2014 كلية تقنية الحاسوب طرابلس **College of Computer Technology Tripoli** 

بكالوريس هندسة التحكم الآلي

2014

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#### كلية تقنية الحاسوب طرابلس

#### مكتب الشؤون العلمية والتقنية

#### البكالوريس التقنى في هندسة التحكم الآلي

صمم هذا البرنامج بما يوافق احتياجات سوق العمل المحلية ، ويتضمن البرنامج التدريب على المهارات الأساسية في التحكم الآلي بالإضافة إلى المهارات التخصصية في مجال الالكترونيات مثل العناصر الالكترونية والدوائر المنطقية، والكترونيات القوى، وأنظمة التحكم وتحليلها وكذلك دراسة أجهزة القياسات ودراسة الحاكمات القابلة للبرمجة ولغاتها وتطبيقاتها والمعالجات والحاكمات الدقيقة وتطبيقاتها في التصميم. وتدمج برامج الدراسة النظرية بالتدريب العملي مع التركيز على احتياجات ومتطلبات بيئة العمل الحديثة. ويتميز الخريجون بقدراتهم ومعطياتهم الفكرية والفنية والتي منه المهارات المتقدمة في التواصل وتكنولوجيا المعلومات، والتفكير الناقد وحل المشاكل، والإدارة الذاتية والعمل ضمن فريق.

ويتم مراجعة البرنامج بصورة مستمرة للتحقق من مواكبة المهارات التي يكتسبها الطلبة في الفصل الدراسي والمعدات المستخدمة لآخر التطورات التقنية ونظراً لهذا التميّز يحظى خريجو القسم بالإقبال الشديد من جهات العمل المختلفة بالدولة الباحثة عن شباب مو هوبين ممن لديهم مهارات التواصل المتقدمة ومهارات العمل ضمن فريق، بما يضمن تحقيقها التطور المهني.

المهارات العامة للبرنامج:

- تطوير قدرة الطالب على التحدث والكتابة باللغة الإنجليزية وكتابة الرسائل والتقارير العلمية والفنية.
  - القدرة علي عرض المشاريع وطرح الأفكار والتحدث للجمهور.
  - البناء على قدرة الطالب في التحليل الرياضي والاستنباط والتعلم الذاتي.
    - القدرة على البحث في المشاريع العلمية والتقنية وتوثيقها.

المهارات التقنية للبرنامج:

- القدرة علي صيانة وتصميم الدوائر الالكترونية.
- القدرة على إجراء التجارب على أجهزة القياسات الالكترونية ومعايرتها حسب المواصفات.
  - القدرة على أجراء التجارب في مجالات التحكم والأجهزة الدقيقة.
    - القدرة على استخدام أجهزة الحاسوب في مجال التحكم الآلي.
      - تحديد و تشخيص الأعطال وإصلاحها.
- الإشراف وإدارة وحدات التحكم الآلي بالمصانع الضخمة ومحطات القوى الكهربية وحل المشاكل التقنية التي قد تتعرض لها.

1

#### المهارات الذاتية والفكرية للطالب:

- القدرة على البحث والاستخلاص والتحليل
- القدرة على العرض وطرح الأفكار بوضوح والعرض المرئي والتوثيق العلمي المنهجي الصحيح
- التعرف على سوق العمل واحتياجاته وطرق النجاح في المقابلات الشخصية و كتابة السيرة الذاتية
  - تعلم مهارات العمل ضمن الفريق وتنسيق العمل والانضباط
- اكتساب مهارات إدارة المشاريع الصغرى والمتوسطة ، الالتزام بالجدول الزمني ، تحديد الموارد ، التنبؤ بالمعوقات وتحليل نسب المخاطر و المعالجات الفورية.

## مصفوفة المواد بقسم هندسة التحكم الآلي

# جدول الوحدات الدراسية المقررة / قسم هندسة التحكم الآلي

Term 1	Subject	Hours	Prerequisi te
IT 100	IT Essentials	3 /3	None
IT 111	Fund. of Programming	4/0	None
CT 113	Electrical Circuits 1	4/0	None
MA 150	Mathematics 1	4/0	None
EN 160	English Language 1	4/0	None
	Credit 20	22	

Term3	Subject	Hours	Prerequisi
			te
CT 212	Microprocessors	3/3	CT 117
CT 216	Electronic Circuits 1	3/3	None
CT 214	Electrical Circuits 2	3/3	CT 113
MA 252	Differential Equations	4/0	MA 151
EN 262	English Language 3	4/0	EN 161
	Credits 20	26	

Term5	Subject	Hours	Prerequisi te
CT 314	Programmable Logical Controller 1	3/3	CT 212
CT 326	Graphical Prog. (Lab View)	3/3	IT 112
CT 318	Power Electronics	3/3	CT 217
CT 320	Controllers	3/3	CT 227
EN 364	English Language 5	2/0	EN 263
EN 300	English Technical Writing 1	2/0	EN 263
	Credits 20	28	

