University of Mosul / College of Engineering / Department of Computer Engineering

Level 1 Laboratories

Description of the Electrical Circuits Analysis 1 Laboratory

1. General Information:	
Laboratory Name:	Electrical circuits analysis 1 Laboratory
Associated Course Name:	Electrical circuits analysis 1
Department:	Computer Engineering
Weekly Lab Hours:	12
Number of Weeks in the Semester:	15
Academic Level:	Level 1
Lab Supervisor:	Prof. Dr. Ahmed M. Alkababji

2. General Description of the Laboratory:

This lab serves the practical side of the Electrical Circuits 1 and 2 course, where students can learn about electrical and electronic devices and the correct way to use these devices in the Electrical Circuits Lab. This lab aims to enable students to acquire basic skills in how to build simple electrical circuits and how to use basic testing and measuring devices. In addition, a set of experiments is studied to prove the theories of electrical circuits in direct current and alternating current. Practical circuits are implemented on educational boards (kits) or by building the required circuits manually on breadboards.

3. Laboratory Objectives:

- To develop problem-solving skills and understand circuit theory through the application of techniques.
- To understand the voltage, current, and power of a given circuit.
- This course covers the basic concepts of electrical circuits.
- To build a foundation for understanding all electrical and electronic circuits.
- To understand Kirchhoff's current and voltage laws.

4. Learning Outcomes:

By the end of the lab, the student should be able to:

● Acquire and apply new knowledge and use appropriate learning strategies.

● Identify, analyze, and solve complex engineering problems according to the principles of engineering, science, and mathematics.

● Apply Ohm's law and analyze series and parallel resistive circuits, including the ability to perform Y Δ transformations and analyze circuits with dependent and independent sources.

● Apply Kirchhoff's laws to analyze and solve complex electrical circuits, both in DC and AC settings.

● Understand the properties of AC signals, including concepts related to frequency, amplitude, phase, and waveform.

● Analyze capacitive and inductive AC circuits, using appropriate mathematical tools and techniques to calculate voltage, current, and impedance.

● Understand the properties of AC signals, including concepts related to frequency, amplitude, phase, and waveform.

● Analyze capacitive and inductive AC circuits, using appropriate mathematical tools and techniques to calculate voltage, current, and resistance.

5. Weekly Experiment Schedule:

Week	Experiment Title	Tools / Software Used	Main Objective
1	Background information	(kits) and (breadboard), mustimeter, resistors and wires	Learn about laboratory equipment. Identify resistor values from their colors and connect basic electrical circuits.
2	Ohm's law and the physical properties of conductors	(kits) and (breadboard), mustimeter, resistors and wires, DC power supply	Proving Ohm's law practically when the physical properties of conductors are known and studying Ohm's law when the physical properties are not

			known.
3	Oscilloscope	Oscilloscope, (kits) and (breadboard), wires, AC power supply	Learn about the operation and uses of a Oscilloscope.
4	AC circuits and phase shift measurement	Oscilloscope, (kits) and (breadboard), wires, AC power supply, resistors, capacitors, inductors.	Understand the relationship between current and voltage in AC circuits and measure the phase angle between current and voltage using lysigraphs.
5	Kirchhoff's law	(kits) and (breadboard), mustimeter, resistors and wires, DC power supply	Practical proof of Kirchhoff's law in DC circuits
6	Phase representation of voltages and currents in AC circuits	Oscilloscope, (kits) and (breadboard), wires, AC power supply, resistors, capacitors, inductors.	Learn how to represent alternating variables with vectors and find the phase angle from a phase diagram.

6. Tools and Equipment Used:

- Multimeter.
- Linear Circuit Lab.
- Oscilloscope.
- Breadboard.

7. Safety Guidelines:

- Ensure the power is off when connecting devices.
- Do not touch electrical outlets or network components without the supervisor's permission.
- Remain calm and organize cables to avoid accidents.

● Use the simulator for routing experiments before testing on real devices.

8. Evaluation Method:	
Percentage	**Evaluation Item**
16%	Quizzes
10%	Field assignments
10%	Projects/labs
4%	Reports
10%	Midterm exam
50%	Final exam

9. References and Sources:

- BASIC ENGINEERING CIRCUIT ANALYSIS 10th Ed by J. Irwin
- Fundamentals of Electric Circuits, C.K. Alexander and M.N.O Sadiku, McGraw-Hill Education

10. Attachments:

- Experimental report form
- Photos of the laboratory and equipment used

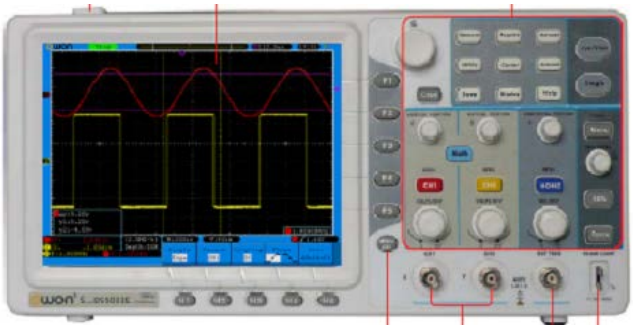
Electrical Circuits Analysis Laboratory

Laboratory Equipment:

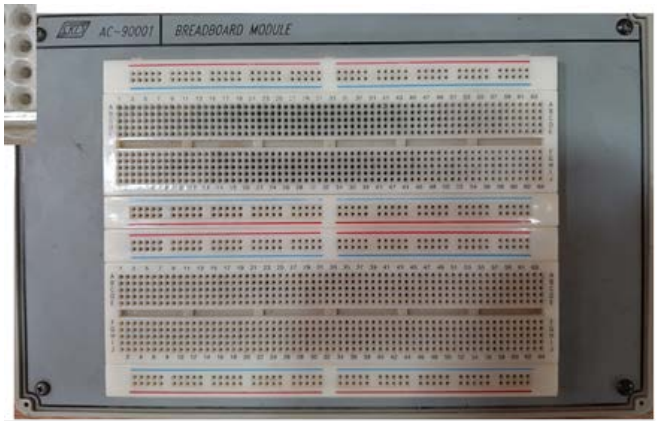
Multimeter: A multi-purpose device that can be used to measure voltage, current, resistance, and capacitance (and in some types, frequency).

