Module (Course Syllabus) Catalogue

2023-2024

College/ Institute	**Khabat Technical Institute**	
Department	**Department of Information Technology**	
Module Name	**Computer Organization and Logic Designs**	
Module Code	**COL105**	
Degree	**Technical Diploma** ☑ **Bachelor** ☐ **High Diploma** ☐ **Master** ☐ **PhD** ☐	
Semester	**1st**	
Qualification	**Master's Degree in Software Engineering**	
Scientific Title	**Assistant Lecturer**	
ECTS (Credits)	**6**	
Module type	**Prerequisite** ☐ **Cor** ☑ **Assis** ☐	
Weekly hours	**4**	
Weekly hours (Theory)	**(2) hr Class**	**(55) Total hrs Workload**
Weekly hours (Practical)	**(2) hr Class**	**(95) Total hrs Workload**
Number of Weeks	**12**	
Lecturer (Theory)	**Ahmed HURMZI**	
E-Mail	**ahmad.khdr@epu.edu.iq**	
Lecturer (Practical)	**Mrs. Sulav Ibrahim Sarhan** **Mrs. Nura Ahmed Omer**	
E-Mail		
Websites	**https://academicstaff.epu.edu.iq/faculty/ahmad.khdr**	

Course Book

<table>
<tr><td>Course Description</td><td>Computer Architecture and Organization is the study of internal working, structuring and implementation of a computer system. Architecture in computer system, same as anywhere else, refers to the externally visual attributes of the system. Externally visual attributes, here in computer science, mean the way a system is visible to the logic of programs (not the human eyes!). Organization of computer system is the way of practical implementation which results in realization of architectural specifications of a computer system.</td></tr>
<tr><td>Course objectives</td><td>The course covers the basic principles of computer organization, operation and performance. It also deals with embedded systems, peripheral devices, memory management, and processor family evolution patterns. The course discusses the role of pipelining and multiple functional units in processor design.
Additional there are some main objects related to studying this course:
1. To become familiar in following topics:
2. How Computer Systems work & its basic principles
3. How to analyze the system performance.
4. Concepts behind advanced pipelining techniques.
5. The current state of art in memory system design
6. How I/O devices are being accessed and its principles.
To provide the knowledge on Instruction Level Parallelism To impart the knowledge on Nano programming.</td></tr>
<tr><td>Student's obligation</td><td>1. Assignments:
In their academic semester, students are obliged to take midterm and final exams, do 8 quizzes, give 2 presentations, writing 4 reports and solving 6 home works as their assignments.