Term7	Subject	Hours	Prerequisi
			te
CT 430	Fuzzy Logic	3/3	CT 227
CT 432	Electrical Drives & Appls.	3/3	CT 214
CT 434	Data Acquisition System	3/3	CT 326
IT 470	Project Management	3/3	None
CT 436	Research Methods	2/0	None
	Credits 18	26	

Term2	Subject	Hours	Prerequisi
			te
CT 115	computer Org. &Architecture	4/0	IT 100
IT 112	Programming in Visual C	3/3	IT 111
CT 117	Digital Systems	3/3	None
MA 151	Mathematics 2	4/0	MA 150
EN 161	English Language 2	4/0	EN 160
	Credit 20	24	

Term4	Subject	Hours	Prerequisi te
CT 213	Microcontroller	3/3	CT 212
CT 217	Electronic Circuits 2	3/3	CT 216
NT 220	Signals and Systems	3/3	MA 151
CT 227	Fund. Of Control Sys.	4/0	MA 252
EN 263	English Language 4	4/0	EN 262
	Credit s 20	26	

Term6	Subject	Hours	Prerequisi
			te
CT 315	Programmable Logical Controller 2	3/3	CT 314
CT 322	Industrial Control Systems	3/3	NT 220
CT 324	Embedded Control Systems	3/3	CT 320
CT 326	Sensors & Transducers	3/3	CT 220
EN 365	English Language 6	2/0	EN 264
EN 301	English Technical Writing 2	2/0	EN 300
	Credits 20	28	

Term8	Subject	Hours	Prerequisi te
CT 438	Professional Issues	3/3	None
NT 403	On Field Practice	1/3	None
CT 444	Research Thesis	0/3	All ASub.
	Credits 7	13	

#### **Total Credit Units = 145**

- Refreshment year (semester 1 & 2) is general for all departments. •
- Subject Code: •

#### Subject Code Abbreviations

EN	English	Language	subjects
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- MA Mathematics subjects IT
- Information Technology Dept. Networking Dept. NT
- СТ **Control Dept.**

Numbering System

3

 $\mathbf{1}^{st}$  digit from left: signifies the year

2<sup>nd</sup> and 3<sup>rd</sup> digit from left: for numbering purposes.

# الفصل الدراسى الاول

Code	Subject	Credit Hours	Theoretical Hours	Practical Hours	Prerequisite
IT 100	IT Essentials	4	3	3	None
IT 111	Fund. of Programming	4	4	0	None
CT 113	Electrical Circuits 1	4	4	0	None
MA150	Mathematics I	4	4	0	None
EN 160	English Language 1	4	4	0	None

### أسس تقنية المعلومات

Subject	IT Essentials	Course Code	IT 100	Theoretical	3 hrs / wk
Semester	1	Prerequisite	None	Practical	3 hrs / wk

البرنـــامج التعلــيمي	
<ol> <li>مفاهيم عامة:</li> <li>الأجهزة والبرامج و تقنية المعلومات</li> <li>أساسيات الحاسوب</li> <li>مكونات الحاسوب.</li> <li>أداء الحاسوب.</li> <li>أداء الحاسوب.</li> <li>أداء الحاسوب.</li> <li>وحدة المعالجة المركزية.</li> <li>وحدات الإدخال.</li> <li>وحدات الإخراج.</li> <li>وحدات التخزين.</li> <li>أنواع البرامج.</li> <li>أنواع البرامج.</li> <li>أنواع البرامج.</li> <li>أنواع البرامج التطبيقات.</li> <li>أنواع البرامج.</li> <li>ألماح المرامج.</li> <li>ألماحيد المرحيد المرامج.</li> <li>أل</li></ol>	الأسبوع 2-1
<ul> <li>4. شبكات المعلومات :</li> <li>الشبكات المحلية والواسعة.</li> <li>الإنترانت والإكسترانت.</li> <li>الإنترانت.</li> <li>الشبكات المهاتفية.</li> <li>الشبكات المعلومات في الحياة اليومية:</li> <li>الحواسيب في العمل.</li> <li>العالم الإلكتروني.</li> <li>التقنية الحيوية.</li> <li>مسائل صحية.</li> <li>مسائل صحية.</li> </ul>	الأسبوع 5 - 3