Linear Circuit Lab:

Oscilloscope : The waveguide is an important device used in the laboratory. It is used to display measurement results as simultaneous plots on a screen divided into a graph paper, with the vertical axis representing voltage and the horizontal axis representing time.



Breadboard : The workbench consists of (640 points * 2) with every five vertical points sharing an electrical connection. For example, points 1E, 1D, 1C, 1B, 1A are considered a single point, and points 1J, 1I, 1H, 1G, 1F are considered a single point and are separated from the previous ones.



Experimental report form

التقرير مطلوب من كل مجموعة من الطلاب (4) وحسب ماتم تقسيم المجاميع في المختبر تعمل كل مجموعة على كتابة وإعداد التقرير عن التجارب الاربعة , لكل تجربة تقرير مفصل جميع التقارير يجب ان تكون مختصرة من حيث الشرح وعدد الصفحات (3-4) وتظهر فهم الطالب للتجربة.

أدناه بعض التعليمات عن كيفية كتابة أجزاء التقرير

Abstract

ملخص عن الهدف من التجربة والأدوات التي تم استخدامها لتنفيذ خطوات التجربة

1- The aim of the experiment

2- The equipment used

THEORETICAL BACKGROUND

I. PROCEDURE

يتضمن خطوات التجربة التي تم تنفيذها داخل المختبر

The procedure section describes the procedure that you followed when carrying out the steps of the experiment. It is a record of what was done. Details of what variables were recorded, what observations were made, and what types of instrumentation were used should be included.

II. EXPERIMENTAL RESULTS

يستعرض النتائج التي تم الحصول عليها بعد تنفيذ خطوات التجربة

Reviews the results obtained after implementing the experimental steps.

III. CONCLUSIONS

في هذا الجزء يتم الكتابة عن الخبرة العملية التي اكتسبها الطالب بعد اجراء التجربة وماهي الاستنتاجات التي يستطيع الطالب التعبير عنها في نهاية كل تجربة.

The conclusion section is a short review of the aims or key questions raised in the experiment results and procedure sections.

Description of the Electrical Circuits Analysis 2 Laboratory

1. General Information:	
Laboratory Name:	Electrical circuits analysis 2 Laboratory
Associated Course Name:	Electrical circuits analysis 1
Department:	Computer Engineering
Weekly Lab Hours:	12
Number of Weeks in the Semester:	15
Academic Level:	Level 1
Lab Supervisor:	Prof. Dr. Ahmed M. Alkababji

2. General Description of the Laboratory:

This lab serves the practical side of the Electrical Circuits 1 and 2 course, where students can learn about electrical and electronic devices and the correct way to use these devices in the Electrical Circuits Lab. This lab aims to enable students to acquire basic skills in how to build simple electrical circuits and how to use basic testing and measuring devices. In addition, a set of experiments is studied to prove the theories of electrical circuits in direct current and alternating current. Practical circuits are implemented on educational boards (kits) or by building the required circuits manually on breadboards.

3. Laboratory Objectives:

- Develop problem-solving skills and understand circuit analysis theories through the application of (superposition, source transformation, mesh analysis, and nodal analysis).
- Determine the conditions for maximum power transfer to any circuit element.
- Understand the importance of transients in RL, RC, and RLC circuits.
- Understand the principles of resonant circuits.
- Understand the principles of three-phase circuits.

4. Learning Outcomes:

By the end of the lab, the student should be able to:

● Demonstrate a comprehensive understanding of the circuit analysis theories underlying direct current (DC) and alternating current (AC) electrical circuits.

● Apply circuit analysis theories (superposition, source transformation, network analysis, and nodal analysis).

● Apply Thevenin and Norton's theorem to determine maximum power transfer for both DC and AC circuits.

● Analyze the transient responses of RL, RC, and RLC for various circuit configurations.

5. Weekly Experiment Schedule:

Week	Experiment Title	Tools / Software Used	Main Objective
1	Superposition Theory	(kits) and (breadboard), mustimeter, resistors and wires, DC power supply	Experimental proof of the superposition theorem in DC circuits.
2	Thevenin's Theorem	(kits) and (breadboard), mustimeter, resistors and wires, DC power supply, AC power supply.	Investigate the Mesh and Nodel analyses in DC circuits. Experimental proof of Thevenin's theorem in DC circuits and prove that the maximum power transfer occurs when the load resistance is equal to the equivalent resistance of the network.
3	Diode Properties	Oscilloscope, (kits) and (breadboard), wires, AC power supply and diodes	Understand the properties of the P-N junction diode.
4	Diode Applications	Oscilloscope, (kits) and	Understand some

		(breadboard), wires, AC power supply and diodes	applications of the diode.
5	Transient State in RL, RC Circuits	Oscilloscope, (kits) and (breadboard), wires, AC power supply, resistors, capacitors, inductors.	Understand the transient state in RL and RC circuits.
6	Transient State in RLC Circuits	Oscilloscope, (kits) and (breadboard), wires, AC power supply, resistors, capacitors, inductors.	Understand the transient state in RLC circuits.

6. Tools and Equipment Used:

- Multimeter.
- Linear Circuit Lab.
- Oscilloscope.
- Breadboard.

7. Safety Guidelines:

- Ensure the power is off when connecting devices.
- Do not touch electrical outlets or network components without the supervisor's permission.
- Remain calm and organize cables to avoid accidents.
- Use the simulator for routing experiments before testing on real devices.

8. Evaluation Method:

Percentage	Evaluation Item
16%	Quizzes
10%	Field assignments
10%	Projects/labs
4%	Reports
10%	Midterm exam
50%	Final exam

9. References and Sources:

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10. Attachments:

- Experimental report form
- Photos of the laboratory and equipment used

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Laboratory Equipment:

Multimeter: A multi-purpose device that can be used to measure voltage, current, resistance, and capacitance (and in some types, frequency).

