

**Department of …Computer Science**

**College of ………Science….**

**University of …Salahaddin.**

**Subject: …Logic System ….**

**Course Book – *For example* (Year 1)**

**Lecturer's name: BSc, MSc Arazu Saeed Omer**

**Academic Year: 2021/2020**

**Course Book**

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| **1. Course name** |  **Digital Logic**  |
| **2. Lecturer in charge** |  **2 hrs tho., 8 hrs practical . for Lab** |
| **3. Department/ College** | **Computer Science & IT** |
| **4. Contact** | **e-mail: arazu.omer@su.edu.krd** |
| **5. Time (in hours) per week**  | **For example Theory: 2 for logic &** **2 hrs Practical: 4 Lab Logic** |
| **6. Office hours** | **Availability of the lecturer to the student during the week** |
| **7. Course code** |  |
| **8. Teacher's academic profile**  | **https: //sites.google.com/a/su.edu.krd/arazuomer/****or few paragraphs about not less than 100 words****لێره‌ مامۆستای وانه‌بێژ پرۆفایلێک ده‌نووسیت له‌سه‌ر ژیانی ئه‌کادیمی خۆی** **ته‌نها ئه‌کادیمی)****-Acquired a BSc from college of Education –Computer Science Department in Salahaddin University in 2003****-Graduated with MSc in** “Availability and reliability of MoH in erbil **“from University of Salahaddin in 2011****-I have been working in the Department of computer science as assistant programmer since January 2004**  |
| **9. Keywords** |  **signal,digital circuit,logic gate,boolean function,IC,truth table,number system, flip-flop.** |
| **10. Course overview:** In this section the lecturer shall write an overview about the subject he/she is giving. The course overview must cover:- Principles and theories of the course is the digital logic design-The importance of studying the subject is to understand the electronic circuits . Understanding of the fundamental concepts of the course is by take a full view of how to design the electronic circuit . -The digital computer is a digital system (binary system) . digital computers use the binary number system, which has two digits: 0 and 1. A binary digit is called a bit. -Understanding digital Integrated circuits and classified according to their complexity to (SSI,MSI,LSI,VLSI,ULSI) -Understanding Number System (Decimal no. ,Binary no. ,Hexadecimal no. , Octal no., BCD, Gray Code ,Ascii)-Learning how to convert the number system from one type to another  -Understanding Binary arithmetic like Addition ,subtraction and multiply-Understanding to use negative number using 1’s complement and 2’s complement of binary numbers and signed number.-Understanding the types of Logic Gates like(NOT,AND,NAND,NOR,OR,XOR,XNOR) - Boolean algebra used to simplify complex logic circuit and formulas-Karnaugh Map is the key for finding a minimum-cost expression for a given logic function is to reduce This should not be less than 200 words  |