2. Attendance Policy:
Students are expected to attend each class for the entire semester. Students are responsible for material present in lectures. Only students with official absence, family crises, and illness are excused from class. The student who misses 10 percent of the classes will be placed on probation.
3. Make up Policy:
Since all examination are announced in advance, ZERO grade will be given to any missed examination unless a student has an acceptable reason, such as illness, for not being able to take the examination during all those days when the examination was announced.</td></tr>
<tr><td>Required Learning Materials</td><td>lecture halls with data show equipment for lecture presentations, white board, overhead projector, Padlet, Moodle, email, and Viber group (if necessary).</td></tr>
<tr><td>Evaluation</td><td>
<table>
<tr><th colspan="2">Task</th><th>Weight (Marks)</th><th>Due Week</th><th>Relevant Learning Outcome</th></tr>
<tr><td colspan="2">Paper Review</td><td>Null</td><td>Null</td><td></td></tr>
<tr><td rowspan="7">Assignments</td><td>Homework</td><td>10</td><td>3,5</td><td></td></tr>
<tr><td>Class Activity</td><td>2</td><td>Null</td><td></td></tr>
<tr><td>Report</td><td>Null</td><td>Null</td><td></td></tr>
<tr><td>Seminar</td><td>Null</td><td>Null</td><td></td></tr>
<tr><td>Essay</td><td>6</td><td>Null</td><td></td></tr>
<tr><td>Project</td><td>10</td><td>Null</td><td></td></tr>
<tr><td colspan="2">Quiz</td><td>8</td><td>3,6,9,12</td><td></td></tr>
<tr><td colspan="2">Lab.</td><td>Null</td><td>Null</td><td></td></tr>
<tr><td colspan="2">Midterm Exam</td><td>24</td><td>7</td><td></td></tr>
<tr><td colspan="2">Final Exam</td><td>40</td><td>13</td><td></td></tr>
<tr><td colspan="2">Total</td><td>100</td><td>Null</td><td></td></tr>
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Specific learning outcome:	• To introduce basic principles of computer organization and architecture. • To provide examples of different processors and instruction sets. • To give a basis for understanding issues of computer operation and performance. • To familiarize the students with computer arithmetic. • To apply the knowledge of performance metrics to find the performance of systems. • To create an assembly language program to program a microprocessor system. • To design a hardware component for an embedded system • To deal with different types of computers • To identify high performance architecture design • To identify the problems in components of computer. • To develop independent learning skills and be able to learn more about different computer architectures and hardware. • To learn & use the new technologies in computers. • To use the knowledge of micro programming in the field of speech processing.
Course References:	**Key References** • Weekly lecture slides • Computer Organization and Architecture, William Stallings, 5th Edition, 2000 • Digital Electronics, William Kleitz, 9th Edition **Useful references:** • Fundamental of Digital Electronics, Barry Paton,1998 Edition • Schaum's outline of Computer Architecture, Tata McGraw Hill, 2006 **Magazines and review (internet):** • http://www.allaboutcircuits.com/textbook/digital/ • http://electronicsproject.org/ • http://en.mcqslearn.com/cs/dld/digital-logic-design-mcqs.ph

Practical Topics	Week	Learning Outcome
Introduction to Computer Organization &Architecture	1	• Why Study Computer Organization & Architecture • Brief History about Computer Generation
Number System	2,3	• Introduction to number System • Conversion among numbering System • Arithmetic operation of binary number system
Digital System	4,5	• Introduction to Digital System & Logic gates • Boolean algebra and its Simplification Techniques
Karnaugh Maps	6	• Introduction • Rules of Simplification & Examples
Digital Circuits	7	• Combination circuits • Adder & Subtraction, Decoder & Multiplexers
Continue…Digital Circuits	8	• Sequential Circuits • Flip-Flops • Register & Counters • Memory organization and storage system
Assembly Language	9	• Introduction • ASCII code • Conversion text • Addressing data items in memory
Computer Architecture The VON NEUMANN MODEL	10	• Functional unit • Input Unit Memory • Unit Arithmetic & Logic Unit (ALU) • Output Unit Control Unit
Basic Operational Concept	11	• Introduction • Bus Instruction
CPU	12	• Data Bus, Address Bus & Control Bus • Introduction • Characteristic Study & Process • 8086 Microprocessor study in details • Introduction • Cache Memory

Practical Topics	Week	Learning Outcome
Registers and counters.	1,2	Introduction to OR, AND, NOT gates
Program Debugging instruction – Trace commands.	3,4	Trace commands.
Data Movement Instructions – MOV PUSH/POP	5	MOV PUSH/POP
Arithmetic Instructions – ADD/ADC/INC SUB/SBB/DEC MUL/IMUL DIV/IDIV.	6	Arithmetic Instructions
Logical Instructions – AND/OR/XOR/NOT/Test and bit test.	7,8	Logical Instructions
String Primitive Instructions.	9	String Primitive Instructions
Program Control Instructions CALL/RET/JMP Conditional Jump.	10	Program Control Instructions
I/O Instructions - IN and OUT Interrupt Instructions – INT.	11	Interrupt Instructions – INT.