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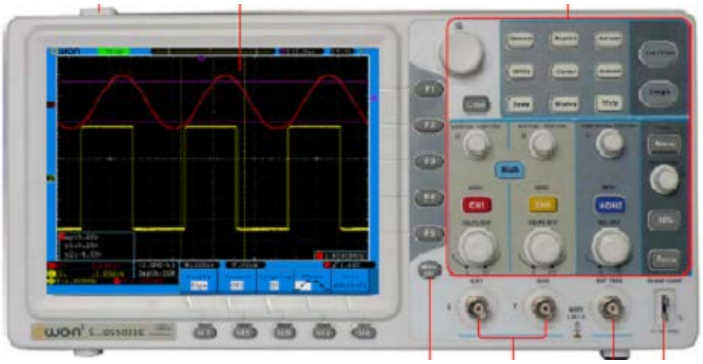
Oscilloscope : The waveguide is an important device used in the laboratory. It is used to display measurement results as simultaneous plots on a screen divided into a graph paper, with the vertical axis representing voltage and the horizontal axis representing time.



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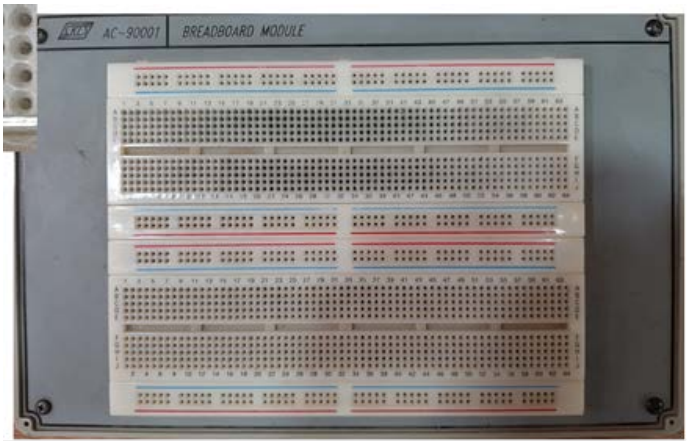

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THEORETICAL BACKGROUND

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The procedure section describes the procedure that you followed when carrying out the steps of the experiment. It is a record of what was done. Details of what variables were recorded, what observations were made, and what types of instrumentation were used should be included.

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يستعرض النتائج التي تم الحصول عليها بعد تنفيذ خطوات التجربة

Reviews the results obtained after implementing the experimental steps.

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The conclusion section is a short review of the aims or key questions raised in the experiment results and procedure sections.

Description of the Computer Laboratory

1. General Information:	
Laboratory Name:	Computer Lab (Lab 312)
Associated Course Name:	Computer Fundamentals
Department:	Computer Engineering
Weekly Lab Hours:	1 Hour
Number of Weeks in the Semester:	15 Weeks
Academic Level:	Level One
Lab Supervisor:	Mr. Noor Mowafeq Jaber

2. General Description of the Laboratory:

The computer lab aims to reinforce the theoretical concepts covered in the Computer Fundamentals course lectures through practical applications using tools and software available in the lab. The lab provides an interactive environment that enables students to acquire computer skills and the computer-programming environment through office software applications, in addition to enhancing their understanding of computer capabilities.

3. Laboratory Objectives:

- Train students on how to use a computer.
- Identify computer components, including hardware, equipment, and software.
- Learn how to use some office programs and computer software applications.
- Learn how to create a specific work environment and a general work environment within a computer system.

4. Learning Outcomes:

By the end of the lab, the student should be able to:

- Operate a computer.
- Set up a private and public work environment, making features available and accessible to users.
- Use office software, prepare reports, and analyze data.
- Document lectures and prepare professional reports.

5. Weekly Experiment Schedule:			
Week	**Experiment Title**	**Tools / Software Used**	**Main Objective**
1	Computer and Operating System	laboratory computer	Familiarize yourself with computers and the concept of an operating system
2	Hardware and Software	laboratory computer	Familiarize yourself with the hardware and software components of a computer
3	The Relationship Between Hardware and Software	laboratory computer	Familiarize yourself with hardware and software
4	Windows File Management	laboratory computer	Manage and manipulate files
5	Computer Components	laboratory computer	Familiarize yourself with the parts and components of a computer
6	Connecting Computer Components	laboratory computer	Learn how to assemble computer components
7	Practical Test	All tools	Measure student comprehension of the material
8	Getting to Know Microsoft Office	Microsoft Office program	Familiarize yourself with Microsoft Office and its applications
9	Using Word program	Microsoft Office program	Ability to write reports and documents
10	Editing and Formatting Documents	Microsoft Office program	Learn to analyze data, gather information, and create a database
11	Using Excel	Microsoft Office program	Learn to analyze data, gather information, and create a database using Excel

12	Organizing a Worksheet Using Worksheet	Microsoft Office program	Manage data and organize a worksheet
13	Creating Formulas, Graphing, and Analyzing Data	Microsoft Office program	Analyze data and create graphs
14	Comprehensive Review and Discussion of Reports	All tools	Integrate acquired skills into a final report and discuss it with students

6. Tools and Equipment Used:

- Laboratory computers
- Microsoft Office software

7. Safety Guidelines:

- Ensure the power is off when connecting devices.
- Do not touch electrical outlets or network components without supervisor permission.
- Remain calm and organize cables to avoid accidents.

8. Evaluation Method:

Evaluation Item	Percentage
Attendance and Participation	10%
Laboratory Report	10%
Quizzes	50%
Final Practical Exam	30%

9. References and Sources:

- IC3 GS5 Certification Guide Using Windows 10 & Office 2016, Print ISBN: 978-1-55332-463-8
- 2015 Computer Literacy BASICS: A Comprehensive Guide to IC3 Connie Morrison, Dolores Wells, Lisa Ruffolo Cengage Learning. ISBN: 128576658X


Office
Excel
OneNote
Outlook
Word
PowerPoint

Description of the Digital System Fundamentals Laboratory

1. General Information:	
Laboratory Name:	Digital System Fundamentals Laboratory (Lab 210)
Associated Course Name:	Digital System Fundamentals
Department:	Computer Engineering
Weekly Lab Hours:	3 hours
Number of Weeks in the Semester:	15 weeks
Academic Level:	First level
Lab Supervisor:	Dr. Shawkat Sabah Khairullah

2. General Description of the Laboratory:

This course aim to ensure that students achieve a thorough understanding of the core concepts and techniques covered in the "Digital Logic Fundamentals" course. By the end of the course, students should be able to apply their knowledge and skills in the laboratory to solve problems, design and fabricate digital logic circuits, and comprehend the practical applications of these fundamental concepts in computer engineering.