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<ul> <li>تحذيرات مسبقة.</li> <li>سرية المعلومات.</li> <li>فيروسات الحاسوب.</li> <li>حقوق النسخ.</li> <li>الحماية القانونية للبيانات.</li> </ul>	
<ul> <li>7. الأنظمة العددية و تحويلاتها:</li> <li>النظام العشري.</li> <li>النظام الثنائي.</li> <li>النظام الثماني.</li> <li>النظام السادس عشر.</li> <li>النظام البين جميع الانظمة.</li> </ul>	الأسبوع 8 - 6
<ul> <li>8. البوابات المنطقية:</li> <li>AND – OR – NOT – NAND – NOR – XOR XNOR</li> <li>الشكل المقابل للبوابة.</li> <li>جدول الصدق.</li> <li>التعبير المنطقي.</li> <li>إستخراج التعبير المنطقي من الدائرة المنطقية.</li> <li>رسم الدائرة المنطقية من التعبير المنطقي.</li> <li>إعطاء قيم للمدخلات و إيجاد قيم المخرجات</li> </ul>	الأسبوع 11 - 9
<ul> <li>9. الجزء العملي:</li> <li>التعرف على جهاز الحاسوب ومكوناته (System Unit)</li> <li>التعرف على نظام التشغيل (Microsoft Windows)</li> <li>التعرف على نظبيق معالج النصوص (Microsoft Word)</li> <li>التعرف على تطبيق العروض التقديمية (Microsoft PowerPoint)</li> </ul>	الاسبوع 14 - 12

Course Work	Mid-Term Tests	Final Exam Practical	Final Examination
10	30	20	40

NOTE: Course Work may include assignments, projects and practical activities.

أساسيات البرمجة

Subject	Fund. of Programming	Course Code	IT111	Theoretical	4 hrs / wk
Semester	1	Prerequisite	None	Practical	0 hrs / wk

	Program Learning Components
	1. Programming and Problems Analysis:
Week 1-2	<ul> <li>Problems solving using computer.</li> <li>Steps of problems solving.</li> <li>Software.</li> <li>Definition Of Software.</li> <li>Types of software.</li> <li>Software development stages.</li> <li>Data types.</li> <li>Variables.</li> <li>Constants.</li> <li>Reserved words.</li> </ul>
	2. Statements:
Week 3-5	<ul> <li>Assign statements.</li> <li>Decision statements.</li> <li>Input /output statements.</li> <li>Control statement.</li> <li>Loops.</li> <li>Math Operations.</li> <li>Relational Operations.</li> <li>Logical Operations.</li> <li>String Operations.</li> </ul>
Week	3. Flowchart:

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6-8	• The definition of flowcharts.
	• The characteristics of flowcharts.
	• Figures and shapes used in flowcharts: process box, choose box,
	input, output box.
	• Algorithms: problem solving using algorithm multiplication or sorting list.
	• Samples of solved mathematical problems like matrix
	multiplication or sorting list of names.
	4. Types Of Flowchart:
Week	Sequential Flowchart.
9-10	Brainchild Flowchart.
2 10	Looping Flowchart.
	• TDMA Of FDMA.
Week	5. Looping And Control:
Week	Using of methematical and logical operation in looping and
11-12	decision the production of output by executing flowchart
	decision the production of output by executing nowchart.

Course Work	Mid-Term Tests	Final Examination
10	30	60

NOTE: Course Work may include assignments, projects and practical activities.

## الدوائر الكهربية 1

Subject	Electrical Circuits 1	Course Code	CT 113	Theoretical	4 hrs / wk
Semester	1	Prerequisite	None	Practical	0 hrs / wk

	Program Learning Components			
	1. Voltage, Current and Resistance:	Resources		
Week 1-2	<ul> <li>Explain Metric system and Electrical units.</li> <li>Use of Scientific notations and metric prefixes.</li> <li>Discuss charge, current, voltage and resistance.</li> <li>Ohm's law and basic calculations.</li> <li>Explain Power formulas, power supply and voltage drops.</li> </ul>	Projector. Simulation using HE© software package.		
	2. Series Circuits:	Resources		
Week 3	<ul> <li>Determine total series resistance.</li> <li>Ohm's law in series circuits.</li> <li>Adding voltage sources in series.</li> <li>Apply Kirchhoff's voltage law.</li> <li>Determine Power in series circuits.</li> <li>Using voltage dividers.</li> </ul>	Projector. Multisim software package.		
	3. Parallel Circuits	Resources		
Week 4	<ul> <li>Identify parallel circuit.</li> <li>Determine total parallel resistance.</li> <li>Apply Ohm's law in parallel circuits.</li> <li>Adding current sources in parallel.</li> <li>Apply Kirchhoff's current law.</li> <li>Using current dividers.</li> <li>Determine Power in parallel circuits.</li> </ul>	Projector. Multisimsoftware package.		

