



منهج قسم الهندسة الكهربائية

كلية الهندسة
جامعة واسط

2025-2026



نموذج وصف البرنامج الأكاديمي

اسم الجامعة :- جامعة واسط
.....

الكلية /المعهد :- كلية الهندسة
.....

القسم العلمي :- قسم الهندسة الكهربائية
.....

اسم البرنامج الأكاديمي او المهني :- بكالوريوس الهندسة الكهربائية
.....

اسم الشهادة النهائية :- بكالوريوس في الهندسة الكهربائية
.....

تاريخ اعداد الوصف :-

تاريخ ملء الملف :- 2025/9/1

التوقيع :-

اسم معاون العلمي :- أ.م.د محمد غالب محسن
التاريخ :- 2025/9/1

التوقيع :-

اسم رئيس القسم :- أ.م.د أمجد يوسف صاحب
التاريخ :- 2025/9/1

دقق الملف من قبل /شعبة ضمان الجودة والاداء الجامعي

اسم مدير شعبة ضمان الجودة والاداء الجامعي :- أ.م.د حيدر ماجد
التاريخ :- 2025/9/1

التوقيع :-

مصادقة السيد العميد
أ.د ثائر سعود الغشام



1 المقدمة

1.1 الهدف

إعداد طلاب الهندسة الكهربائية لمسارات مهنية ناجحة من خلال تزويدهم بمهارات قابلة للتطبيق ، ومساعدتهم على اكتساب الخبرة، وتنمية حس التفكير النقدي لديهم.

الرؤية

تبني عقول منفتحة لتدريس الأفكار المبتكرة وتشجيعها وتعلمها.

الاهداف التعليمية للبرنامج

المتخرجون من بكالوريوس الهندسة الكهربائية سوف :

- أ - ممارسة مهنة الهندسة الكهربائية في القطاعين العام والخاص، بما في ذلك -على سبيل المثال لا الحصر- الجهات الحكومية ذات الصلة، والمكاتب الاستشارية، وشركات المقاولات، ومجالات التسويق، وريادة الأعمال
- ب- المشاركة في أنشطة التطوير المهني المستمر من خلال السعي للحصول على دراسات عليا و/أو اغتنام فرص تعليمية أخرى، وذلك لمواجهة التحديات الناشئة.
- ت- تطوير مساراتهم المهنية من خلال تحمل المسؤولية وتولي أدوار قيادية



1.2 مخرجات البرنامج

- أ. القدرة على تطبيق المعرفة بالرياضيات والعلوم في الهندسة.
- ب. القدرة على تصميم التجارب وإجرائها، وكذلك تحليل البيانات والنتائج وتفسيرها
- ت- القدرة على تصميم نظام أو مكون أو عملية لتلبية الاحتياجات المطلوبة ضمن قيود واقعية، مثل القيود الاقتصادية والبيئية والاجتماعية والسياسية والأخلاقية وقيود السلامة.
- ث - القدرة على العمل ضمن فرق متعددة التخصصات.
- ج - القدرة على تحديد المشكلات الهندسية وصياغتها وحلها.
- ح - فهم المسؤولية المهنية والأخلاقية.
- خ - التواصل مع الآخرين بشكل فعال.
- د- التعليم الشامل اللازم لفهم تأثير الحلول الهندسية في سياق عالمي واقتصادي وبيئي ومجتمعي.
- ذ- إدراك الحاجة إلى التعلم على المستوى البعيد والقدرة على الانخراط فيه.
- ر-الإلمام بالقضايا المعاصرة.
- ز- القدرة على استخدام التقنيات والمهارات والأدوات الهندسية الحديثة اللازمة للممارسة الهندسية.



1.3 Electrical Engineering Program: Mapping PO'S to PEO'S

Program Outcomes (PO'S) Code	Program Educational objectives (PEO'S)		
	i	ii	iii
a	V		
b	V		
c	V		
d	V	V	
e	V		
f	V	V	V
g	V		
h	V	V	
i	V	V	
j	V	V	V
k	V		V





2 Course Description

Courses are coded as follows:

1. Course code and number
2. Course title
3. Parenthesized numerals, e.g., (4-3-1-3), indicate, in order, the credit hour, the classroom hours (1 hour = 1 credit hour), tutorial hours (credit hour = 0), and the laboratory hours (2-3 hour = 1 credit hour).

Prerequisites, if any, are indicated at the course description. These have been established to assure an adequate and uniform background for students in advanced classes. Occasionally, students may feel they already have the appropriate background for an advanced course because of previous training, transfer credits, or credit by examination.

- **For year (2025-2026)the stages from one to three are prepared according to bologna as follow :-**

Course Numbering System

Course code = UoWEE123

The number consists of 5 digits as following: -

UoWEE12340 -50- First year

UoWEE 12350 -60- Second year

UoWEE12360 -70- Third year

COE- College Requirements

UoWEE - Department Requirements

WUO- University Requirements



- **For year (2025-2026)the stage fourth are prepared as follow :-**

Course Numbering System

Course code = EE

The number consists of 4 digits as following: -

EE 4301- EE 4316 Fourth year level

Numbers from 01, 02, 03, ...etc. describes the sequence of the course.



3 Graduation Requirements/ weekly hours and units

Requirements	Hrs./ week			Units
	Theo.	Tut.	Lab.	
University Requirements	14	0	4	18
	18			
College Requirements	3	1	0	5
	4			
Department Requirements	108	34	50	195
	192			
Total	125	35	54	218
	214			

4 University Requirements: 18 Units

Course Code	Course Title	Hrs./ Week			ECTS
		Theo.	Tut.	Lab.	
WUO4	Human Rights and Democracy	2	-	-	2
WUO1	Arabic Language	2	-	-	2
WU21	Arabic Language II	2	-	-	2
WUO3	Computer Basics and Programming	1	-	2	3
WU23	English Language III	2	-	-	2
WU05	Criminals of Al-Baath Regime	2	-	-	2
WU22	Computer II	1	-	2	3
EE 4107	English Language VII	1	-	-	1
EE 4108	English Language VIII	1	-	-	1
Total		14	0	4	18
		18			





5 College Requirements: 5 Units

Course Code	Course Title	Hrs./ week			ECTS
		Theo.	Tut.	Lab.	
COE01	Mathematics I	3	1	-	5
Total		3	1	0	5
		4			





Department Requirements: 195 Units

Course Code	Course Title	Hrs./ week			ECTS
		Theo	Tut.	Lab.	
UoWEE12346	Digital Technique I	1	1	2	4
UoWEE12348	Basics of Electrical Engineering I and Lab I	3	1	2	7
UoWEE12349	Electronics Physics	3	1	-	7
UoWEE12353	English Language	2	-	-	2
UoWEE12354	Digital Technique II	1	1	2	4
UoWEE12355	Mathematics II	3	1	-	5
UoWEE12356	Basic of Electrical Engineering-II and Lab-II	3	1	2	7
UoWEE12357	Engineering Drawing & AutoCAD	3	1	2	4
UoWEE12358	Mechanical Engineering	3	-	-	3
UoWEE12360	Programming language (C++ , python & Matlab Programming)	2	1	2	5
Total for 1st year		24	8	12	48
UoWEE123611	Engineering Mathematics I	3	1	-	4
UoWEE123612	Electromagnetic Fields I	2	1	-	4
UoWEE123613	Electrical Circuits I	2	1	-	4
UoWEE123614	Electronic Circuits I	2	1	2	5
UoWEE123615	Electrical Machines I	2	1	-	5
UoWEE123616	Computer Architecture	2	-	2	4
UoWEE12368	Engineering Mathematics II	3	1	-	4
UoWEE12369	Electromagnetic Fields II	2	1	-	4
UoWEE12370	Electrical Circuits II	2	1	-	4
UoWEE12371	Electronic Circuits II	2	1	2	5
UoWEE12372	Electrical Machines II	2	1	2	4
UoWEE12373	Embedded Systems & Programmable Logic Controller	2	-	2	4
Total for 2nd year		26	10	10	51
UoWEE12375	Engineering Analysis I	3	1	-	4
UoWEE12376	Electrical Machines III	2	1	2	5
UoWEE12377	Electronics III	2	1	2	5
UoWEE12378	Communications Theories I	2	1	-	5
UoWEE12379	Antennas & Waves Propagation I	2	1	-	5
UoWEE12380	Electric Power Systems I	3	-	2	5
UoWEE12381	English Language V	1	-	-	1
UoWEE12382	Engineering Analysis II	3	1	-	4
UoWEE12383	Electrical Machines IV	2	1	2	5
UoWEE12384	Electronics IV	2	1	2	5
UoWEE12385	Communications Theories II	2	1	-	5
UoWEE12386	Antennas & Waves Propagation II	2	1	-	5
UoWEE12387	Electric Power Systems II	3	-	2	5
UoWEE12388	English Language VI	1	-	-	1
Total for 3rd year		30	10	12	60
EE 4301	Laboratories V	-	-	4	2
EE 4302	Digital Communications I	3	-	-	3
EE 4303	Electric Power III	2	1	-	2



EE 4304	Power Electronics	2	1	-	2
EE 4305	Computer Networks I	1		2	2
EE 4306	Control Engineering I	3	0	-	3
EE 4307	Advanced Electronics I	2	1	-	2
EE 4308	Engineering Project (one year)	1	-	2	2
EE 4309	Laboratories VI	-	-	4	2
EE 4310	Digital Communications II	3	-	-	3
EE 4311	Electric Power IV	2	1	-	2
EE 4312	Advanced Machines	2	1	-	2
EE 4313	Computer Networks II	1	-	2	2
EE 4314	Control Engineering II	3	0	-	3
EE 4315	Advanced Electronics II	2	1	-	2
EE 4316	Engineering Project (one year)	1	-	2	2
Total for 4th year		28	6	16	36
Total		108	34	50	195

Summer Training

The **Electrical Engineering** curriculum requires students to complete one month of summer training at private industries or governmental firms. This training is a compulsory component of graduation requirements. It is supervised by the Summer Training Committee of the department.