3. Laboratory Objectives:

The basic objective of this lab is to give an introduction to digital logic design with an emphasis on practical design techniques and hardware circuit implementation. Topics include number representation in digital computers, Boolean algebra theorems, theory of Boolean logic functions, mapping techniques and logic function minimization, design of combinational and interactive digital circuits such as magnitude comparators, binary decoder and encoder, adder and subtractor logic circuits. An introduction on designing digital circuits using schematic capture and logic simulation is included.

4. Learning Outcomes:

Here are Seven Course Learning Outcomes (CLOs) for the course "Digital System Fundamentals":

CLO 1: Understand the fundamentals of number representation in digital computers, including binary arithmetic, binary representation of numbers, and conversions between the different number representations such as binary, octal, hexadecimal, and decimal.

CLO 2: Apply properties of Boolean algebra theorems and truth table principles to simplify and analyze the Boolean logic functions of digital logic circuits.

CLO 3: Utilize Karnaugh maps as a graphical tool for minimizing and optimizing Boolean logical expressions and truth tables.

CLO 4: Design and analyze combinational, and interactive digital circuits such as magnitude comparators, binary adders and subtractors, binary decoder and encoder circuits and understand their applications.

CLO 5: Demonstrate proficiency in the basic skills to design and fabricate digital logic circuits using discrete logic design and various logic gates and components.

CLO 6: An ability to identify, analyze, and solve complex engineering problems according to principles of engineering, science, and
mathematics.

CLO 7: An ability to participate and work professionally and ethically in
different projects to function on multi-disciplinary teams.

5. Weekly Experiment Schedule:

Week	Experiment Title	Tools / Software Used	Main Objective
1, 2	Experiment (1): Understanding the Operation of Basic Logic Gates	M-Logic Kit	Introduce students to using the M Logic Kit with its basic logic gates: NOT, AND, OR, NAND, NOR, XOR, and XNOR. In this lab you will use what you learned in the digital system fundamentals class to design more complex logic gates. You will then test your logic circuit and record your results.

3, 4	Experiment (2): Boolean Algebra Laws	M-Logic Kit	Boolean equations can be simplified using Boolean algebra laws, DeMorgan's theorem, or/and Karnaugh maps. In this experiment, we will present Boolean Laws and rules, and then verify them.
5, 6	Experiment (3): Boolean Expression Simplification	M-Logic Kit	The purpose of this experiment is to demonstrate the operation and characteristics of a CMOS logic gates: NAND, NOR and how these logic gates are used to implement any logic function.
7, 8	Experiment (4): Functional Minimization using Karnaugh Map	M-Logic Kit	minimizing the implementation of logic functions using Karnaugh map into the smallest possible amount of basic logic gates NOT, OR, AND.
9, 10	Experiment (5): Design of Digital Multiplexer and Comparator Circuits	M-Logic Kit	implementing logic functions using multiplexer-based logic and comparator logic circuits.
11, 12	Experiment (6): Implementation of Digital Decoder and Encoder Circuits	M-Logic Kit	implementing logic functions using decoder and encoder logic circuits.
13, 14	Experiment (7): Implementation of Adder and Subtractor Circuits using Half-Adder and Full-Adder/Ripple Carry Adder Circuits	M-Logic Kit	To familiarize the students with the functionality of the digital adder-subtractor circuits.
15	Final Exam		

6. Tools and Equipment Used:

- M Logic Kit
- Wires
- Voltmeter

7. Safety Guidelines:

Ensure the power is disconnected when connecting devices.

Do not touch electrical outlets or main device components without the supervisor's permission.

Maintain quiet and organize cables and devices to avoid accidents.

8. Evaluation Method:

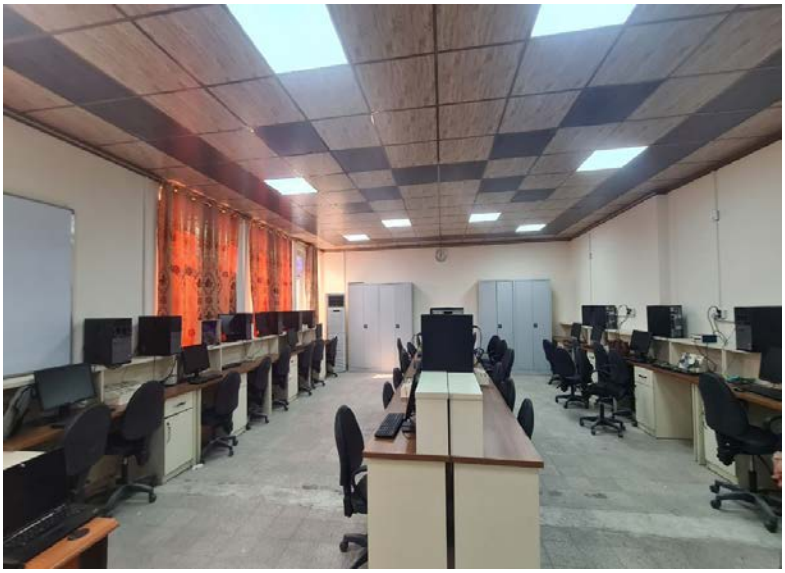
Percentage	Evaluation Item
10%	Reports
6%	Projects/Lab
10%	Final Exam

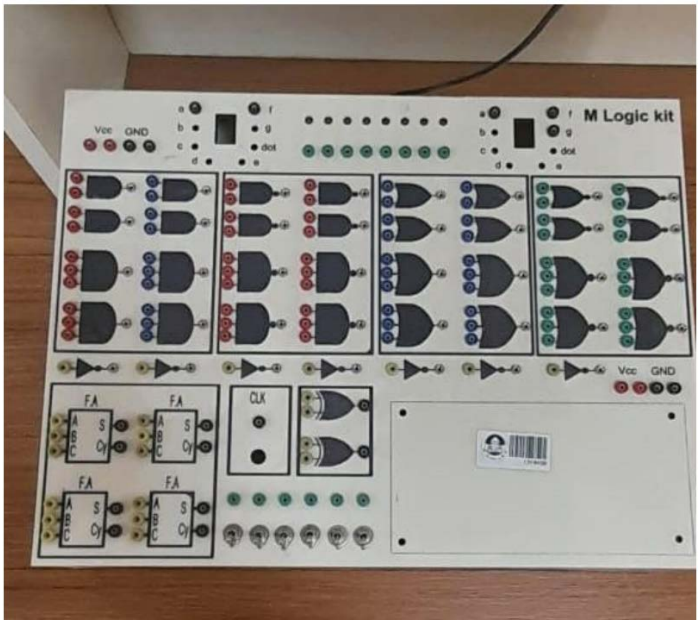
9. References and Sources:

- Modern digital design by Richard S. Sandige (McGraw-Hill)
- Digital Fundamentals, 9th Edition, Thomas L. Floyd, Pearson Prentice Hall, 2006.
- Introduction to Logic Design, 3rd edition, Alan Marcovitz, McGraw-Hill, 2010.
- Digital Design, 5th edition, Morris Mano, Pearson Prentice Hall, 2013.

10. Attachments:

- Experiment Report Template
- Experiment Assignment




M Logic kit
Vcc GND
FA
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113LGE04004
مقتبر المعالجات
113LGE03003
مقتبر المنطق

Description of Programming using C++ language Lab

1. **General Information:**	
Laboratory Name:	Programming using C++ language (Lab 312)
Associated Course Name:	Programming using C++ language
Department:	Computer Engineering
Weekly Lab Hours:	3 Hours
Number of Weeks in the Semester:	15 Weeks
Academic Level:	First level
Lab Supervisor:	Sahar Khalid Ahmed

2. General description of the laboratory:

This course introduces students to the **C++ programming language**, which serves as a starting level to enter programming. It starts from the basics of programming and gives a comprehensive overview of the **C++** programming language, detailing all aspects **of the C++** language from data types, to operators and expressions, to if statements, as well as loops, arrays, strings, and structure. The course provides practical training to help the student write programs, test his programming skills, and prepare him for realistic application.

3. Laboratory Objectives:

- Understand the basics of C++ programming
- Develop practical knowledge of the software infrastructure: definitions, variables, types, instructions.
- Applying Structured Programming Concepts
- Use conditional sentences (if, switch) and repetition clauses (for, while, do-while).
- Enhance Functions writing skills
- Working with Arrays
- Promote analytical thinking and problem solving
- Debugging and software tracking practice

- Developing teamwork and cooperative programming skills, as the student learned to work in a team and share and review code.
- Understand structures and use them to group relevant data into a single data type, helping to organize complex data in a clearer and more efficient way.

4. Learning Outcomes:

At the end of the semester the following objectives are achieved:

- Students understand "programming using C++" with an emphasis on the basic concepts and skills needed to develop engineered software using the C++ programming language.
- Students gain a solid understanding of C++ programming principles and will be able to apply them effectively in practical programming scenarios.
- Documenting the software project and preparing a professional report
- Work within a team to solve programming problems.

5. Weekly Experiment Schedule:

Week	Experiment Title	Tools / Software Used	Main Objective
1	IDE (download, install, use)	Computer/Software Codeblock	Learn about installing and using Codeblock
2	C++ programming basics	Computer/Software Codeblock	Identify (identifiers, comments, variables, assignment statement) and apply them in practice.
3	input and output statements (cin, cout).	Computer/Software Codeblock	Understand and use input and output statements (cin ،cout)
4	Operators: arithmetic, logical and relational operators	Computer/Software Codeblock	Application of arithmetic, logical and relational expressions
5	Selection statement (if statement)	Computer/Software Codeblock	Understand and use conditional clause to solve

			programming problems (if sentence)
6	Selection statements (if and switch)	Computer/Software Codeblock	Understand and use conditional clause to solve programming problems (switch clause)
7	Loop statement (for)	Computer/Software Codeblock	Ability to employ loops to solve programming problems (for statement)
8	Loop statements (while and do)	Computer/Software Codeblock	Ability to employ loops to solve programming problems (while and do clauses)
9	Functions (call by value)	Computer/Software Codeblock	Enhance function writing skills (recall by value)
10	Functions (call by reference)	Computer/Software Codeblock	Enhance function writing skills (recall by reference)
11	One-dimensional array	Computer/Software Codeblock	Working with one-dimensional arrays
12	Two-dimensional array	Computer/Software Codeblock	Dealing with two-dimensional matrices
13	structures and functions	Computer/Software Codeblock	Understand structures and use them to group relevant data into a single data type
14	Software project	Computer/Software Codeblock	Work in a team to solve programming problems

6. **Tools and equipment used:**

- Lab Computers
- Code block software

7. Safety Guide:

- Ensure that the power supply is unplugged when connecting devices.
- Do not touch electrical outlets without the permission of the supervisor.