| **11. Course objective:**This course aim to prepare student to design any electronic circuit or logic gates . And to get a good view of the manipulation and manufacturing this ICs and electronic components, logic circuits ,multiplexer , counter .In addition of that how their design the circuits and connect these circuits together to get the best performance.And used digital system (binary system) , which has two digits: 0 and 1. A binary digit is called a bit. -Understanding types of Number System (Decimal no. ,Binary no. ,Hexadecimal no. , Octal no., BCD, Gray Code ,Ascii) and how how to convert the number system from one type to another and learn to sum and subtract this numbers.  - Also understand about negative number and signed number.-Understanding the types of Logic Gates like(NOT,AND,NAND,NOR,OR,XOR,XNOR) and how to connect to other.To simplify complex logic circuit and formulas used Boolean algebra u- -Karnaugh Map is the key for finding a minimum-cost expression for a given logic function  All these terms that above is a very important to design and implement any electronic circuit ,logic gates,Number system, Boolean expression. This should not be less than 100 words |
| **12. Student's obligation****In this section the lecturer shall write the role of students and their obligations throughout the academic year, for example the attendance and completion of all tests, exams, assignments, reports , essays…etc** **-Students must attend weekly theoretical and practical lecture.****This course consist of 2 theoretical exams and 2 lab or practical exam in order to get 40 marks before getting into the final exam of 60 marks , within the quize exams that enforce the student to learning process in the interval between the two exams. in addition to reports that is optional** .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** :‌ داتاشۆ و پاوه‌رپۆینت، ‌سه‌ر ته‌خته‌ڕه‌ش، ته‌خته‌ی سپی، سمارتبۆرد یان‌ مه‌لزه‌مه‌... هتدIn this Courseonly Datashow is needed to express the lectures ,sketches and figuresIn addition to the whiteboard to help me to explain the figures to the students. |
| **14. Assessment scheme**Breakdown of overall assessment and examinationلێره‌ 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؟1-1st practical exam 30%2-Quiz and absence on 5%  35% practical of the hall scores   |
| **15. Student learning outcome:**پڕکردنه‌وه‌ی ئه‌م خانه‌یه‌ زۆر گرنگه‌، مامۆستا ده‌رئه‌نجامه‌کانی فێربوون ده‌نووسێت. بۆ نموونه‌: ڕوونی ئامانجه‌ سه‌ره‌کیه‌کانی کۆرسه‌که‌ (بابه‌ته‌که‌) بۆ خوێندکار‌گونجاندنی ناوه‌ڕۆکی کۆرسه‌که‌ به‌ پێویستی ده‌ره‌وه‌ و بازاڕی کارقوتابی چی نوێ فێرده‌بێت له‌ ڕێگه‌ی پێدانی ئه‌م کۆرسه‌وه‌؟ **It is requested by this Course to learn and understand the digital system which now all devices like TV, Mobile,satellite all these work with digital system and understanding of circuit, IC, logic gates , numbers system and all components that is taking apart in implementation of the typical electronic circuit of computer. Learning how to add and subtract a binary number.**  **The student need to understand how to use the circuits system's functionality most actively. Specially. ,****The student must understand its digital logic so that you will be able to exploit that circuits during design electronic circuit program that use EWB v.5**This should not be less than 100 words  |
| **16. Co****urse Reading List and References‌:*** 1- Brock J. LaMeres, 2016” Combinational logic analysis”