5 First Year

5.1 First Semester

Subject		Hrs./week			ECTS
		Theo.	Tut.	Lab.	
UoWEE12346	Digital Technique I	1	1	2	4
UoWEE12348	Basics of Electrical Engineering I and Lab I	3	1	2	7
UoWEE12349	Electronics Physics	3	1	-	7
WUO3	Computer Basics and Programming	1	-	2	3
COE01	Mathematics I	3	1	-	5
WUO4	Human Rights and Democracy	2	-	-	2
WUO1	Arabic Language	2	-	-	2
Total		15	4	6	30
		25			

5.2 Second Semester

Subject		Hrs./week			ECTS
		Theo.	Tut.	Lab.	
UoWEE12353	English Language	2	-	-	2
UoWEE12354	Digital Technique II	1	1	2	4
UoWEE12355	Mathematics II	3	1	-	5
UoWEE12356	Basic of Electrical Engineering-II and Lab-II	3	1	2	7
UoWEE12357	Engineering Drawing & AutoCAD	3	1	2	4
UoWEE12358	Mechanical Engineering	3	-	-	3
UoWEE12360	Programming language (C++ , pyhton & Matlab Programming)	2	1	2	5
Total		17	5	8	30
		30			





6 Second Year

6.1 First Semester

Subject		Hrs./week			ECTS
		Theo.	Tut.	Lab.	
UoWEE123611	Engineering Mathematics I	3	1	-	4
UoWEE123612	Electromagnetic Fields I	2	1	-	4
UoWEE123613	Electrical Circuits I	2	1	-	4
UoWEE123614	Electronic Circuits I	2	1	2	5
UoWEE123615	Electrical Machines I	2	1	-	5
UoWEE123616	Computer Architecture	2	-	2	4
WU23	English Language III	2	-	-	2
WU21	Arabic Language II	2	-	-	2
Total		17	5	4	30
		26			

6.2 Second Semester

Subject		Hrs./week			ECTS
		The o.	Tut.	Lab.	
UoWEE12368	Engineering Mathematics II	3	1	-	4.
UoWEE12369	Electromagnetic Fields II	2	1	-	4
UoWEE12370	Electrical Circuits II	2	1	-	4
UoWEE12371	Electronic Circuits II	2	1	2	5
UoWEE12372	Electrical Machines II	2	1	2	4
UoWEE12373	Embedded Systems & Programmable Logic Controller	2	-	2	4
WU05	Criminals of Al-Baath Regime	2	-	-	2
WU22	Computer II	1	-	2	3
Total		15	5	8	30
		28			





7 Third Year

7.1 First Semester

Subject		Hrs./week			ECTS
		Theo.	Tut.	Lab.	
UoWEE12375	Engineering Analysis I	3	1	-	4
UoWEE12376	Electrical Machines III	2	1	2	5
UoWEE12377	Electronics III	2	1	2	5
UoWEE12378	Communications Theories I	2	1	-	5
UoWEE12379	Antennas & Waves Propagation I	2	1	-	5
UoWEE12380	Electric Power Systems I	3	-	2	5
UoWEE12381	English Language V	1	-	-	1
Total		15	5	6	30
		26			

7.2 Second Semester

Subject		Hrs./week			ECTS
		Theo.	Tut.	Lab.	
UoWEE12382	Engineering Analysis II	3	1	-	4
UoWEE12383	Electrical Machines IV	2	1	2	5
UoWEE12384	Electronics IV	2	1	2	5
UoWEE12385	Communications Theories II	2	1	-	5
UoWEE12386	Antennas & Waves Propagation II	2	1	-	5
UoWEE12387	Electric Power Systems II	3	-	2	5
UoWEE12388	English Language VI	1	-	-	1
Total		15	5	6	30
		26			





8 Fourth Year

8.1 First semester

Subject		Hrs./week			Units
		Theo.	Tut.	Lab.	
EE 4301	Laboratories V	0	0	4	2
EE 4302	Digital Communications I	3	0	0	3
EE 4303	Electric Power III	2	1	0	2
EE 4304	Power Electronics	2	1	0	2
EE 4305	Computer Networks I	1	0	2	2
EE 4306	Control Engineering I	2	1	0	3
EE 4307	Advanced Electronics I	2	1	0	2
EE 4308	Engineering Project (one year)	1	0	2	2
EE 4107	English Language VII	1	0	-	1
Total		14	4	8	19
		26			

8.2 Second semester

Subject		Hrs./week			Units
		Theo.	Tut.	Lab.	
EE 4309	Laboratories VI	0	0	4	2
EE 4310	Digital Communications II	3	0	0	3
EE 4311	Electric Power IV	2	1	0	2
EE 4312	Advanced Machines	2	1	0	2
EE 4313	Computer Networks II	1	0	2	2
EE 4314	Control Engineering II	2	1	0	3
EE 4315	Advanced Electronics II	2	1	0	2
EE 4316	Engineering Project (one year)	1	0	2	2
EE 4108	English Language VIII	1	0	-	1
Total		14	4	8	19
		26			

Total Units: 195





منهج قسم الهندسة الكهربائية

كلية الهندسة

FIRST YEAR

First Year

First Semester:

Course Number: WUO4

Course Name: **Human Rights and Democracy**

Course content

WEEK	Topics Covered	Hours/ SEM
1	The nature of human rights.	2
2	Human rights in Islam.	2
3	Human rights in modern political thought.	2
4	Human rights in contemporary political thought.	2
5	Human rights in international conventions	2
6	Human rights in the Iraqi constitution in force	2
7	Midterm exam +Human rights violations in multiple experiences with the Universal Declaration of Human Rights	2
8	Legal rights in the International Covenant on Civil and Political Rights	2
9	Types of rights mentioned in the Iraqi constitution in force with the provisions of the Iraqi constitution related to rights and freedoms	2
10	The historical development of the concept of democracy in the civilization of the MesopotamiaGreek civilization and Roman civilization.	2
11	The difference between freedom and democracy	2
12	Islamic views in the democratic system of government	2
13	Forms of democracy and conditions for the success of the democratic system	2
14	Elements and pillars of the democratic system	2
15	Preparatory week before the final Exam	2
16	Preparatory week before the final Exam	2



Course Number: **WU01**
Course Name: **Arabic Language**
Course content

الاسبوع	Topics Covered	Hours/SEM
1	القواعد:- الكلام وما يتكون منه: الاسم، والفعل، والحرف. أولاً: الفعل وأجزاؤه، وعلاماته، والفعل الماضي.	2
2	القواعد: المبتدأ والخبر، أنواع المبتدأ وأحكامه، تعريف الخبر وأنواعه.	2
3	القواعد: إن و أخواتها، الأفعال الخمسة.	2
4	قواعد : جمع المذكر السالم والملحق به. التعريف بمصادر اللغة العربية..	2
5	قواعد: العدد.	2
6	القواعد: الجملة الفعلية والفاعل ونائبه	2
7	الاملاء: قواعد كتابة الهمزة	2
8	الاملاء: الأخطاء اللغوية الشائعة، وعلامات الترقيم	2
9	امتحان نصف الفصل	2
10	املاء: الفرق بين الضاد والطاء والسين وسوف	2
11	الاملاء: كتابة قواعد كتابة الالف في نهاية الكلمة	2
12	الأدب: الشاعر بدر شاكر السياب، حياته ودواوينه، وتحليل قصيدة (جيكور والمدينة)، وقراءة وتحليل نص نثري لابن غيبيته الصوفي	2
13	الأدب: الشاعرة نازك الملائكة، حياتها ودواوينها، وتحليل قصيدة (غرباء) وقراءة نص نثري خطبة المتقين للإمام علي – عليه السلام-	2
14	النصوص القرآنية دروس في التربية الإسلامية والتفسير والإعجاز البلاغي	2
15	محاضرة و مناقشات عامة	2
16	مراجعة	



Number: COE01

Course Name: **Mathematics I**

Course content:

Week	Topics Covered	Hours/ SEM
1	Brief review	4
2	Domain and range of functions.	4
3	Functions and their graphs.	4
4	Functions and their graphs.	4
5	Limits and continuity of functions.	4
6	Limits and continuity of functions.	4
7	Mid term	4
8	Derivatives of functions Rules of derivatives. Chain rule. Implicit derivatives. Higher derivatives.	4
9	Trigonometric functions Properties , Derivatives Rules	4
10	Inverse trigonometric functions Properties, Derivatives Rules.	4
11	Hyperbolic functions Properties, Derivatives Rules	4
12	Application of Derivatives. Velocity and acceleration. Equation of tangent.	4
13	Integrals Integration formulas Integration of logarithmic and exponential functions.	4
14	Integration of Trigonometric, Inverse trigonometric, and Hyperbolic functions	4
15	Integration of Trigonometric, Inverse trigonometric, and Hyperbolic functions	4
16	Review	



Number: **WUO3**

Course Name: **Computer Basics and Programming**

Course content:

Week	Topics Covered	Hours/SEM
1	Part1: Chapter One: Computer Fundamentals, Computer Components.	3
2	Part1: Chapter Two: Computer Safety and software Licenses.	3
3	Part1: Chapter Three: Main operating systems	3
4	Part2: Chapter One: Introduction to Microsoft word + Quizzes1	3
5	Part2: Chapter Two: Insert Objects to Microsoft word, Editing Documents	3
6	Part2: Chapter Three: writing the equations	3
7	Part2: Chapter Four: Formatting Pages	3
8	Part3: Chapter One: Introduction to Microsoft Excel+ Quizzes2	3
9	Part3: Chapter Two: Additional Tasks in Microsoft word+ Midterm Exam	3
10	Part3: Chapter Three: Additional Tasks in Microsoft word+ Assignments	3
11	Part3: Chapter Four: Additional Tasks in Microsoft word	3
12	Part4: Chapter One: Introduction to Power Point+ Quizzes3	3
13	Part4: Chapter Two: Insert Objects and Add Animations in Microsoft Power Point+ Project	3
14	Part4: Chapter Three: Additional Tasks in Microsoft Excel Cont.	3
15	Part4: Chapter Four: Additional Tasks in Microsoft Excel Cont.	3
16	Review	





Course Number: **UoWEE12348**

Course Name: **Basics of Electrical Engineering I and Lab I**

Course content:

Week	Topics Covered	Hours/SEM
1	Basic concept and units: Electricity & atomic structure of substance, current and current density current flow.	4
2	Electric circuit, E.M.F & potential difference, international system of unit, abbreviation for multiples & sub- multiples.	4
3	Quantities derived from SI units, units of force-energy-torque and power	4
4	Relation between energy and heat, electric units, specific heat capacity.	4
5	Efficiency and percentage efficiency, electromechanical equivalent of element.	4
6	Analysis of D.C circuits: Ohms law, resistivity & conductivity, temperature effect, internal resistance of a source, open circuit & short circuit, equivalent resistance.	4
7	Series – parallel – Series- parallel – delta and star connections, equivalent voltage source.	4
8	Series – parallel – circulating current method, floating source method & grouping of E.M.F sources, double subscript, power calculation in D.C circuit, introduction to network theorems, types of sources	4
9	Independent and dependent voltage and their transformation, Kirchhoff's laws, KVL – KCL.	4
10	Maxwell's circulating current (mesh analysis), nodal analysis, superposition theorem, Thevenin's theorem, Norton's theorem.	4
11	Maximum power transfer theorem, Mill man's theorem, substitution theorem, reciprocity theorem.	4
12	Alternation quantities: Magnetic fields, magnetic fields due to electric current, magnetic fields in a coil, force in current carrying conductor across a magnetic field, left hand rule.	4
13	Magnitude of the force, electromagnetic induction, Faraday 's law, right hand rule, magnitude of induced e.m.f magnitude of e.m.f in a coil.	4
14	Generation of single-phase voltage, waveforms – instantaneous value and real value, relation between time and angle, max – average & r.m.s values of alternating and sinusoidal voltage and current, form factor and peak factor.	4
15	Phasor quantities, voltage and current relations in pure resistive inductive and capacitive circuits.	4
16	Preparatory week before the final Exam	

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي لمختبر القياسات 1

Week	Topics Covered	Hours/SEM
1	Lab 1: Introduction to Agilent VEE and PSPICE	4
2	Lab 2: Thévenin's / Norton's Theorem and Kirchhoff's Laws	4
3	Lab 3: First-Order Transient Responses	4
4	Lab 4: Second-Order Transient Responses	4
5	Lab 5: Frequency Response of RC Circuits	4
6	Lab 6: Frequency Response of RLC Circuits	4
7	Lab 7: Filters	4



Course Number: **UoWEE12346**

Course Name: **Digital Techniques I**

Course content:

Week	Topics Covered	Hours/SEM
1	Introduction to Digital Techniques and Basic Definitions	2
2	System of numbers and general number formula	2
3	Binary, octal, decimal & hexadecimal numbers.	2
4	Numbers base conversion	2
5	Arithmetic operation in different numbers,	2
6	complements, binary codes	2
7	Logic functions	2
8	Boolean algebra: Basic definitions, basic theorem & properties, Boolean functions	2
9	Simplification of logic expression by using Boolean algebra	2
10	Midterm exam	2
11	Examples of simple logic circuits	2
12	The Karnaugh Map: SOP Minimization	2
13	Simple logic circuit designs	2
14	Canonical & standard forms digital logic gates	2
15	Error detection circuits	2
16	Preparatory week before the final Exam	2



Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي لمختبر التقنيات 1

Week	Topics Covered	Hours/SEM
1	Lab 1: Basics: lab equipment and rules	2
2	Lab 1: Basics: lab equipment and rules	2
3	Lab 2: Basic logic gates by using ICs and VHDL	2
4	Lab 2: Basic logic gates by using ICs and VHDL	2
5	Lab 3: Boolean algebra	2
6	Lab 3: Boolean algebra	2
7	Midterm exam	2
8	Lab 4: Simplification of logic functions using Boolean algebra	2
9	Lab 4: Simplification of logic functions using Boolean algebra	2
10	Lab 5: Universal gates	2
11	Lab 5: Universal gates	2
12	Lab 6: Karnaugh map	2
13	Lab 6: Karnaugh map	2
14	Lab 7: Demonstration of projects	2
15	Review	



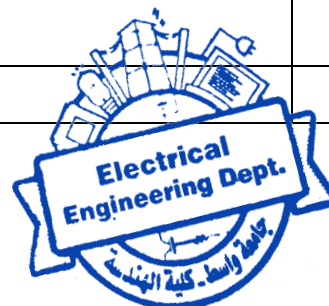


Course Number: **UoWEE12349**

Course Name: **Electronic Physics I**

Course content:

Week	Topics Covered	Hours/SEM
1	Energy levels and atomic structure: The atom, models, wave nature of light, dual nature of matter, wave function	4
2	energy-band theory of metals.	4
3	Insulators and semiconductors, crystal structure, ionic, covalent and metallic bonding, energy band of crystals.	4
4	Internal structure of materials cell, packing miller indices,	4
5	crystal planes and directions, brag's law and x-ray diffraction, electronic ballistics.	4
6	Electrical Conduction in metals: Mobility and conductivity, energy distribution of electrons, Fermi level, work function.	4
7	Semiconductors: Semiconductors materials (Si, Ge and compound Semiconductors), Extrinsic Semiconductors, Fermi-level in semiconductor, diffusion and carrier life time, Hall effect.	4
8	Semiconductor p-n Junction ; P-n Junction in equilibrium, current-voltage characteristics,	4
9	charge-control description of a diode transition and diffusion capacitances, diode switching times,	4
10	diode models, small-signal model and load line concept	4
11	introduction to heterojunctions and double heterojunctions.	4
12	Diode circuit application: Rectifiers, zener diodes voltage regulators	4
13	clipping circuits, clamping circuits and wave form generation. Other types of Semiconductor diodes	4
14	Varactor diode, tunnel diode, photodiode and photovoltaic (solar) cell, light emitting diode,	4
15	principle and operation of semiconductor laser, metal electronic ballistics semiconductor diode.	4
16	Preparatory week before the final Exam	



Second Semester:

Course Number: **UoWEE12353**

Course Name: **English Language**

Course content:

Basic Introduction, Reading Skills, Listening Skills, Making Notes during Lectures Course

Course Number: UoWEE12355

Course Name: Mathematics II

Course content:

Week	Topics Covered	Hours/SEM
1	Approximation Integral: Trapezoidal,	4
2	Simpson. Vector Algebra: Representation of Vectors in space (i, j, k) unit vectors ,	4
3	Scalar Product, Vector Product . Complex numbers	4
4	Invented number systems, the Argand diagram, Addition, Subtraction,	4
5	Product, Quotient, Power and Roots	4
6	Demover's theorem. Polar Coordinates	4
7	The Polar Coordinate system	4
8	Graphs of polar equations,	4
9	Plane area in polar Coordinates	4
10	Matrices and Determinants: Definitions,	4
11	Properties, Inverse of a matrix,	4
12	Solution of Equations (Cramer's rule).	4
13	Solution of Equations (Cramer's rule).	4
14	Review	4
15	Review	4
16	Preparatory week before the final Exam	



Course Number: **UoWEE12357**

Course Name: **Engineering Drawing & AutoCAD**

Course content:

Topics Covered	Hours/SEM
Introduction and standards information: Tools, sheets, sketching, ISO standards, lines, titles, scales, tables.	6
Geometrical constructions: Bisection line, Bisection an angle, pentagon, hexagon, polygon, Arc. Ellipse	6
Projection: Introduction, First angle projection, the production of engineering drawings, dimensions, sections.	10
Isometric drawing (pictorial): Introduction, isometric projection, dimensions, sections.	4
Electrical drawing: Introduction, isometric projection, dimensions, sections.	4
Computer aided drawing (CAD): Introduction, Menus, toolbar, Zoom, grid, snap, limits, units, Lines, circle, point, Arc, Ellipse, rectangles, ray, redraw, Copy, move, rotate, scale, erase, Break, mirror, array, trim, extend, Dimensions, hatch, blocks, Insert, layers, print, text.	30



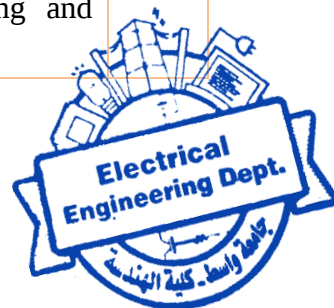


Course Number: UoWEE12360

Course Name: Computer Programming II

Course content:

Pyhton	
1- INTRODUCTION What Is Python, The Python System, Starting, Quitting Python and Opening P-files, Python Desktop, Controlling Command Window Input and Output	7
2- Python EXPRESSIONS Variables, Numbers, Operators, Functions	7
3- VECTORS, MATRICES and ARRAYS Definitions, Arithmetic operations on matrices, Subscripts, The Colon Operator, Deleting Rows and Columns, Concatenation ,Matrices Linear Algebra, Generating Matrices , Array operators, Array tables.	7
4- FLOW CONTROL if statement, if- else statement, if- elseif statement, switch and case statements, for loops, while loops, continue statement, break statement	8
5- GRAPHICS Creating a Plot, Multiple Data Sets in One Graph, Specifying Line Styles and Colors, Imaginary and Complex Data, Adding Plots to an Existing Graph, Figure Windows, Controlling the Axes, Multiple Plots in One Figure,3-D Plots.	8
Matlab Lab.	
1- INTRODUCTION What Is MATLAB, The MATLAB System, Starting, Quitting MATLAB and Opening M-files, MATLAB Desktop, Controlling Command Window Input and Output	7
2- MATLAB EXPRESSIONS Variables, Numbers, Operators, Functions	7
3- VECTORS, MATRICES and ARRAYS Definitions, Arithmetic operations on matrices, Subscripts, The Colon Operator, Deleting Rows and Columns, Concatenation ,Matrices Linear Algebra, Generating Matrices , Array operators, Array tables.	7
4- FLOW CONTROL if statement, if- else statement, if- elseif statement, switch and case statements, for loops, while loops, continue statement, break statement	8
5- GRAPHICS Creating a Plot, Multiple Data Sets in One Graph, Specifying Line Styles and Colors, Imaginary and Complex Data, Adding Plots to an Existing Graph, Figure Windows, Controlling the Axes, Multiple Plots in One Figure,3-D Plots.	8
6- SIMULINK Starting Simulink, Creating a New Model, Connecting Blocks, Drawing a Line Between Blocks, Selecting Objects, Viewing Output Trajectories, Starting and Stopping a Simulation, Modeling Systems	8



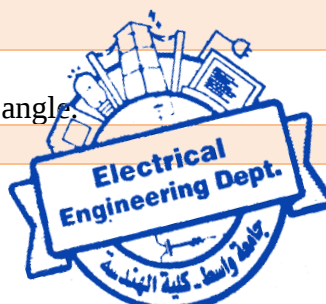


Course Number: UoWEE12356

Course Name: Basic of Electrical Engineering-II and Lab-II

Course content:

Topics Covered	Hours/SEM
Analysis of single phase A.C. circuits: Resistance, reactance and impedance, conductance - susceptance and admittance, the phasor diagram series – parallel - and series / parallel circuits, power calculation in A.C. circuits, power factor & power factor correction.	10
Complex number & its application to A.C. circuit: Equivalent impedance: Series – parallel – Series/parallel – delta and star connections, introduction to network theorems, Kirchhoff 's law: KVL-KCL, Maxwell 's circulating currents (mesh analysis), Nodal analysis, super position theorem, thevenin's theorem, Norton 's theorem, maximum power transfer theorem, Mill man's theorem, substitution theorem, reciprocity theorem, power calculation (complex power).	10
Resonance: Series resonance: quality factor – selectivity – half power – frequency and bandwidth. Parallel resonance: quality factor – selectivity – half power – frequency and bandwidth, Series/ parallel resonance circuits.	10
Magnetic circuit: Magnetic field, direction of magnetic field, characteristics of lines of magnetic field, magnetic field due to electric current, magnetic field in a coil, force in current carrying conductor across a magnetic field, left hand rule, magnitude of the force, electromagnetic induction, Faraday 's law, right hand rule, magnitude of induced e.m.f. magnitude of e.m.f. in a coil, mmf a magnetic field strength, Magnetic constants, reluctance, Magnetic leakage and fringing, Magnetic factors, Magnetic circuit : Series – parallel and Series/ parallel, Kirchhoff 's laws for magnetic circuit, hysteresis and factors effect on its loop, hysteresis loss and eddy current loss, condition for minimum volume of a permanent magnet, load line of a permanent magnet, force between two magnetic poles, magnetic pull between two iron surfaces.	15
Exp. No.9: D.C. Bridge circuit Bridge circuit, balanced circuit, null detector device, Wheatstone bridge, and rheostat.	6
Exp. No.10: Superposition and Thevenin/Norton theorem Superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem.	6
Exp. No.11: Oscilloscope and function generator Oscilloscope, function generator, cathode-ray tube, setting up a function generator, measuring time, measuring frequency, measuring amplitude	6
Exp. No.12: Frequency Domain Analysis Frequency domain, time shift, phase shift, magnitude.	6
Exp. No.13: Average and R.M.S. value Average value, root mean square (r.m.s) value.	6
Exp. No.14: Sinusoidal A. C. analysis Equation for sinusoidal current, angular frequency, phase angle.	8
Exp. No.15: Maximum power transfer in A.C. circuit.	7



Maximum power transfer, ideal voltage source, gain.

Course Number: **UoWEE12358**

Course Name: **Mechanical Engineering**

Course content:

Topics Covered	Hours/SEM
Statics: Force system, unit system, parallelogram law, forces and components, resultant of coplanar forces components of force in space, moment of a force, moment of couples, equilibrium: Free body diagram, coplanar system, analysis of trusses, friction: Nature of friction, theory of friction, coefficient of friction, centroids & center of gravity _centroids of area, centroids determined by integration, moments of inertia; radius of gyration, moment of inertia of composite area.	20
Dynamics: Kinetics of particle, rectilinear motion, curvilinear motion, rectangular components of curvilinear motion, normal and tangential component of acceleration, kinetics (Force, mass, acceleration).	10
Thermodynamics: Introduction, Active materials & their specification, work and heat in ideal gasses and steam 1st law of thermodynamics practical law in steam and gasses, 2nd law of thermodynamics practical law in steam and gasses, thermodynamics cycles.	15
Strength of materials: Simple stress, simple strain, Hook's law, statically indeterminate members.	15





Course Number: **UoWEE12354**

Course Name: **Digital Techniques II**

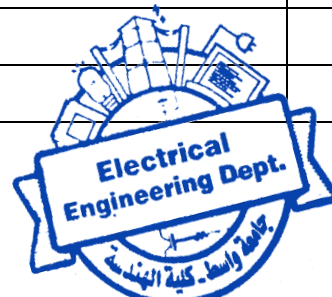
Course content:

Week	Topics Covered	Hours/SEM
1	Adders arithmetic operation	2
2	Half & full adders & subtractors	2
3	Binary ripple and cascade adders	2
4	Decoders, encoders, comparator	2
5	Multiplexers & DE multiplexers	2
6	Even and odd parity logic and code conversion.	2
7	Midterm exam	2
8	Latches: SR, D, etc	2
9	Master slave FF and edge detector	2
10	Flip flops (JK, D, T , etc.)	2
11	Shift registers	2
12	Asynchronous counters	2
13	Sequential logic design	2
14	Synchronous counters	2
15	Review of lectures	2
16	Review of lectures	2

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي لمختبر التقنيات 2

Week	Topics Covered	Hours/SEM
Week 1	Lab 1: implementation of half adder from basic logic gates	4
Week 2	Lab 2: implementation of full adder from basic logic gates	4
Week 3	Lab 3: implementation of decoder from basic logic gates	4
Week 4	Lab 4: implementation of parity checker/generator	4
Week 5	Lab 5: implementation of full adder by using decoder as a function generator	4
Week 6	Lab 6: implementation of flip-flops	4
Week 7	Lab 7: implementation of shift register	4





منهج قسم الهندسة الكهربائية

كلية الهندسة

SECOND YEAR

Second Year

First Semester:

Course Number: **UoWEE123611**

Course Name: **Engineering Mathematics I**

Course content:

Topics Covered	Hours/SEM
Sequences and Series: i) Sequences: Convergence, test of monotone. ii) Series: Geometric Series, nth partial sum, test of convergence, alternating Series. iii) Power series and Tayler's series	21
Fourier Series: i) Periodic Function., ii) Fourier series – Euler Formulas. iii) Even and Odd Function, (Half Range Expansion). iv) Application of Electrical Engineering.	12
Partial Differentiation: i) Function of two or more variable. ii) Partial derivatives. iii) Directional derivative, iv) Gradient, divergence and curl. v) Tangent plane and normal line., vi) Maxima, minima and saddle point	12

Course Number: **UoWEE123613**

Course Name: **Electrical Circuits I**

Course content:

Topics Covered	Hours/SEM
A Review of Ac Waveforms and Analysis of AC- Circuits Definition of Ac quantities circuit analysis using mesh-Current method, analysis using node-voltage method	4
Resonance in Ac circuits Series resonance, parallel resonance, resonant frequency Quality Factor, parallel resonance, series to parallel coversine and vice-versa.	4
Admittance and Current Locus R,L with variable L locus , R,L with variable R Locus R,C with variable C locus , R,C with variable R locus , Admittance locus for parallel circuits	11
The Transient Circuits: RC, RL, RLC circuits in series and parallel and their complete response in time and S-domain.	12
Periodic non Sinusoidal Signals Effective value for non-Sinusoidal waves, power dissipated in circuits, response of series parallel circuits for periodic non-Sinusoidal waveforms.	8
Two- Port Networks: Two-port networks, Z-Y parameters, Analysis of the terminated two-port networks.	6



Course Number: **UoWEE123614**

Course Name: **Electronic Circuits I**

Course content:

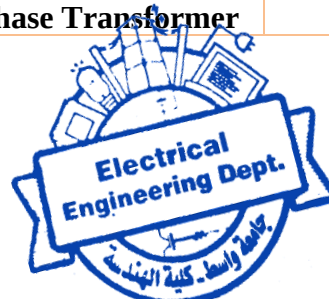
Topics Covered	Hours/SEM
Bipolar Junction Transistors (BJTs): Basic transistor operation, volt-ampere equations for the BJT, regions of operation, BJT configuration (CB, CE, and CC) and the input and output characteristics. Dc biasing of BJT (fixed biased cct. Voltage feedback cct., circuit with emitter resistor, voltage divider cct. and CB circuit) using npn and pnp BJT. BJT as a switch. Stability factor of BJT & compensation techniques. AC analysis of BJT, as amplifier, small – signal models, (h model). AC analysis of CE, CB, and CC configurations, AC analysis of BJT using re- model for the same configuration.	30
Electronic Lab. (15 Week)	
Normal Diode characteristic	6
Zener Diode characteristics	6
HWR, FWR, Bridge, rectifier	6
Clipper Diode Circuit	6
Clamper Diode Circuit	6
Differentiator and Integrator	6
Common Base Characteristics	5
Common Emitter Characteristics	4

Course Number: **UoWEE123615**

Course Name: **Electrical Machines I**

Course content:

Topics Covered	Hours/SEM
D.C Machine: General principle of rotating electrical machines and calculation of induced e.m.f., energy, power and torque in D.C. machines, construction of D.C. machines and function of commutator. Type of armature windings of m.m.f. per pole. Type of excitation connections, armature reaction, commutation type and characteristics of D.C. generators, parallel operation of D.C. generators, losses and efficiency of D.C. machines.	20
Motors : Principle of operation of D.C. motors, calculation of speed, calculation of torque.	10
Machine Lab. (15 Week)	
Exp-1: No-Load Characteristics Of D.C. Shunt Generator	7
Exp-2: Load Characteristics Of D.C. Shunt Generator	7
Exp-3: Magnetization And Load-Characteristics Of D.C Series Generator	7
Exp-4: Load Test Of D.C. Shunt-Wound Motor	8
Exp-5: Speed Control Of D.C. Shunt-Wound Motor	8
Exp-6: No Load Test And Short Circuit Test Of A Single Phase Transformer	8



Course Number: **UoWEE123612**
Course Name: **Electromagnetic Fields I**
Course content:

Topics Covered	Hours/SEM
Vector algebra: The Cartesian coordinate system, vector components and unit, vector field, dot product, cross product, circular cylindrical coordinate system, spherical coordinate system.	4
Coulombs law and electric field intensity : Coulombs law, electric field intensity- field of a point charges, field due to a continuous volume charge distribution, field of line charge, field of sheet of charge, streamline and sketches of fields, electric flux density.	6
Gauss 's laws& divergence: Electric flux density, Gauss 's law – application of Gauss 's law, differential volume element- divergence, Maxwell 's first equation.	8
Vector operation& divergence theorem: Energy & potential energy expended in moving a point charge, the line integral- definition of potential difference & potential, the potential field of point charge. The potential field of system charge, conservative property, potential gradient, the dipole.	6
Energy density in electrostatic field Conductors, dielectrics& capacitance, current & current density, continuity of current metallic conductors, conductor properties & boundary condition, method of image semiconductors, nature of dielectric material.	6



Course Number: **UoWEE123616**

Course Name: **Computer Architecture**

Course content:

- 1- **Computer Evolution.**
- 2- **Processors Architecture**, Internal Microprocessor organization, RISC vs CISC Instruction Cycle, Single Cycle Data Path and Control, Instruction-Level Parallelism (Pipelining), Pipelined Data path and Control, Data Hazards, Control Hazards and Exceptions, Processor-Level Parallelism.
- 3- **Memory Organization and I/O Systems**, Memory Hierarchy, Basic principles of the cache, Virtual Memory, Real Mode Memory Addressing, Protected Mode Memory Addressing, Program-Invisible Registers, The Memory Paging Mechanism, Memory Address decoding, Memory Interface (8-bit, 16-bit, 32-bit and 64-bit), Multiprocessor Memory Architectures, I/O Address decoding, I/O Interface (8-bit, 16-bit, 32-bit and 64-bit), Serial and Parallel I/O
- 4- **Field-Programmable Gate Arrays (FPGAs)**
- 5- **Interrupts**
- 6- **Bus Interface**, the Peripheral Component Interconnect Express (PCIe) bus, The Universal bus (USB)
- 7- **Parallel Processors**, SISD, MIMD, SIMD, SPMD, and Vector Multiprocessor vs Multicomputer, Hardware Multithreading, Multicore and Other Shared Memory Multiprocessors, Introduction to Graphics Processing Units, Introduction to Multiprocessor Network Topologies, Cluster Computing, Grid Computing, Cloud Computing
- 8- **8086 Microprocessor**, Internal architecture of 8086, CPU register, Status flag, ALU buffers, addressing modes, Assembly language, Microprocessor 8086 types of assembler's opcodes, Instruction format 8086 introduction sets, Data transfer group, Arithmetic & logical group, branching group, Stack I/O group, Interrupts and Interrupt control.