Questions Example Design

1. Compositional:

Q/ Simplify this Boolean function to a minimum number of literals. $F = (A + B).(A + \bar{B})$

Solution:

$$\begin{aligned}(A + B).(A + \bar{B}) &= A.A + A.B + A.\bar{B} + B.\bar{B} \\ &= A + A.B + A.\bar{B} + 0 \\ &= A.(1 + B + \bar{B}) \\ &= A.(1 + \bar{B}) \\ &= A.1 \\ &= A\end{aligned}$$

Q/ Convert the decimal number (112.7) to:

1- Binary number

2- Octal number

3- Hexadecimal number

Solution:

1- <u>Converting to Binary Number</u>

a) Real Part

Dec No.÷2	Result	Remainder
112÷2	56	0
56÷2	28	0
28÷2	14	0
14÷2	7	0
7÷2	3	1
3÷2	1	1
1÷2	0	1

b) Fraction Part

Dec No.×2	Result	Carry
0.7×2	1.4	1
0.4×2	0.8	0
0.8×2	1.6	1
0.6×2	1.2	1
.	.	.
.	.	.
.	.	.

$(112.7)_{10} = (1110000.1011)_2$

2- <u>Converting to Octal Number</u>

a) Real Part

Dec No.÷8	Result	Remainder
112÷8	14	0
14÷8	1	6
1÷8	0	1

b) Fraction Part

Dec No.×8	Result	Carry
0.7×8	5.6	5
0.6×8	4.8	4
0.8×8	6.4	6
0.4×8	3.2	3

$(112.7)_{10} = (160.5463)_8$

3- <u>Converting to Hexadecimal Number</u>

a) Real Part

Dec No.÷16	Result	Remainder
112÷16	7	0
7÷16	0	7

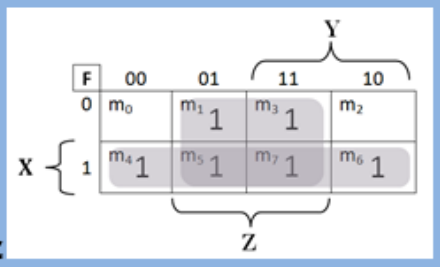
b) Fraction Part

Dec No.×16	Result	Carry
0.7×16	11.2	11=B
0.2×16	3.2	3
0.2×16	3.2	3

$(112.7)_{10} = (70.B33)$

Q/ Simplify the following Boolean expression function by using Karnaugh Map: $F = \sum(1,3,4,5,6,7)$

Solution:



Final Solution: **F= X+Z**

2. True or false type of exams:

1- The Boolean expression for a tow input AND gate equal to($F = \overline{A+B}$). **(True)**

2- Slide Rule is inventoried by John Napier.**(False)**

3- The Full adder is a combinational circuit that performs the addition of two bits. (False)

4- A Registers holds a single bit of memory. **(True)**

5- First Electronic digital computer, was called (Mark1), build in 1964. **(False)**

6- Keyboard for input and monitor for output, first time used in 3rd generation. **(True)**

3. Multiple choices:

1- Slide Rule is inventoried by_____.

a. John Napier

b. William Oughtred

c. Ada Lovelace

d. George BOOLE

2- The Main Memory_____is used in the 2nd generation.

a. Punched Card

b. PROM & DRAM

c. RAM & ROM

d. EPROM & SRAM

3- Major Innovation using to designed computer in the 3rd generation, it's_____.

a. Transistors

b. Integrated circuit

c. Vacuum Tubes

d. LSIC and VLSIC

4- This Binary number (10101010101101111.11) is equal to_____Hexadecimal number.

a. EA378.C

b. 352158.3

c. 1D46F.C

d. 1556F.C

5- _____that is the mathematics of variables with values that can be only "True" or "False".

a) Boolean Logic

b) ENIAC

c) ABACUS

d) Pascal Machine

Extra notes:

Ask questions, Respect and listen to your classmates, and the teacher, Raise your hand to speak, Be prepared for class, Be quiet when the teacher and your classmates are talking, Share new ideas, Respect others' property, Keep your workspace tidy, Be kind, Always do your best, Be a good friend, Be on time, Share with others, Use equipment properly, turn in your homework on time, Use positive language, Listen with your ears and your eyes, Contribute to discussions, Be respectful of others' ideas, Follow the teacher's directions, Cooperate with your classmates, Be creative, Be honest, Use technology appropriately, Be proud of your work

External Evaluator

As a participant I supported and reviewed the curriculum of the course book and I see It suitable for the first graders and it is quite academic and at the level of the institute