2-  [Franco P. Preparata](https://www.amazon.com/s/ref%3Ddp_byline_sr_book_1?ie=UTF8&text=Franco+P.+Preparata&search-alias=books&field-author=Franco+P.+Preparata&sort=relevancerank) ,1985 “Introduction to Computer Engineering”3-Tom Martin,M Morris Mano,Charles R Kime, Mano “Logic and Computer Design Fundamentals” ISBN:01337606344- William kllits “Digital electronics “ 5-“DIGITAL ELECTRONICS REFERENCES” , Theory:L.R. Fortney, Principles of Electronics6- Dr. I. J. Wassell “Digital Electronics Part1- Combitional and sequential Logic”  7- Ian R. Snaclair , 1990 “Digital Logic Gates and flip-flops”8- Rex A. Barzee , 2014 “ Really Understand Binary” 9- William R Parks , 2014 “Introduction to Boolean Algebra and Switching Circuits (Computer Math Series)” (Volume 4) ▪ Key references:▪ Useful references:▪ Magazines and review (internet): |
| **17. The Topics:** | **Lecturer's name** |
| In this section the lecturer shall write titles of all 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

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| Week(s) |  Topics |
|  1 | **Introduction to digital logic** |
|  2-4 |  **Number Systems:** Binary, Octal, Decimal, and Hexadecimal number Systems Representation. Number based conversation |
| 5-8 | **Digital System Arithmetic** : Signed Binary Number(Complement), Addition ,Subtraction ,Multiplication, Division |
| 9-12 | **Digital Integrated circuit** ( counter, multiplexer, De multiplexer ) |
| 13-14 |  **Digital Integrated circuit** (flip-flop, gates, chip, encoder, decoder ) |
| 15 | **First Mid Exam** |
| 16-17 |  **Logic Gates:**  NOT, AND, NAND , OR, NOR, X-OR, X-NOR and combinational network and operation with wave form |
| 18-20 | **Integrated Circuits:** Flip-Flops(SR, D, JK, and T |
| 21-22 | **Integrated Circuits:** Registers and Counters. |
| 23-24 | **Boolean Algebra:** Definitions and theorems |
| 25-28 | **Logic Simplification :** Truth table , Karnauph maps(Two-and three Variable map, Four Variable Map) |
| 29 | **Second Mid Exam** |

Each term should include not less than 16 weeks  |   |
| **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

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| Weeks | Topics  |
| 1 | Introduction to Electronic Work Bench (EWB V.5) is the program that used in practical lab to design electronic circuits. |
| 2-4 | Design logic circuit with truth table (NOT, AND, NAND, OR, NOR, X-OR, X-NOR) |
| 5-7 | Design Integrated Circuit with truth table( Flip-Flops ,Type of flip-flop -SR, D, T, JK) |
| 8-10 | Arithmetic number system ( Half Adder, Full adder, binary adder) |
| 11-13 | Arithmetic number system ( Subtractor, half-subtractor , full-subtractor ) |
| 14-15 | Design circuit to account binary number like counter (Up-Down counter). |
| 16 | First Mid Exam |
| 17-18 | Design Digital Integrated circuit and how to use the (Multiplexer, DE multiplexer) |
| 19-20 | Design Digital Integrated circuit and how to use the (decoder, Encoder) |
| 21-23 | Digital integrated circuit used multiplexer to account binary number with example |
| 24-26 | Arithmetic number system ( Decrementer ,Incrementer) |
| 27 | Second Mid Exam |

 | Arazu Saeed (2 hrs) |
| **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 answersExamples should be providedQ1/ Choose the correct answer1. What is the decimal value of the binary number 1111?

 A. 15 B. 4 C. 642-[Convert the hexadecimal number B2 to binary](http://www.proprofs.com/discuss/q/204463/convert-the-hexadecimal-nuber-b2-to-binary)A. 100011 B.  11011 C.  10110010 3-[Convert the binary number 11011 to hexadecimal](http://www.proprofs.com/discuss/q/169539/convert-the-binary-number-11011-to-hexadecimal)A. 1A B. B1 C. 1B4- Base 10 refers to which number system? A .binary coded decimal B. decimal c. octal5- The weight of the LSB as a binary number is:1. 3 B. 2 c. 1
2. 6- The number of bits used to store a BCD digit is:

 A.1 B. 4 c. 87- The output will be a LOW for any case when one or more inputs are zero in a(n): A. OR gate B . AND gate C. NOT8- How many truth table entries are necessary for a four-input circuit?1. 8 B.16 C. 12

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| 9-One hex digit is sometimes referred to as a(n): Which is typically the longest: |
|  A. bit B. byte C. nibble  |

10- Which of the following logic expressions represents the logic diagram shown?http://www.indiabix.com/_files/images/digital-electronics/digital-systems/mcq4_1018_1.gifA. http://www.indiabix.com/_files/images/digital-electronics/digital-systems/mca4_1018c1.jpeg B. http://www.indiabix.com/_files/images/digital-electronics/digital-systems/mca4_1018d1.jpeg C. http://www.indiabix.com/_files/images/digital-electronics/digital-systems/mca4_1018b1.jpegQ2 A- Calculate the following 1. ii. iii. iiii.

 1010 0110 1111 110 +0011 +0011 -0111 \*111 B- convert the following 1. Convert the binary number 10101101 to decimal

 ii. Convert the decimal number 7542 to Binary  C/ Simplify this expressions. 1- AB+A(B+C)+B(B+C) 2-(X+Y)(X+Z) |
| **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 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.‌‌  |

Arazu Saeed