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	4. Series-Parallel Combination Circuits	Resources
Week 5	<ul> <li>Identifying and analyzing the circuits.</li> <li>Simplifying ladder networks.</li> <li>Convert voltage source to current source.</li> <li>Convert current source to voltage source</li> </ul>	Projector.
Week	5. Circuit Analysis Methods	Resources
6-7	<ul> <li>Explain Mesh Analysis (General Approach).</li> <li>Undertake First-Midterm Test.</li> </ul>	Projector.
	• Explain Nodal Analysis (General Approach).	Multisimpackage.
	6. Network Theorems	Resources
Week 8-10	<ul> <li>Explain and apply superposition theorem.</li> <li>Explain and apply The venin's theorem.</li> <li>Explain and apply Norton's theorem.</li> <li>Explain maximum power transfer theorem.</li> </ul>	Projector. Multisimpackage.
	7. Capacitance	Resources
Week 11-12	<ul> <li>Explain the capacitor and type of capacitors.</li> <li>Determining series and parallel connections.</li> <li>Charging and discharging of capacitors and current and voltage relationship.</li> <li>Undertake Second-Midterm Test.</li> </ul>	Projector. Multisimpackage.

Course Work	Mid-Term Tests	Final Written Exam.
20	30	50

NOTE: Course Work may include assignments, projects and practical activities.

**Textbook:** Introductory Circuit Analysis 10th Edition by Boylestad, Prentice Hall.

Note to students: Contact CCTT Library to get a free DVD e-book (Code: CT 113).

#### رياضيات 1

Subject	Mathematics 1	Course Code	MA150	Theoretical	4 hrs / wk
Semester	One	Prerequisite	None	Practical	0 hrs / wk

	Program Learning Components				
	1. Matrices and Determinants				
	matrices and matrix arithmetic				
	Types of Matrices				
Week	• Evaluating Determinants by Row Reduction and				
1-4	Cramer's Rule				
	• Properties of determinants				
	• The adjoins and inverse of a matrix 2x2, 3x3				
	• Solution of Homogenous and Non homogenous system of				
	• linear Equations by Gauss Elimination and Cramer's rule				
	2. Vectors:				
	Introduction to Vectors				
	Cartesian and Polar Representation				
Week	Vector Arithmetic				
5-7	• Dot Product and Projection				
	Cross Product and Parallel Lines				
	Properties of vectors				
	• Parametric equations for the Line				
	• Plane equation				
	3. Differentiation				
Week	Definition of the Derivative of a function				
0 13	Geometric meaning of the derivative				
0-12	Basic differentiation rules				
	Implicit differentiation				

- Applying the chain rule
  - Derivatives of Trigonometric functions
  - Derivatives of logarithmic and exponential functions
- Derivatives of Inverse Trigonometric functions
- Higher Order Derivatives / L'hopital's Rule

Course Work	Mid-Term Tests	Final Examination
10	30	60

#### NOTE: Course Work may include assignments, projects and practical activities.

#### **Textbooks:**

- 1- Calculus by Anton , Bivens, Davis ,  $8^{TH}$  Edition
- 2- Linear Algebra by Seymour Lipshutz
- 3- Calculus and Analytical Geometry by Fisher and Ziebur

## لغة إنجليزية 1

Subject	English language 1	Course Code	EN160	Theoretical	4 hrs / wk
Semester	One	Prerequisite	None	Practical	0 hrs / wk

Program Learning Components			
	1. Grammar:		
	* NOUNS:		
	**Functions of nouns		
	**Countable and uncountable nouns		
	** Plural from nouns		
	**Definite and indefinite articles		
	*PRONONUNS:		
	**Subject pronouns		
Week	**Object pronouns		
1-4	**Possessive pronouns		
	**Possessive adjective		
	**Demonstrative pronouns		
	*TENSES		
	**Present simple		
	**present continuos		
	**past simple		
	**Past continuos		
	**future simple		

(EACH OF THE TENSES MENTIONED ABOVE SHOULD BE PRESENTED IN THE AFFIRMATIVE, NEGATIVE AND INTERPROGATIVE FROMS.

THE MOST COMMON ADVERBS SHOULD BE PRESENTED WITH EACH TENSES)

#### **\*INTERROGATIVES:**

\*\*WHO

\*\*WHOM

\*\*WHAT

\*\*WHEN

\*\*WHERE

\*\*WHOSE

\*\*WHOM

\*\*WHICH

\*\*WHY

\*\*HOW (MANY, MUCH, TALL, ... ETC)

#### **\*ADIECTIVE :**

\*\* Positions of adjectives

\*\*proper adjectives

\*\*Comparative adjectives

\*\*Superlative adjectives

\*\*Irregular adjectives

#### **\*PREPOSITIONS:**

\*\*Prepositions of time

\*\*Prepositions of place

	**Prepositional adjectives
	2. LCOMPREHENSION:
	Reading for appreciation :
Week	(FOUR OR FIVE SIMPLE AND SHORT PASSGES TAKEN FROM SELECTIONS FOR DEVELOPING READING SKILSS)
5-7	Reading for information:
	(THREE SIMPLE PASSGES AND DIALOGUES ABOUT THE FIELD OF COMPUTER AND IT'S MOST COMMON TERMS)
	3. COMPOSITION : STUDENT SHOULD BE TAUGH HWO TO WRITE SIMPLE SENTCENS CONSISTING OF : *NOUN+VERB(subject and predicate of sentence) *NOUN+VERB+NOUN(subject and predicate , object)
	*NOUN+VERB+NOUN+NOUN (indirect , direct obj)
Week	*NOUN+ VERB+ adjective+NOUN
8-10	*ADJECTIVE+ NOUN +ADJECTIVE+ NOUN
	*NOUN+ADVERB+VERB
	*NOUN+ADVERB+VERB+NOUN
	*NOUN+VERB+ADVERB
	*NOUN+VERB+NOUN+ADVERB