Course Number: **WU23**

Course Name: **English Language III**

Course content: Grammars, Principles of academic writing, Preparing for English tests.



Course Number: WU21
Course Name: Arabic Language II
Course content:

Week	Topics Covered	Hours/SEM
1	القواعد: التمييز	2
2	القواعد: اسم الإشارة	2
3	القواعد: النسب	2
4	قواعد : جمع التكسير	2
5	قواعد: حروف الجر	2
6	القواعد: أنواع الواو في اللغة العربية	2
7	الاملاء: الفرق بين التاء المربوطة والتاء المفتوحة	2
8	الاملاء: الحروف التي تحذف عند الكتابة	2
9	الاملاء: الأخطاء اللغوية الشائعة	2
10	امتحان	2
11	الاملاء: المخاطبات الرسمية	2
12	الأدب: - الشاعر دعبيل الخزاعي (اسمه ونسبه وحياته), وتحليل الخطاب الشّعري في قصيدته (الثانية في رثاء الإمام الحسين عليه السلام) وحفظ عدد من الأبيات. - الشاعر الفرزدق (اسمه ونسبه وحياته), وتحليل الخطاب الشّعري في قصيدته (مدح الإمام زين العابدين عليه السلام) وحفظ عدد من الأبيات.	2
13	الأدب: تحليلي نص نثري من كتاب نهج البلاغة للإمام علي عليه السلام, خطبة (النهي عن اغتياب الناس) في ضوء الفكر التربوي.	2
14	تحليل النص القرآني (التفسير والإعجاز البلاغي). - تحليل جزء من سورة يوسف (عليه السلام), وجزء من سورة العاديات عند عدد من المفسرين. - حفظ عدد من السور القصار وبيان معانيها.	2
15	محاضرة و مناقشات عامة	2





Second Semester:

Course Number: **UoWEE12368**

Course Name: **Engineering Mathematics II**

Course content:

Topics Covered	Hours/SEM
Ordinary Differential Equations: i) First order (variables separable, homogeneous, linear – Bernoulli and exact). ii) Second order (homogeneous and non – homogeneous). iii) Higher order differential equation.	23
Laplace Transform (L.T.): A) Laplace Transform (L.T.): i) Unit step function, ii) Gamma function, iii) Definition of LT, iv) Properties. B) Inverse Laplace Transform: i) Properties, ii) Partial fraction iii) Solution of differential equation using Laplace Transform. C) Applications (Orthogonal Trajectories and Electric Circuit).	12
Multiple Integrals: i) Double integral, ii) Areas and volumes. ii) Double integral in polar coordinates. iii) Evaluation of volume and triple integral. iv) Evaluation of volume and triple integral) Evaluation of surface and surface integrals.	10
Vectors: i) Equations of lines and planes. ii) Product of three or more vectors. iii) Vector function & motion: velocity and acceleration. iv) Tangential vectors, v) curvature and normal vector.	10

Course Number: **UoWEE12370**

Course Name: **Electrical Circuits II**

Course content:

Topics Covered	Hours/SEM
Two- Port Networks: Two-port networks, Z-Y parameters, Analysis of the terminated two-port networks.	8
Coupling circuits: Mutual coupling, coefficient of coupling, equivalent circuits linear and ideal transformers.	8
Polyphaser Circuits: Single-phase three wire system, circle, diagram, 3- phase balance and unbalance system star and delta connections, power in 3- phase circuits. power measurement using wattmeter method	8
Filters: Constant k- filters, low pass and high pass filter design, Butterworth and Chebyshev filters, and active filters.	6



Course Number: **UoWEE12372**

Course Name: **Electrical Machines II**

Course content:

Topics Covered	Hours/ SEM
Motors: Starting of D.C. motors, characteristics of D.C. motors and their type, speed control of D.C. motors & electrical breaking, testing of D.C. machines.	12
Transformer: Transformer type and construction, transformer action, Faraday's and Lenz's law, transformer general equation, voltage ratio, current ratio power rating equations, volt per turn from general equation volt per turn in terms of power rating, losses in transformer, equations of these losses relating to transformer variables as a functions of frequency and voltage (eddy current loss and hysteresis loss), tapping of transformer, regulation calculations using voltage values, equivalent circuits of the transformer, leakage reactance, equivalent resistances, reactance and impedances, phasor diagram, short circuits- test and open – circuits test, regulation calculations using short and open circuit test, power rating related to window and core area of transformer, efficiency calculation using short and open circuit tests, max efficiency, all day efficiency, short circuit times as related current rating, transformer polarity, parallel operation of transformers, three- phase transformers, connection of three - phase transformers, importance of connecting transformer neutral to the earth, phasor groups, zigzag transformer, voltage grading of transformer, harmonics in transformer, auto transformer and their types, calculation of power rating of auto transformer.	18



Course Number: **UoWEE12371**

Course Name: **Electronic Circuits II**

Topics Covered	Hours/Year
Field Effect Transistors (FETs): Junction field – effect transistor (JFET) :physical operation and static characteristics.-Metal – Oxide semiconductor FET (MOSFET), depletion MOSFET D-MOSFET, enhancement E- MOSFET. The main parameters of FET , the operation characteristics for different FET types . DC analysis of FET , the FET as an amplifier. AC analysis of FET , Small – signal FET models, analysis of CS, CD and CG configurations.	16
Multistage Amplifiers: Analysis of multistage amplifiers (voltage gain, current gain, etc....) types of multistage amplifiers (cascade,etc).	14

Electronic LAB.(15 Week)	
Common Collector Characteristics	8
Common Base Amplifier	6
Common Emitter Amplifier	6
Common Collector Amplifier	6
Transistor As Inverter	7
FET-Transistor Characteristics	6
FET Amplifier	6



Course Number: UoWEE12373

Course Name: **Embedded Systems & Programmable Logic Controller**

Topics Covered	Hours/SEM
Microprocessor: Motorola HCS12 Introduction to computer architecture, microprocessor, memories, I/O units, bus system, microprocessor architecture. CPU register status flag, ALU buffers, addressing modes, assembly language, microprocessor, types of assemblers op-codes, instruction format, introduction sets, data transfer group, arithmetic & logical group. Branching group, stack I/O group, simple programs, delay programs, traffic light programs, washing machine programs, interrupt control mask able, interrupts.	30
To understand the scientific principles and concepts behind embedded systems	
To obtain hands-on experience in programming embedded systems.	
Arduino microcontroller structure, programing and interfacing	



Course Number: **WU05**Course Name: **Criminals of Al-Baath Regime****Course content**

Week	Topics Covered	Hours/SEM
1	الفصل الأول: مفهوم الجرائم وأقسامها, 1-تعريف الجريمة لغة واصطلاحا	2
2	الفصل الأول: 1- أقسام الجرائم. 2- أنواع الجرائم	2
3	الفصل الأول : القرارات الصادرة من المحكمة الجنائية العليا/ ابرز القضايا التي نظرت فيها المحكمة	2
4	الفصل الثاني: الجرائم النفسية والاجتماعية وآثارها, وأبرز انتهاكات النظام البعثي في العراق 1-الجرائم النفسية, وآثارها	2
5	الفصل الثاني: 1-الجرائم الاجتماعية وآثارها	2
6	الفصل الثاني : انتهاكات القوانين العراقية, صور انتهاكات حقوق الإنسان وجرائم السلطة	2
7	الفصل الثاني: 1-بعض قرارات الانتهاكات السياسية والعسكرية لنظام البعث 2-اماكن السجون والاحتجاز لنظام البعث.	2
8	. الفصل الثالث: الجرائم البيئية لنظام البعث في العراق. 1-التلوث الحربي والاشعاعي وانفجار الالغام أولا البصرة, استعمال الاسلحة المحرمة دوليا ومخاطر الالغام, والتلوث بالمواد المشعة.	2
9	امتحان	2
10	. الفصل الثالث: ثانيا: مدينة حلبجة. 2- تدمير المدن والقرى (سياسة الأرض المحروقة)	2
11	الفصل الثالث: 3- تجفيف الأهوار, 4- تجريف بساتين النخيل والأشجار والمزروعات	2
12	الفصل الرابع: التعريف بالمقابر الجماعية, 1- أحداث المقابر الجماعية	2
13	- الفصل الرابع: التصنيف الزمني لمقابر الإبادة الجماعية في العراق للمدة 1963م-2003م - مقابر الإبادة الجماعية المرتكبة من قبل نظام البعث البائد 1979م- 1988م - مقابر الإبادة الجماعية ذات الصلة بالحرب العراقية- الإيرانية للمدة 1980م- 1988م	2
14	الفصل الرابع: - مقابر الابادة الجماعية للأكراد البرزانيين لعام 1983م- - مقابر الابادة الجماعية لضحايا مجزرة الانفال للمدة 1987م-1988م	2
15	الفصل الرابع : مقابر الابادة الجماعية لضحايا الانتفاضة الشعبانية لعام 1999م	2