8. Evaluation Mechanism:

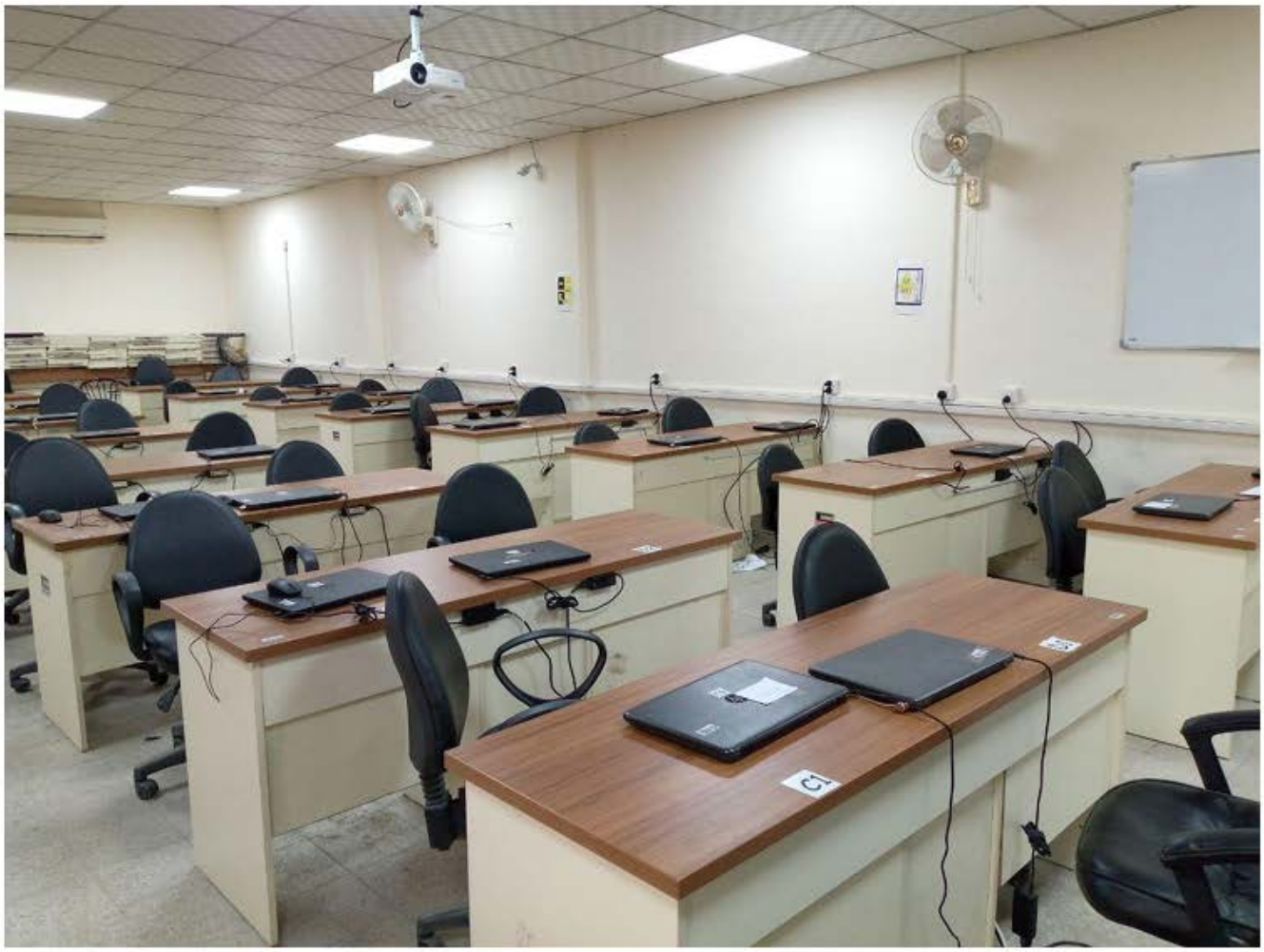
Ratio	Evaluation element
20%	Attendance and participation
40%	Quizzes
30%	Final practical exam
10%	Practical Project

9. References and sources:

- C++ How to Program, 8/E, Paul Deitel & Harvey Deitel, ©2012
- The Complete Reference in C++ By Herbert Schildt, 4thedition,2003

10. Attachments:


VISTOUCH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Safety Starts
With
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Description of the Computer-Aided Engineering Drawing Laboratory

1. General Information:	
Laboratory Name:	Computer-aided engineering drawing lab (lab 312)
Associated Course Name:	Computer-aided engineering drawing
Department:	Computer Engineering
Weekly Lab Hours:	12 Hour
Number of Weeks in the Semester:	15
Academic Level:	First Level
Lab Supervisor:	Joan Atheel Ahmed

2. General Description of the Laboratory:

The Computer-Aided Engineering Drawing Lab is an advanced learning environment equipped with the latest engineering technologies and software. Students learn and apply engineering drawing concepts using computers and specialized software, enabling them to acquire the skills necessary to create accurate and advanced engineering models and drawings. This lab is an essential tool in engineering and design education, providing students with practical experience using engineering software such as AutoCAD and SolidWorks. It enables them to apply engineering drawing concepts to practical projects and develop their skills in engineering analysis and design.

3. Laboratory Objectives:

The Computer-Aided Engineering Drawing Lab has several main objectives:

- Develop students' skills in using engineering drawing programs such as AutoCAD, SolidWorks, and others.
- Apply engineering concepts to practical computer-aided projects.
- Improve accuracy and speed in creating engineering drawings.
- Develop the ability to solve engineering problems using computer-aided engineering drawing tools.
- Prepare students for work in advanced engineering environments that utilize modern technology.
- Overall, the lab aims to prepare students to work efficiently in the field of engineering

using computer-aided engineering drawing tools.

4. Learning Outcomes:

The Computer-Assisted Engineering Drawing Lab aims to develop students' skills in using engineering software to create accurate and precise drawings. Learning outcomes for such a lab may include:

● Use of Engineering Software: Students learn how to use engineering drawing software such as AutoCAD, SolidWorks, or Catia to create two- and three-dimensional engineering drawings.

● Engineering Drawing: Students acquire basic engineering drawing skills, including creating geometric shapes, details, and assemblies.

● Design Thinking: The lab encourages students to develop design thinking skills by applying engineering principles to solve problems and design solutions.

● Technical Communication: Students learn how to effectively present their ideas and designs through engineering drawings, enhancing their ability to communicate technically.

● Precision Work and Attention to Detail: The lab reinforces the importance of precision and attention to detail in creating engineering drawings, which are essential skills in engineering fields.

● Practical Application: The lab allows students to apply theoretical concepts in a practical setting, enhancing their understanding of engineering subjects.

● By completing the computer-aided engineering drawing lab, students will have acquired the practical and technical skills necessary to succeed in their future engineering projects.