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	*NOUN+VERB+PREPOSITION+NOUN+ADVERB
	*VERB+NOUN
	*ADVERB +VERB+NOUN
	4 FUNCTUATION AND SPELING -
	TONCTOATION AND STELING.
	*Capitalization
	*Full stop
	*Question mark
Week	*Doubling final consonants
11	*Omission of final (E)
	*Changing final (y)
	**(C)=a)(s)
	**(K)
	**(TCH)
	5. PRONUNCIATION:
Week	(MORE CONCENTRATION SHOULD BE GIVEN TO THE SOUNDS
12	WHICH DO NOT OCCUR IN ARABIC LANGUAGE OR LIBYAN
	DIALOG SUCH AS (P),(V),(TH)AND THOSE WHICH DO NOT HAVE THE SAME POINT OF ARTICULATION SUCH AS $(R)$ $(L)$ )

Course Work	Mid-Term Tests	Final Examnation
10	30	60

الفصل الدراسي الثاني

Code	Subject	Credit Hours	Theoretical Hours	Practical Hours	Prerequisite
CT115	Computer Organ./Architect	4	4	0	IT100
IT112	Programming in Visual C	4	3	3	IT111
CT117	Digital Systems 1	4	3	3	None
MA151	Mathematics 2	4	4	0	MA150
EN161	English Language 2	4	4	0	EN160

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## تنظيم الحاسبات

Subject	Computer Organ./Architect	Course Code	CT115	Theoretical	4 hrs / wk
Semester	Two	Prerequisite	IT100	Practical	0 hrs / wk

Objective: To Provide the opportunity to Understand Structure of Computers to be able to utilize architecture to develop System Program				
	Торіс	Description		
Week 1	<ol> <li>Introduction and Terms.</li> <li>Computer Hardware Units.</li> <li>Computer Software.</li> <li>The Software Development Cycle.</li> </ol>	Including The Subject of Computer architecture and organization. General view and Von-Nueman architecture highlighting program tasks and components, software development environment and producing executable machine code.		
	Торіс	Description		
Week 2	<ol> <li>Computer Description.</li> <li>Computer main functions and data flow.</li> <li>Performance criteria CISC Computer and Risk Computers.</li> <li>Technology Constraint.</li> </ol>	Explaining the architecture versus Organization Structure versus function. The main function of computers. Computer classification into Microcomputer versus Minicomputers and technology constraint for each class.		

3	<ol> <li>Central processing unit.</li> <li>The functions the CPU.</li> <li>The role of the control unit in the CPU</li> <li>Internal CPU buss and the external system bus.</li> </ol>	The structure of the CPU : ALU , CU , General Register , Special Register and Buses . Introduction the function of the CPU , Then knowing how the CPU synchronizes its functions internally and externally by the control unit and the system bus.
	Торіс	Description
Week 4	<ol> <li>Case Study: the architecture organization for Intel 8086 microprocessor.</li> <li>Intel 8086 CPU.</li> <li>Intel 8086 Flag Register.</li> </ol>	Introduction and analyzing the Intel 8086 CPU architecture: Bus interface Unit BIU, Execution Unit EU and operations Parallelism. Example in assembly how flags are affected by instructions.
	Торіс	Description
Week 5	<ol> <li>Memory organization and the physical address calculation.</li> <li>Interrupt system in Intel 8086.</li> </ol>	<ul> <li>How the main memory for 8086 cpu is organized and divided into segments.</li> <li>and how is the address space in mapped into a virtual space with physical address calculation mechanism.</li> <li>Then the student should know the interrupts , vectors and handling.</li> </ul>
	Торіс	Description
Week 6	<ol> <li>Instructions Execution and Sequencing.</li> <li>Machine code programming.</li> <li>Instruction fetching and executing cycle.</li> </ol>	Explaining how the CPU executes and instructions from decoding the instruction format and interrupting the meaning of the instruction.

