectors. |
| Technology equipment (projector, smart board, software) | The practical should be placed in a lab with the following requirements: • Computer connected to projector. • 30-40workstations • emu8086 software |
| Other equipment (depending on the nature of the specialty) | |

## F. Assessment of Course Quality

| Assessment Areas/Issues | Assessor | Assessment Methods |
|---|---|---|
| Effectiveness of teaching | Students | Course evaluation survey form |
| Effectiveness of students assessment | TL/HOD | Classroom monitoring |
| Quality of learning resources | Track leaders / CRC | Review meetings and star rating with suggestions for further modification and improvements |
| The extent to which CLOs have been achieved | | |
| Other | | |

**Assessor** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
**Assessment Methods** (Direct, Indirect)

## G. Specification Approval Data

| COUNCIL /COMMITTEE | Department Council |
|---|---|
| REFERENCE NO. | |
| DATE | 26-08-2022 |