5. Weekly Experiment Schedule:

Week	Experiment Title	Tools / Software Used	Main Objective
1	Introduction to Engineering Drawing	Lab 1: Getting started: 1- Start a new drawing. 2- User Interface. 3- Drafting settingsI (Snap, Rectangular & Isometric grid). 4- Limits. 5- Units. 6- Absolute & Relative coordinate system. 7- Ortho	Proficiency in AutoCAD: Gain a comprehensive understanding of AutoCAD software, its basic commands, and tools necessary for professional 2D drawing, design, and drafting

2	Learn Program Instructions	Lab 2: Drawing I1- Point (DDPTYPE = POINT STYLE). 2- Line, Arc, Circle, Ellipse, Polygon, Rectangle	Proficiency in AutoCAD: Gain a comprehensive understanding of AutoCAD software, its basic commands, and tools necessary for professional 2D drawing, design, and drafting
3	Applying Commands to Draw Objects	Lab 3: Drawing II, View. 1- Zoom, Pan, Steering wheel. 2- Drafting settingsII.(Osnap, Polar snap). 3- Pline, Pedit. 4- Erase. 5- SelecƟng objects. 6- Ltype, Ltscale	Application of Drawing Commands: Acquire the ability to utilize various drawing commands in AutoCAD, including lines, circles, arcs, ellipses, polygons, and other geometric shapes, to create accurate and precise 2D drawings.
4	Applying Modify Menu Commands	Lab 4: ModifyI, Drawing III: 1- Copy, Rotate, Move, Scale, Stretch. 2- Undo, U, Redo. 3- Divide, Measure	Application of Drawing Commands: Acquire the ability to utilize various drawing commands in AutoCAD, including lines, circles, arcs, ellipses, polygons, and other geometric shapes, to create accurate and precise 2D drawings.
5	Applying Modify Menu Commands	Lab 5: Layers, Modify II: 1- Working with Layers. 2- Properties (Mo, Ch)... 3- Working with Grips. 4- Align	Modification and Editing Techniques: Develop skills in modifying and editing drawings by employing commands such as erase, trim,

			extend, mirror, lengthen, offset, chamfer, fillet, and other relevant tools to refine and adjust the design as required.
6	Applying Modify Menu Commands	Lab 6: Modify III. 1- Array, Offset, Fillet, Chamfer, Trim, Extend, Lengthen, Mirror, Break, Join, Explode.	Modification and Editing Techniques: Develop skills in modifying and editing drawings by employing commands such as erase, trim, extend, mirror, lengthen, offset, chamfer, fillet, and other relevant tools to refine and adjust the design as required.
7	Applying Modify Menu Commands	Lab 7: Annotation I, Modify IV, Inquiry: 1-Style, Text, Mtext, Ddedit, 2- ID, Dist, Area, Massprop	Dimensioning and Annotation: Understand the principles of dimensioning and annotation in engineering drawings. Learn to apply dimensioning commands, create text, use different font types, and utilize dimension styles to accurately convey measurements and annotations.
8			Mid Exam .
9	Measurements and Dimensions	Lab 10: Hatch, Hatchedit.. 2- tool paleΣes 2	Dimensioning and Annotation: Understand the principles of dimensioning and annotation in engineering drawings. Learn to apply

			dimensioning commands, create text, use different font types, and utilize dimension styles to accurately convey measurements and annotations.
10		Lab 11: Block I: 1- Block, Insert. 2- Wblock. 3- AΣributes, Block Editor. 4- Image, Draworder	Quiz
11	Drawing Objects	Lab 12: Block II: Parametric constraints. 2- Dynamic Block. 3- Tool paleΣes. 4- Jpgout, Bmpout.	Advanced Features and Techniques: Explore advanced features and techniques in AutoCAD, including working with layers, using design templates, inserting and managing blocks, working with 3D models, applying shading and better visibility commands, and utilizing design center and other relevant tools.
12	Drawing Worksheets	Plot Drawings: 1- Mspace, Pspace. 2- Mviewport. 3- Layouts. 4- Plot.	Advanced Features and Techniques: Explore advanced features and techniques in AutoCAD, including working with layers, using design templates, inserting and managing blocks, working with 3D models, applying shading and

			better visibility commands, and utilizing design center and other relevant tools.
13		Quiz 2	Dimensioning and Annotation: Understand the principles of dimensioning and annotation in engineering drawings. Learn to apply dimensioning commands, create text, use different font types, and utilize dimension styles to accurately convey measurements and annotations.
14	Drawing Worksheets	Plot Drawings: 1- Mspace, Pspace. 2- Mviewport. 3- Layouts. 4- Plot.	Dimensioning and Annotation: Understand the principles of dimensioning and annotation in engineering drawings. Learn to apply dimensioning commands, create text, use different font types, and utilize dimension styles to accurately convey measurements and annotations.
15		Final Exam	Final Exam

6. Tools and Equipment Used:

A computer-aided engineering lab typically contains a range of hardware and software that support the engineering learning and design process. Common tools and equipment in such labs include:

1. Computers: These computers are typically high-spec devices that run engineering design software smoothly.

2. Engineering Design (CAD) software: Such as AutoCAD, CATIA, and others. These programs allow students to create two- and three-dimensional models of engineering designs.

4. Graphics Tablets: Some labs may provide graphics tablets that allow students to draw more naturally on the computer.

6. Displays and Smart Boards: Displays or smart boards may be used to display lessons or to explain engineering concepts interactively.

7. Assistive equipment: These may also include headphones, microphones, and other equipment that supports interactive learning and collaboration.

The equipment and tools available in a computer-aided engineering lab vary depending on the needs of the educational institution, the curriculum, and available resources.

7. Safety Guidelines:

The Computer-Aided Engineering Drafting Lab Safety Guide includes several guidelines to ensure a safe and healthy work environment. Here are some key points:

1. Ensure electrical equipment is in good condition: Electrical equipment should be checked regularly to ensure it is in good condition and usable.

2. Avoid overloading electrical outlets: Electrical outlets should be avoided to avoid electrical shorts or fires.

3. Use personal protective equipment: Students should wear safety goggles and avoid wearing loose clothing that could catch on equipment.

4. Maintain lab cleanliness: The lab should be kept clean and organized to avoid accidents caused by obstacles or slips.

5. Follow safe equipment operation guidelines: Students should follow safe equipment operation guidelines in the lab.

6. Avoid prolonged sitting in front of the computer: Students should take regular breaks to avoid fatigue and eye strain.

7. Emergency Procedure Training: Students and instructors participating in the lab should be familiar with emergency procedures, such as shutting down equipment in an emergency and evacuating the lab when necessary.

These are some basic guidelines for ensuring safety in the computer-aided engineering drawing lab. It is important that this information be provided to students and trainees before beginning work in the lab.