	4. Instruction format.	This is well demonstrated using a sample from machine code programming: Op-code field and operand(s) field.
	Торіс	Description
Week 7	<ol> <li>Instruction sequencing state diagram.</li> <li>Operations done by the instruction.</li> <li>CPU tasks to complete the execution of an instruction.</li> <li>Place of data to be manipulated.</li> </ol>	<ul><li>Following how a CPU completes the execution of an instruction.</li><li>What stages to follow and what the operations are done by the instruction.</li><li>Where data can be found to be manipulated as sources of information.</li></ul>
	Торіс	Description
Week 8	<ol> <li>Immediate addressing mode.</li> <li>Direct and indirect addressing mode.</li> <li>Register and register indirect addressing mode.</li> <li>Displacement and stack addressing mode.</li> </ol>	<ul> <li>Introduction and analyzing various addressing modes used by most architectures.</li> <li>Examples are taken from addressing modes used by Intel 8086 CPU for real demonstration.</li> <li>Other addressing modes can be easily derived from those mentioned addressing mode.</li> </ul>
Week	Торіс	Description
9	1. Mid Term Exam.	Testing the knowledge gained by students so far.
Week	Торіс	Description
10	<ol> <li>Memory hierarchy and performance factors.</li> <li>Semiconductors memory.</li> </ol>	Memory organization. Memory as a store for programming and data: RAM, ROM, PROM, EPROM, EEPROM,

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	3. Memory cell Structure.	Flash memory, Data line, Control line and select line and the bit storage media.
	Торіс	Description
Week 11	<ol> <li>Mapping techniques: Direct mapping, set associative mapping and full associative mapping.</li> <li>Replacement strategies: FIFO, LRU, LFU.</li> <li>Write policies: write back write through.</li> </ol>	Cash memory organization and management. Example for mapping techniques, replacement strategies and write policies.
	Торіс	Description
Week 12	<ol> <li>Mechanisms for data input and output.</li> <li>Memory mapped devices and isolated addressed device.</li> <li>Programming and interrupted input/output.</li> </ol>	<ul> <li>Input and output techniques handling.</li> <li>Introducing the concept of device interface.</li> <li>Highlighting how devices are treated from the software point of view: example for each method.</li> </ul>
	Торіс	Description
Week 13	<ol> <li>Direct memory access (DMA).</li> <li>DMA controller architecture.</li> <li>DMA programming and functions.</li> </ol>	Introducing the concept, general structure and comparing and outputting using DMA.
	Торіс	Description
Week 14	<ol> <li>External buses classifications.</li> <li>PC2 bus structure and operations.</li> <li>ISA and EISA bus structures, attributes and functionality.</li> <li>USB features, structures.</li> </ol>	System bus architectures. Introducing and comparing different buses structures.

Mid Term	Lap Activities	Final Exam
25%	15%	60%

#### **Textbook and References:**

- 1. "Computer Architecture and Organization" john P.Hayes, 2nd Edition.
- "The Intel Microprocessor 8086/80286.../Pentium Pro Processor: Architecture Programming and Interfacing" Barry B.Bary, 5<sup>th</sup> Edition 2000.

## البرمجة المرئية بلغة السي

Subject	Programming in Visual C	Course Code	IT112	Theoretical	3 hrs / wk
Semester	2	Prerequisite	IT111	Practical	3 hrs / wk

Program Learning Components			
	Торіс	Description and Practical Work	
Week 1	<ol> <li>Basic of C programming.</li> <li>Variables and data Type.</li> <li>Operators and Expressions.</li> <li>Basic input and output statement.</li> </ol>	Getting Stated With first step for C programming : The General program structure, variables and abstract data type. Arithmetic and logical Expression. Writing First simple C program.	
	Торіс	Description and Practical Work	
Week 2	<ol> <li>Variables declaration.</li> <li>Simple built-in Data types.</li> <li>Constant and their use.</li> <li>Memory allocation and binding for variables and constants.</li> </ol>	<ul> <li>Understanding the sue of variables and constants for data holding during manipulation.</li> <li>Using constants for fixed data values.</li> <li>Getting knowledge how memory space is allocated for variables holding different data types.</li> <li>The role of declaration statement for memory allocation.</li> </ul>	
Week	Торіс	Description and Practical Work	
3	<ol> <li>Decision statement and program control flow selection.</li> </ol>	Using the language available selection programming constructs.	

	<ol> <li>2. The simple IF Statement.</li> <li>3. The tow way IFELSE Statement.</li> <li>4. The multi selection.</li> </ol>	Conditional selection in different version with one way, tow ways and multiways selections. Intensive examples are to be provided that demonstrate the use and benefits of those constructor. Description and Practical Work
Week 4	<ol> <li>Iteration Statements and program compaction.</li> <li>FOR Statement as counting loop.</li> <li>WHILE statement as pretested loop.</li> <li>DOWHILE statement as post tested loop.</li> </ol>	Learning the need for program compaction and eliminating reparations of code parts by building program construct blocks using iteration statements. The difference and usage of those statements are clarified by example during lab activities sessions.
	<b>Topic</b>	Description and Practical Work           Learning how to split programs into functional
Week 5	<ol> <li>Punction and program decomposition.</li> <li>Types of functions.</li> <li>Parameters passing</li> </ol>	unit as subprograms. By this splitting the programmers gain tow benefits: avoiding the reparations of code and
	<ul><li>methods between</li><li>functions.</li><li>4. Standard library functions.</li></ul>	reusing modules in more than one program as well as using ready developed modules from system library and other programmers.
	<ul> <li>methods between functions.</li> <li>4. Standard library functions.</li> </ul>	reusing modules in more than one program as well as using ready developed modules from system library and other programmers. Description and Practical Work