Course Number: **UoWEE12369**

Course Name: **Electromagnetic Fields II**

Course content

Week	Topics Covered	Hours/SEM
1	Vector algebra: The Cartesian coordinate system, vector components and unit,	3
2	vector field, dot product, cross product, circular cylindrical coordinate system, spherical coordinate system.	3
3	Coulombs law and electric field intensity	3
4	Coulombs law, electric field intensity- field of a point charges,	3
5	field due to a continuous volume charge distribution, field of line charge, field of sheet of charge,	3
6	streamline and sketches of fields, electric flux density.	3
7	Gauss 's laws& divergence:	3
8	Electric flux density, Gauss 's law – application of Gauss 's law,	3
9	differential volume element- divergence, Maxwell 's first equation.	3
10	Vector operation& divergence theorem	3
11	Energy & potential energy expended in moving a point charge,	3
12	the line integral- definition of potential difference & potential, the potential field of point charge.	3
13	The potential field of system charge, conservative property, potential gradient, the dipole.	3
14	Energy density in electrostatic field Conductors, dielectrics& capacitance, current & current density	3
15	, continuity of current metallic conductors, conductor properties & boundary condition, method of image semiconductors, nature of dielectric material.	3
16	Preparatory week before the final Exam	



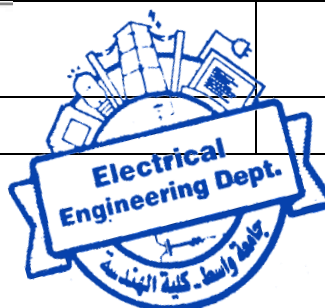


Course Number: **WU22**

Course Name: **Computer II**

Course content

Week	Topics Covered	Theoretical Hours/SEM	Practical Hours/SEM
1	Security and Networking : What is a network ? Types of networks . Basic network components	1	2
2	Security and Networking : Network security Basics. Understanding network threats	1	2
3	E-Commerce : Concept of Electronic banking service this include online banking : ATM and debit card service ,Phone banking ,SMS banking , electronic alert , Mobile banking	1	2
4	Computer Troubleshooting : Identifying and solving common hardware and software problems that computer users encounter.	1	2
5	Computer Troubleshooting (Cont.) : Basic troubleshooting techniques and tools for diagnosing and resolving issues.	1	2
6	Introduction to AI : Definition of AI, History of AI, AI Techniques and Approaches.	1	2
7	Introduction to AI(Cont.) : Key Characteristics of AI, Benefits of AI, Challenges and Ethical considerations.	1	2
8	The Role of AI in Modern Smartphones : AI-Driven Mobile Technologies, Virtual Assistants (Siri Google Assistant, Alexa).	1	2
9	The Role of AI in Modern Smartphones (Cont.) : Adaptive Learning, Real-Time Translation Services.	1	2
10	Applications and Tools of AI : Overview of AI Applications in Various Industries, Education and Healthcare.	1	2
11	Applications and Tools of AI (Cont.) : Transportation, Marketing and Advertising.	1	2
12	Applications and Tools of AI(Cont.) : Finance, Robotics and Automation Technologies.	1	2
13	AI and Society : How AI affects social, AI and international relations, AI and the future of humanity.	1	2
14	Ethical Challenges in AI : AI ethics, privacy and surveillance, the impact of AI on the job market.	1	2
15	The Future of AI : Future trends in AI, recent research and emerging technologies.	1	2
16	Preparatory week before the final Exam	1	2





منهج قسم الهندسة الكهربائية

كلية الهندسة

THIRD YEAR



Third Year

First Semester:

Course Number: UoWEE12375

Course Name: **Engineering Analysis I**

Course content:

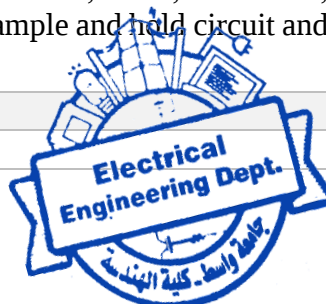
Topics Covered	Hours/SEM
Fourier transform: Properties, convolution theorem, power spectral density and correlation, signals and linear systems, applications.	10
The Z- transform: Region of convergence, properties of Z- transform, Z- transform pairs, the inverse of Z- transform, analysis and discrete- time system, applications.	11
Numerical Analysis: i) Solution of non-linear equations (Iteration, bisection and Newton-Raphson), ii) Finite differences, iii) Numerical differentiation and Integration, iv) Numerical solution of 1st order ordinary differential equations.	12
Matrix analysis: Review of matrix theory, linear transformation, Eigen values & Eigen vector, Laplace transform of matrices , application of matrices to electric circuit.	12

Course Number: UoWEE12377

Course Name: **Electronics III**

Course Content:

Topics Covered	Hours/SEM
Frequency Response Characteristics: Frequency small signal models of JFETs, and Frequency response of various amplifier configurations.	6
Amplifier Frequency Response: Frequency response concepts, transistor, at high Frequency, multistage at low & high Frequency, FET amplifiers at low & high Frequency.	6
Feedback Amplifier Feedback concept, types, effects & topologies, Feedback analysis, voltage- series, voltage- shunt, Current- series, and series Current- shunt F.B. stability & response of Feedback amplifier.	6
Operational Amplifier Design: Op-Amp characteristics and structure, difference amplifier (D.C. & A.C. analysis), D.C. level shifting stage.	6
Operational Amplifier Applications: Inverting and non- inverting amplifiers, integrator, differentiation, adder, subtractor, comparator, precision diode, rectifier, precision clamps, sample and hold circuit and peak detector.	6
Electronic Lab.	
Single and Multistage RC Amplifier	6





Direct Coupled Amplifier	6
Current Series Feedback	6
Voltage Shunt Feedback	6
Inverted Operational Amplifier	6
Non-Inverted and Buffer Operational Amplifier	6
Operational Amplifier Integrator	5
Operational Amplifier Differentiator	4

Course Number: **UoWEE12379**

Course Name: **Antennas & Waves Propagation I**

Course content:

Topics Covered	Hours/SEM
Introduction to communication systems & antennas design	2
Basic antenna concepts: antenna parameters, radiation field pattern, beam solid angle, radiation intensity, directivity and gain, aperture concept, effective height, wave polarization, cross field, reciprocity theorem, image theorem, field regions	6
Ideal dipole: E and H fields, radiation resistance, normalized pattern and power pattern, effective length. Ideal Isotropic: (point radiating source), E and H fields, radiation resistance, normalized pattern and power pattern, effective length. Short dipole: E and H fields, normalized E field, normalized power pattern, radiation resistance. Thin linear dipole: current distribution, E and H fields, radiation resistance.	6
Uni-pole & Monopole antennas: radiation pattern, radiation resistance, directivity and gain	6
Small loop antenna: E and H fields, radiation resistance, folded dipole, Yagi antenna, helical antenna	4
Array of point sources: two and multi-isotropic point sources, non-isotropic point sources, principle of pattern multiplication Array of dipoles: principle of pattern addition, broadside array, end-fire array, scanning array	6

Course Number: **UoWEE12378**

Course Name: **Communications Theories I**

Course content:

Topics Covered	Hours/SEM
Introduction of Communications Systems, Fourier Series and its applications.	3
Communication system elements (Signal analysis): Signal classification of periodic and non-periodic signals (Fourier series and Fourier transform), classification of systems, power spectral density and correlation.	15
Noise: Types, power calculation, thermal white Gaussian noise (AWGN), band-limited noise (base band and band pass) noise through linear system.	10





linear modulation (AM): AM/DSB- SC, AM/DSB- LC, AM/SSB- SC, AM/VSB, frequency division multiplexing (FDM), commercial receivers (TRF and super heterodyne), and noise in AM systems.	16
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Course Number: **UoWEE12380**

Course Name: **Electric Power Systems I**

Course Content:

Topics Covered	Hours/SEM
Sources of electrical energy: Structure of power system and elements, power stations, steam, hydro, gas, turbines, nuclear power and development of electric power, load curve , diversity factor , load factor,....etc .	8
Economic aspects of power system planning: Cost evaluation of power system projects, economic dispatch of generation station , selection of generation units, power factor improvement.	6
Mechanical design of transmission line: Calculation of sag, number of towers and insulators, design of suspension insulators, voltage distribution and efficiency of starting insulators.	4
Transmission line parameters: Line resistance, line inductance, single- phase line with multi-conductors, bundling, line inductance of three- phase transmission systems, single-phase and three- phase capacitance.	4
Electrical characteristics of an overhead transmission lines: 6hrs. Short, medium and long transmission lines, line voltage regulation and compensation, power circle diagrams.	8



Course Number: **UoWEE12376**

Course Name: **Electrical Machines III**

Course content:

Topics Covered	Hours/SEM
Synchronous machine: Construction, salient and non-salient pole types, E.M.F. equation, windings, chording and distribution factors, armature reaction phasor diagram for salient and non-salient pole generators, parallel operation of Synchronous generators. Performance of generator connected to infinite- bus, Synchronous motors, Synchronous motor phasor diagram and equivalent circuit, power- factor control, V and V-curves, torque angle characteristics of Synchronous motors, Synchronous motor starting, hunting of Synchronous machines.	30
Machine Lab.	
To Determine The Efficiency Of Three Phase Transformer By Open Delta Test	7
Separation Of A Single Phase Transformer Core Losses	7
Parallel Operation Of Two Three Phase Transformers	6
To Study The Effect Of External Rotor Resistance On The Performance Of Three Phase Wound Rotor Induction Motor	8
Determination Of Performance Characteristics Of A Three Phase Squirrel Cage Induction Motor By Load Test	6
Performance Determination Of A Three Phase Induction Motor From Circle Diagram	7
To Control The Speed Of Three Phase Induction Motor By Stator Voltage Variation And Variable Frequency Supply	6

Course Number: **UoWEE12381**

Course Name: **English Language V**

Course content:

Writing an Essay, General Structure of an Essay, Examples for Good and Poor Essays, Useful Skills for Doing a Research.