8. Evaluation Method:

Percentage	Evaluation Item
16%	Quizzes
10%	Assignments
10%	Projects / Lab.
4%	Report
10%	Midterm Exam
50%	Final Practical Exam

9. References and Sources:

● "Autodesk AutoCAD 2022 Tutorial First Level 2D Fundamentals" –

● "Engineering Drawing with CAD Applications" – Covers the fundamentals of engineering drawing and its applications using CAD software

10. Attachments:

• Experimental Report Form

• Weekly Work Plan


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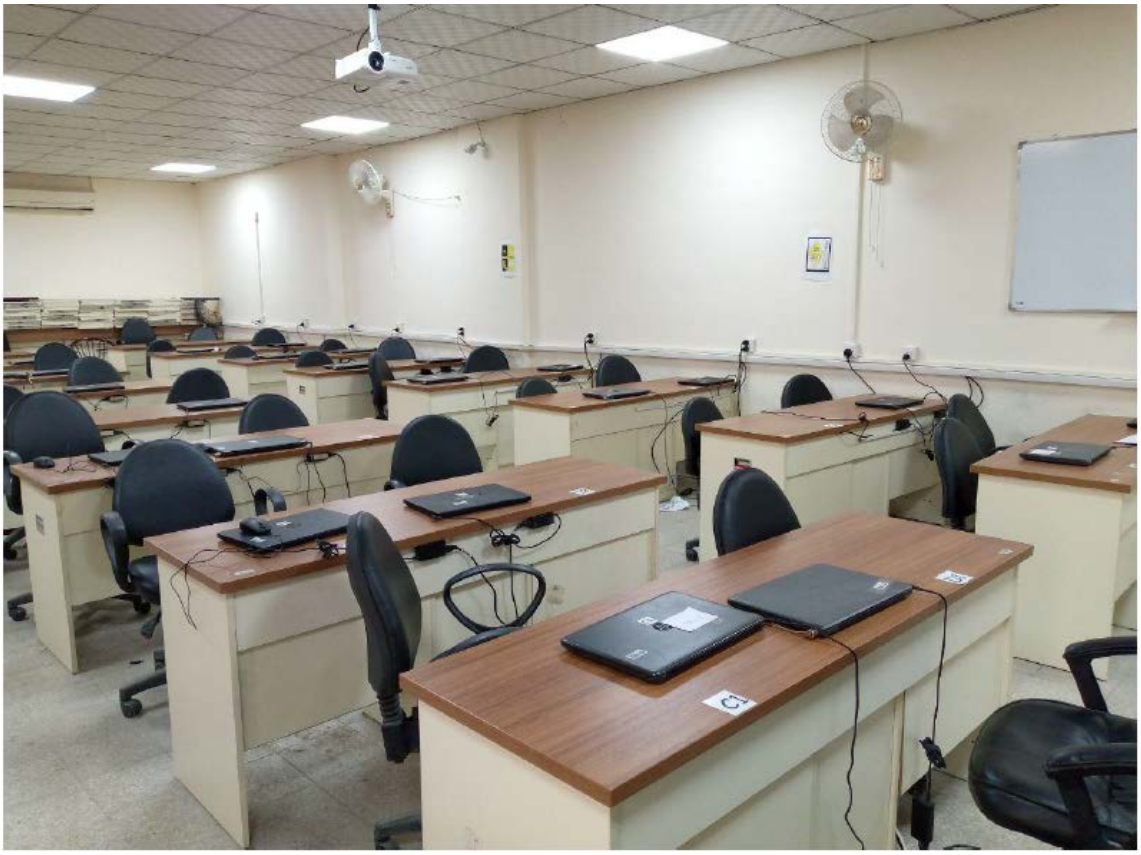


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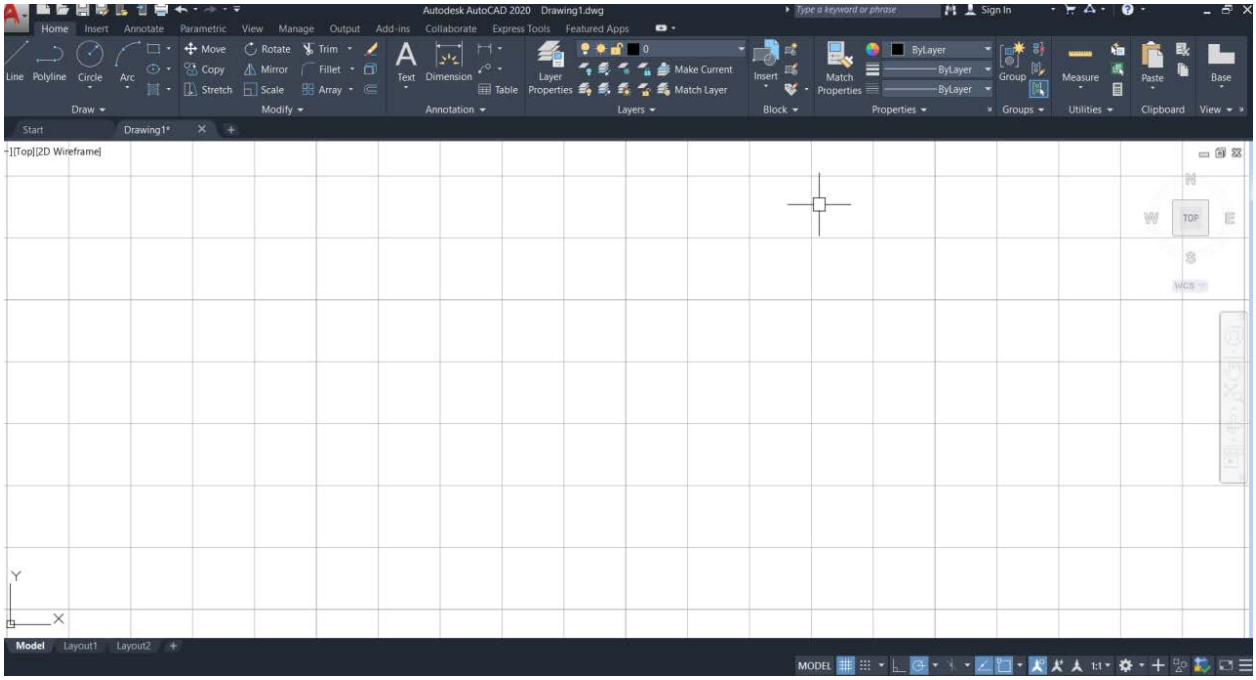
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