	Торіс	Description and Practical Work
Week 7	<ol> <li>String as special arrays of type character.</li> <li>Data inputting and outputting from strings.</li> <li>Handling strings as one unit of data.</li> <li>Library functions for strings.</li> </ol>	A string get special attention and treatment in most of modern programming language. The student has to know how VC/VC++ treats string and what library function are available to work with string in word/text processing applications.
	Торіс	Description and Practical Work
Week 8	<ol> <li>Classes, Objects and inheritance.</li> <li>Overriding, overloading and polymorphism of functions between classes.</li> <li>Interface and abstract classes and the general program prototype.</li> </ol>	Adding the related functions for related data types/ structures in one programming unit to form a class. This steps enters the students smoothly into VC++ programming. Function organization between classes is treated by over loading functions in the same class, overriding function between subclasses and polymorphism in different cases in the same hierarchy.
Week	Торіс	Description and Practical Work
9	1. Mid Term Exam.	Testing the knowledge gained by students so far.
	Торіс	Description and Practical Work
Week 10	<ol> <li>VC project setting.</li> <li>Massage box Format.</li> <li>Standard controls.</li> <li>Windows messages and notification.</li> </ol>	Learning how to start with developing a complete project as an application. Learning the available controls in VC++ to design the graphical user interface GUI.
Week	Торіс	Description and Practical Work

11	<ol> <li>Continue with controls.</li> <li>Examples.</li> <li>Command line parsing.</li> <li>Mapping and error handling.</li> </ol>	Learning how to start with developing a complete project as an application. Learning the available controls in VC++ to design the graphical user interface GUI.
	Торіс	<b>Description and Practical Work</b>
Week 12	<ol> <li>Files creation.</li> <li>Data inputting from files.</li> <li>Data outputting to files.</li> </ol>	Dealing with files: file type, file formats and file attributes. When using text files and when using Binary file. Importing data from files and exporting data to files. Space management in memory and on disks.
	Торіс	Description and Practical Work
Week 13	<ol> <li>Introduction to applications development.</li> <li>The capabilities of VC++ for windows Applications.</li> <li>What is next of VC++</li> </ol>	Tow lab sessions to develop a semi windows application to highlight the capabilities of VC++ to develop interactive windows application.
Week	Торіс	Description and Practical Work
14	1. General reviw.	Reviewing what have been studied and what is left for applications development using VC++.

Mid Term Exam	Home works and Lap Activities	Final lap Exam	Final Exam
15%	25%	20%	40%

### **Text Box and References:**

- "Microsoft Visual C++" by Julian T.And Andy Olsen 2002.
   "Programming in C" 5<sup>th</sup> Edition by ritch and karnighan.

## أنظمة رقمية 1

Subject	Digital Systems I	Course Code	CT117	Theoretical	3 hrs / wk
Semester	2	Prerequisite	None	Practical	3 hrs / wk

Program Learning Components				
	<ol> <li>Understanding the various types of Binary Arithmetic and Boolean algebra.</li> <li>To introduce the concept of basic logic gates.</li> </ol>	Resources	Practical	
Week 1-5	<ul> <li>To understand the: Binary arithmetic. Boolean algebra.</li> <li>Comprehend fully the concept of: -basic logic gates. [and, or, not, nand, nor, ex-or, exnor].</li> </ul>	-Lesson Plan -Chalk board -Comprehensive workbook of control engineering and systems and data sheets.	To be able to design and Implement combinations of logic circuits.	
Week	<ol> <li>Introducing Boolean Algebra and minimization</li> <li>Techniques. Designing combinations of logic circuits.</li> </ol>	Resources	Practical	
6-9	Comprehension of: Boolean algebra and its associated theorems. To understand the: Logic minimization using Boolean theorems and K-Map	<ul> <li>-Lesson Plan.</li> <li>-Chalk board.</li> <li>-Comprehensive workbook of control engineering and</li> </ul>	Supervise the laboratory and support students in their practical work.	

	<b>To understanding the functional logic</b> <b>unit such as:</b> Encoders, decoders, multiplexers, demultiplexers, Half Adder, Full Adderetc	systems and data sheets.	
Week	5. Understanding and ability to design Sequential circuits and analysis.	Resources	Practical
10-14	To understanding the: Basic unit of sequential circuits. Comprehension of the design and analysis process for: synchronous logic design. Asynchronous counters& registers. *Parallel registers, shift registers *Ripple counter, up – down counter Int. ROM, Ram, Pla, Prom, EPROM.	-Lesson Plan. -Chalk board. -Comprehensive workbook of control engineering and systems and data sheets.	Supervise the laboratory and support students in their practical work.