Second Semester:

Course Number: UoWEE12382

Course Name: Engineering Analysis II

Course content:

Topics Covered	Hours/SEM
Statistics: Definition, frequency distribution (relative & commutative, mean, standard deviation).	5
Probability: Definition, mutually exclusive & conditional probability, permutations & combinations, probability distribution: Binomial, normal & Poisson distributions.	10
Complex variable theory: Function of complex variable, complex differentiation, analytic Function & its properties, integration in the complex plane, Cauchy's theorem, Cauchy's integral formula for simply & multiply connected regions, complex variable theory: Taylor's theorem, Laurent series, the residue theorem.	10
Solution of differential equations by power series: Legendre's equation, Legendre's polynomials, Bessel Function of the first and second order kinds, Bessel Function properties.	10
Partial differential equation: Wave equation, Laplace's equation, solution of boundary condition problems, general solution by separation of variables.	10

Course Number: UoWEE12384

Course Name: Electronics IV

Course content:

Topics Covered	Hours/SEM
Active Filters: Filters concept, types, approximations, active RC design, bi-quad structure, ladder design and GIC.	6
Oscillators: Oscillator concept, RC oscillator, LC oscillator, crystal oscillator.	6
Power Amplifiers: Class A, Class B, Class AB and push-pull amplifiers.	6
Integrated Circuit Design: IC biasing techniques, current mirror, current repeaters and widler current sources, bipolar technology TTL, RTL, ECL, MOS, NMOS, CMOS.	6





Integrated Circuit Fabrication: Fabrication processes IC components (resistors, capacitors), transistor fabrication, layout design rules, full custom, semicustom design, and phase locked loop.	6
Electronic Lab.	
Operational Amplifier Summer	6
Active Low Pass Filter	6
Active High Pass Filter	6
Phase Shift Oscillator	7
Class -A- Power Amplifier	7
Class -B- Push Pull Power Amplifier	7

Course Number: UoWEE12386

Course Name: Antennas & Waves Propagation II

Course content:

Topics Covered	Hours/SEM
Microwave antennas: horn antenna, reflector antenna, slot antenna,.	4
Microwave antennas: lens antenna, broadband and frequency independent antennas	3
Folded dipole	2
Introduction to wave propagation fundamentals & wireless transmission Wave propagation characteristics: phase constant, attenuation and phase velocity in a lossless and conducting media, conductors and dielectrics, wave propagation in a good dielectrics & good conductors, depth of penetration, surface impedance.	3
Radar range equation	2
Reflection and refraction of EMWs: direction cosine, wave polarization, reflection by a perfect conductor (normal incidence& oblique incidence), reflection by a perfect dielectric: normal incidence, oblique incidence (perpendicular and parallel polarization), Brewster angle reflection by a perfect dielectrics: normal incidence, oblique incidence (perpendicular and parallel polarization), Brewster angle	4
Radio wave propagation: definitions, frequency spectrum and frequency bands. Ground wave propagation : surface wave, space wave (sky wave), propagation over a plane earth, effect of earth curvature on line-of-sight (LOS) propagation, fresnel zones	4
Ground wave propagation : surface wave, space wave (sky wave), propagation over a plane earth, effect of earth curvature on line-of-sight (LOS) propagation, fresnel zones	2
Ionospheric propagation: critical frequency, maximum usable frequency optimum frequency, virtual height, skip distance and multiple-hop transmission Ionospheric propagation: critical frequency, maximum usable frequency optimum frequency, virtual height, skip distance and multiple-hop transmission	4
Waveguides	2

Course Number: UoWEE12385

Course Name: Communications Theories II





Course content:

Topics Covered	Hours/SEM
Angle modulation: NBFM, NBPM, WBPM, WBPM, noise in angle modulation system.	15
Digital communications: Nyquist sampling theorem, pulse modulation PAM. PWM, PPM, time division multiplexing (TDM), noise in pulse modulation, pulse code modulation PCM/TDM. Delta modulation (DM), quantization noise in PCM and DM. signaling format (unipolar, bipolar & split- phase Manchester) sinusoidal digital modulation ASK, PSK, FSK and M-ary. Noise in ASK, PSK FSK (error probability using coherent matched filter and non- coherent detection).	20
Transmission lines: Equivalent circuit, characteristic impedance, phase velocity, reflection coefficient, standing waves, quarter- wave transformer, Smith chart calculation and stub matching.	15

Course Number: **UoWEE12387**

Course Name: **Electric Power Systems II**

Course content:

Topics Covered	Hours/SEM
Corona: Phenomenon, disruptive critical voltage, visual critical voltage, corona losses, factor and conditions affecting corona losses.	8
Underground cables: Advantages and disadvantages, types of cables, insulating resistance and capacitance, electrical stress, inter-sheets capacitance grading in three- core cables, thermal characteristics, power factor in cables, capacitance in three- core cables, thermal characteristics.	12
Distribution: Different types of distributors AC & DC distributor fed from one, two ends.	10

Course Number: **UoWEE12388**

Course Name: **English Language VI**

Course content:

Writing an Essay, General Structure of an Essay, Examples for Good and Poor Essays, Useful Skills for Doing a Research.

Course Number: **UoWEE12383**

Course Name: **Electrical Machines IV**

Course content:

Topics Covered	Hours/Year
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Synchronous machine: Construction, salient and non-salient pole types, E.M.F. equation, windings, chording and distribution factors, armature reaction phasor diagram for salient and non- salient pole generators, parallel operation of Synchronous generators. Performance of generator connected to infinite- bus, Synchronous motors, Synchronous motor phasor diagram and equivalent circuit, power- factor control, V and V-curves, torque angle characteristics of Synchronous motors, Synchronous motor starting, hunting of Synchronous machines.	30
Machine Lab.	
To Determine The Parameters Of Three Phase Induction Motor By Open And Short Circuit Tests	7
Efficiency Of Alternator	7
Determination Of Voltage Regulation Of A Three Phase Alternator By Synchronous Impedance Method	6
Determination Of Voltage Regulation Of A Three Phase Alternator By Zero Power Factor Method	7
To Obtain V – Curves And Inverted V- Curves Of Three Phase Synchronous Motor	8



منهج قسم الهندسة الكهربائية

كلية الهندسة

FOURTH YEAR

Fourth Year

First Semester:

Course Number: EE 4301

Course Name: Laboratories V (Control Lab. +Communication Lab.)

Course content:

Optional (Control, Communication, Power, and advance Machine). It depends on the devices which available in the department.	
Matlab	
Formulating, solving, verifying, and reporting engineering problems such as control, signal processing, and communication systems and engineering, math, and physics problems such as engineering/scientific computations and operations research using the MATLAB/Simulink program	
Control Lab.	
1. D.C Servo Motor Characteristic	4
2. Characteristic of Operation Amplifier.	4
3. Armature Controlled Speed Control System With Constant Gain.	4
4. Armature Controlled Speed Control System With Variable Gain.	4
5. The Characteristics of Pre-Amplifier	4
6. Transient Response of Simple Speed Control System.	5
7. Simple Position Control.	5
8. The General Characteristic of Synchronous.	5
9. Measurement of Transmitter Output.	5
10. Measurement of Transformer Output.	5





Course Number: EE 4302

Course Name: Digital Communications I

Course content:

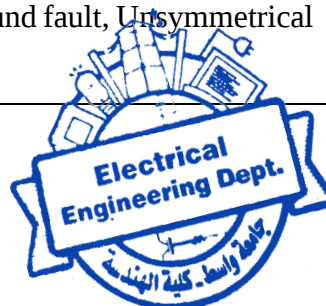
Topics Covered	Hours/ Year
1-Information Theory: Self-information, source entropy and source entropy rate, mutual information, channel model BSC and TSC, joint and conditional entropies, capacity and efficiency of symmetric and non- symmetric discrete channels, Optimum threshold setting. Capacity of continuous channel (Shannon equation).	16
2-Condong of Discrete Sources: Efficiency and redundancy of a code, fixed length codes, variable length codes, Fano code, Huffman code, Shannon code, Non-binary source coding, source extension for higher coding efficiency.	12
3-Channal Coding: Even and odd parity error detecting codes, probe of undetected errors, error, correcting codes, linear block codes (generator and parity check matrices), hamming distance, hamming weight Hamming bound and error correction capabilities. Decoding of linear block codes (syndromes). Cyclic codes: generator polynomial, nonsystematic code (multiplication), systematic cyclic code (division) and realization logic circuit for encoding and decoding of systematic cyclic codes. Convolutional codes, encoding logic (generation), tree diagram, state diagram and trellis diagram of convolutional code. Decoding of convolutional codes using Viterbi algorithm.	17

Course Number: EE 4303

Course Name: Electric Power III

Course content:

Topics Covered	Hours/ Year
1-Per unit system: Per phase Analysis, Transformer modeling, Normal Systems, Per Unit normalization, Per Unit Three-Phase Quantities, Change of Base, Per Unit Analysis of normal Systems.	6
2-Network Matrices Solution by Nodal Equations, Bus Admittance Matrix	3
3-Symmetrical Fault calculations: Transients in RL Series Circuits, Internal Voltages of loaded Machines Under Transient Conditions, Fault Calculation by Thevenin's Theorem.	6
4-Symmetrical components The Symmetrical components of Unsymmetrical Phasors, Power in Terms of Symmetrical components, Sequence Impedances and sequence networks, Generator Models for Sequence networks, Transformer Models for sequence networks, Sequence Representation of Transmission lines.	6
5-Unsymmetrical Faults Calculation Single line-to-ground fault, Line-to line fault, Double line to ground fault, Unsymmetrical faults in Power system, Faults through impedance	9





Course Number: EE 4304

Course Name: Power Electronics

Course content:

Topics Covered	Hours/ Year
Power electronics	
1-Introduction: Principal devices & characteristics: diode, power transistor, thyristor (SCR), LASCR, GTO and triac, SCR dynamic properties at switching ON& OFF. Methods of SCR turning ON, turning OFF & protection. Trigger circuit design. Series & parallel operation of SCR. Cooling. Non-principal devices.	9
2-Rectifiers: Uncontrolled, half & fully controlled :half &full wave rectifiers, single phase, half wave, biphas, bridge, 3-phase half wave& bridge and p-pulse rectifiers, effects of FWD. specification of devices & transformers.	12
3-Converter Operation: Overlap: Principal, 2-pulse, 3- pulse, p- pulse and bridge converters. FWD, Overlap power factor and effects of Overlap. Regulation. Inversion & delay angle control.	6
4- DC Line Communication & Choppers : Inverter classifications, forced commutation by parallel capacitor, step down chopper, step up chopper.	6
5-Inverters: Analysis of single phase bridge & center tapped source Inverters: Square & quasi- Square wave output. Operation of 3- phase bridge Inverters: Square & square wave output. Inverter voltage & frequency control technique.	9





Course Number: EE 4305

Course Name: Computer Networks I

Course content:

Topics Covered	Hours/ Year
Networking Fundamentals: Bandwidth, Digital Versus Analog Bandwidth, Bandwidth Measurement, Bandwidth Limitation, Bandwidth Throughput, and Data Transfer Calculations. Data Network, Network Devices, Network Topology, Local Area Network (LAN), Wide Area Network (WAN), Network Interconnection, Peer-to-Peer Network, and Client/Server.	4
Networking Models: Using layers to describe data communication, OSI model, OSI layers, The Application Layer, The Presentation Layer, The Session Layer, The Transport Layer, The Network Layer, The Data Link Layer, and The Physical Layer. Encapsulation, Peer Layer Communications, TCP/IP Model, and Data Movement Through the Protocol Stack.	6
Network Media: Introduction, Copper Cable, Cable Specification, Coaxial Cables, STP Cable, Screened UTP (ScTP), UTP Cable, and UTP Implementation. Fiber-Optic, Single-Mode and Multi-Mode Fiber, Other Optical Components, and Wireless Media.	3
MAC Address: Address details, Individual Address Block, and Printed Format.	2





Course Number: EE 4306

Course Name: Control Engineering I

Course content:

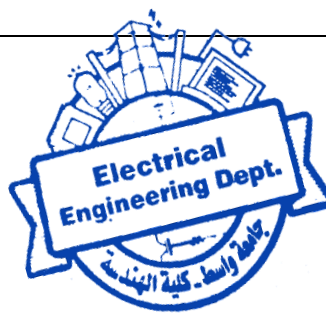
Topics Covered	Hours/Year
1-Basic definition	3
2-Transfer functions: Transfer functions of electrical system, mechanical system& Servo systems.	3
3-Block diagram algebra: Signal flow graph & Mason 's rule.	6
4-Time domain response: Typical test signals & types of the systems, the steady-state error due to step. Ramp& parabolic inputs.	6
5-Transient response of second order system: Stability of control system, Routh criterion, root locus.	6
6-Frequency response: Introduction to Nyquist plot, Nyquist plot, phase margin, gain margin, Introduction to Bode diagram, bode diagram.	12
7-Compensation: Lead, lag, lead- lag.	9

Course Number: EE 4307

Course Name: Advanced Electronics I

Course content:

Topics Covered	Hours/Year
1-Timing circuits: Multivibrators: Bistable, Monostable, and Astable circuits. The 555 Timer circuit design, Schmitt trigger circuit. Shift Registers: principles, and applications. Sequence generators principles & design.	10
2- Analysis & Design of Finite State machines: - Synchronous state machine, steps of the design with its application. -A synchronous state machine, steps of the design with its application.	25
3-Digital to Analogue & Analogue to Digital Converters: Types of D/A converters (Resistive network, Ladder, MDAC). Types of A/D converters (Voltage to Frequency converters, Voltage to Time converters. and their Applications). Sample & Hold circuit, Multiplexer, and Errors.	20



Course Number: EE 4308 & EE 4316

Course Name: Engineering Project (1 year)

Course content:

This is an independent study under the supervision of department members. Each student is expected to do research trying to explore and define a potential study area suitable for a senior design project. A specific engineering problem must then be identified from within the selected study area. Results from this study must be documented and submitted in the form of a design project proposal.

Course Number: EE 4107

Course Name: English Language VII

Course content:

Academic writing skills, skills of writing a report, advanced skills with Microsoft word, plagiarism, referencing and citations, strengthen your report skills.





Second Semester:

Course Number: EE 4309

Course Name: Laboratories VI (Control Lab + Communications Lab)

Course content:

Optional (Control, Communication, Power, and Advance Machine). It depends on the devices which available in the department.	
1. D.C Servo Motor Characteristic	4
2. Characteristic of Operation Amplifier.	4
3. Armature Controlled Speed Control System With Constant Gain.	4
4. Armature Controlled Speed Control System With Variable Gain.	4
5. The Characteristics of Pre-Amplifier	4
6. Transient Response of Simple Speed Control System.	5
7. Simple Position Control.	5
8. The General Characteristic of Synchronous.	5
9. Measurement of Transmitter Output.	5
10. Measurement of Transformer Output.	5
Communication Lab.	
1. Harmonic Analysis of A Square Wave	5
2. Harmonic Analysis of Modulated Waveform	5
3. Single-Side Band (SSB)	5
4. Amplitude Modulation With & Without Carrier Suppression	5
5. Amplitude Modulation and Demodulation	5
6. Frequency modulation and Demodulation	5
7. Sample and Hold	5
8. Pulse Code Modulation	5
9. Delta & Delta - sigma Modulation	5





Course Number: EE 4310

Course Name: Digital Communication II

Course content:

Topics Covered	Hours/ Year
Introduction to Digital Signal Processing(DSP): Block diagram of a general (DSP) system. Basic concept: linear, time variant, stable and casual discrete systems, Input/out relations in Z-domains. Discrete convolution techniques: tabular method, Z- transforms method, matrix method, add over method. Deconvolution methods: iterative method and Z- transform method. Frequency response of discrete system. Discrete Fourier transform (DFT) fast Fourier transform (FFT) decimation in time.	16
Digital Filter Design: Review of analogue filter design (Butterworth and Chebyshe filter). Classification and realization of discrete systems (FIR and IIR systems) IIR filter design using analogue filters and the bilinear transformation, filter transformations for IIR (LPF/ LPF, LPF/HPF, LPF/ BPF, LPF/ BSF). FIR filter Design using windows: rectangular, Bartlett, Hanning, Hamming and Blackman windows, LPF, HPF, BPF, and BSF FIR filter.	14
Selected Communication Systems: Descriptive lectures on: a) Optical communication system. b) Satellite communication system. c) Spread spectrum systems (Direct Sequence And Frequency Hopping) PN codes and CDMA	10

Course Number: EE 4311

Course Name: Electric Power II

Course content:

Topics Covered	Hours/ Year
Power Flow Analysis Power flow equations, The power flow problem, Solutions by Gauss-Seidel Iterative Method, Solutions by Newton-Raphson Iterative Method, Decoupled power flow method	9
Power System Stability: The stability problem, Energy balance, Rotor dynamics and the swing equation, linearization of the Swing Equation, The Power angle equation, Equal- area criterion of stability.	18
Power System Protection: Protection of Radial systems, Zones of protection, Over current Relays, protection with Two sources, Impedance (Distance) Relays, Differential Protection of Generator, Differential Protection of Transformer, Differential Protection of Busses and Line.	21





Course Number: EE 4312

Course Name: Advanced Machines

Course content:

Topics Covered	Hours/ Year
MACHINES	
Single Phase Induction Motor (IM): Analysis of single phase IM using double revolving field theory. Characteristics & winding of single phase IM. Analysis of combined winding performance using revolving field theory. Symmetrical components Analysis. MMF components & components elimination. General equivalent circuit & particular cases.	23
Two Phase Servo Motor: Shade Pole Single Phase Motor and AC Series motor, Principles of operation, Construction, Application problems.	9
Shaded Pole Motors: Construction, Principle of operation, speed reversal & speed changing.	6
Universal & Single- Phase AC Series Motors: Principle, torque & speed equations. Small universal & large AC motors speed changing. Applications.	2
Single Phase Repulsion Motors: Repulsion Principle & repulsion motors. Repulsion start LM. Repulsion IM.	2
Stepper Motor(SM): Permanent magnet SM, variable reluctance SM. Properties of SM, characteristics. Step angle & speed.	6





Course Number: EE 4313

Course Name: Computer Networks II (Elective)

Course content:

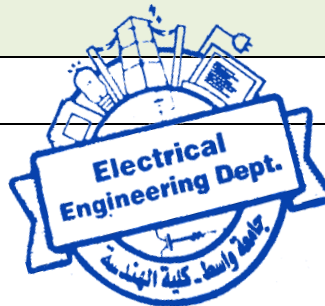
Network Layer:	7
The IP (Internet Protocol) Addresses, Assignment of IP Addresses, IP Address Format, IP Address Class Identification, Class A Address, Class B Address, Class C Address, Broadcast Address, Subnets, Network and Sub Network Masks, and More Sub-netting Masks Ways for Class B.	
Public and Private IP Addresses, IPv4 Versus IPv6, Obtaining an Internet Address, Static Assignment of an IP Address, RARP IP Address Assignment, BOOTP IP Address Assignment, DHCP IP Address Management, Problems in Address Resolution, and Address Resolution Protocol (ARP).	
Routing, Routing Information Protocol (RIP), Interior Gateway Routing Protocols (IGRP), and Open Shortest Path First (OSPF).	
Transport Layer:	4
The Purpose of the Transport Layer, Duties (Primary Functions) of the Transport Layer, Transport Layer Connection, The OSI Transport Layer Protocol, The TCP/IP Transport Layer Protocol, and Port Addressing.	
Summary, Transport Layer Functions, Application and Operation of TCP Mechanisms, Managing TCP Sessions, Confirming Receipt of Segments, Flow Control, Managing TCP Sessions, and UDP Protocol.	
Network Applications:	4
Using The Internet, Understanding the World Wide Web, Recognizing Web Page Elements, Using the Uniform Resource Locator (URL), Identifying Other Elements, Understanding Viruses, Performing a Data Backup, The Electronic Mail, Internal Mail, Internet E-mail, Domain Name Format, Internet Server Types, Looking at E-mail Components, and Using E-mail Options.	

Course Number: EE 4314

Course Name: Control Engineering II

Course content:

Topics Covered	Hours/Year
Three- term controller: Proportional-Integral-Derivative (PID) controller	12
State space analysis: State equation for dynamic system (electrical system) solving state equations.	12
Analogue computer simulation	10
11-Nonlinear control system: (Describing function approach).	6
Review	5



Course Number: EE 4315

Course Name: Advanced Electronics II

Course content:

Topics Covered	Hours/ Year
Logic Families: General characteristics, Different Types of logic circuits families, interface between TTL & CMOS circuits.	15
Semiconductor Memories: Memories ROM, EPROM, EEPROM, RAM. PLA, some types of array circuits.	15
Hardware design of microcomputers and microprocessors.	15

Course Number: EE 4108 (Updated by Dr Basim 2022)

Course Name: English Language VIII

Course content: Communication and Presentation Skills

1. Introduction

- Understanding the purpose of Communication
- Analyze the Audience
- Communicating with words as well as with body language
- Writing with a Purpose

2. Presentation skills

3. Delivering your presentation

4. Speaking with Confidence

5. Communicating Effectively

6. Job Interviews and Communicating Skills

7. Communicating with Customers

8. Communication in a Team

Recommended Readings: • Carnegie, Dale. (). How to Win Friends & Influence People. • Giblin, Les. Skill with People. • Newton, Paul. How to communicate effectively. • Tracy, Brian. Speak to Win.