Course Work	Mid-Term Tests	Final Exam Practical	Final Examination
10	30	20	40

NOTE: Course Work may include assignments, projects and practical activities.

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### رياضيات 2

Subject	Mathematics II	Course Code	MA151	Theoretical	4 hrs / wk
Semester	2	Prerequisite	MA150	Practical	0 hrs / wk

Program Learning Components			
	1. Integration		
	Definition of indefinite and definite Integration		
	Properties of Integration		
	Integration by substitution		
Week	Integrals of Inverse Trigonometric functions		
1-6	Trigonometric substitutions		
	Further Substituting		
	Powers of Trigonometric functions		
	Completing the square		
	Partial Fractions		
	Integration by Parts		
	2. Applications of Integration		
	Area under a curve		
Week	Area between 2 curve		
10-7	Area under a curve (method Riemann)		
	compute the arc length of a function		
	Numerical Integration (Trapezoidal and Simpsons Rules)		

	3. Complex Numbers
	Introduction to complex numbers
	Cartesian Representation of complex numbers
	Complex Number Arithmetic
Week	Modulus, complex conjugate, Division
14-11	The Argand Diagram
	Complex Equations
	De Moivres theorem
	Eulers Rule
	Roots of Complex Numbers

Course Work	Mid-Term Tests	Final Examination
10	30	60

### Text books:

- 1. Calculus by Anton, Bivens, Davis, 8<sup>th</sup> Edition.
- 2. Liner Algebra by Seymour Lipshutz.
- 3. Calculus and Analytical Geometry by Fisher and Ziebur.

# لغة إنجليزية 2

Subject	English language2	Course Code	EN161	Theoretical	4 hrs / wk
Semester	2	Prerequisite	EN160	Practical	0 hrs / wk

Program Learning Components			
	2. Grammar:		
	* Tenses		
	** Present perfect continuous		
	** Past perfect continuous		
	** Future perfect continuous		
	* If cause		
Wook	** Probable conditions		
1-4	** Improbable conditions		
1-4	** Impossible conditions		
	* Gerund		
	** As subject		
	** After prepositions		
	** The perfect gerund		
	** The passive gerund		
	* Direct and indirect speech (reported speech)		
Week	6. COMPREHENSION:		

5-7	* Units 8 of ( oxford of computing )				
	* Using dictionary				
	7. BASIC LOGIC GATES:				
	* The mechanics of composition				
	** Methods of starting				
	** Continuity and paragraphing				
	** Methods if ending				
	** Somme types of composition				
Week	** Language and style				
8-10	* Spelling and pronunciation				
	** (ce, ci, ti) before a vowel have the sound of (sh) as in cetaceans, gracious, motion, partial				
	** (si) after an accented vowel is pronounced like (zh) confusion				
	* Summerizing				
	** Doro grouphs				
	Paragraphs				
	** Letters				
	8. SPELLING AND PRONUNATION				
	Students are given the must common words which have pronunciation				
	but Different spelling such as :				
Week	ACCEPT / EXERT ANT/AUNT				
11-12	BREAK/BRAKE CHEQUE/ CHECK				
	DRAFT/DRAUGHTDEAR/DEER HOLE / WHOLEHEAR/ HERE				
	HIRE/HIGHER MAIL/ MALEPEACE/PIECE QUIFT /				

	QUITERIGHT / WRITE PRECED / PROCEED					
	PREPOSITION / PROPOSITION TALL/TALE					
	WAIT/ WEIGHTWAY/WEIGH WEEK / WEAK THEIR /					
	THEREKNEW/ NEW READ/RED					
	9. NUMBER REPRESENTATION					
	Students are given the most common abbreviations more, concentration					
	on those which are related computer science such as :					
	* GRAMMAR					
	** N. NOUN ** SING SINGULAR					
	** PRON.PRONOUN ** PL.PLURAL					
	** V.VERB ** SYN. SYNONYM					
Week	** ADV ADVERB ** ANT.ANTONYM					
13-14	** ADJ. ADJECTIVE ** PUNCT.PUNCTUATION					
	** PREP.PREPOSITION ** MUSC. MUSCULINI					
	** CONJ. CONJUNCTION ** FEM.FEMININE					
	* TITLES OF PERSONS					
	** DR. DOCTOR					
	** MR. MISTER					
	** MRS. MISTER'S					
	** PROF. PRFESSOR					

Course Work	Mid-Term Tests	Final Exam Practical
10	30	60

الفصل الدراسي الثالث

Code	Subject	Credit Hours	Theoretical Hours	Practical Hours	Prerequisite
CT 212	Microprocessors	4	3	3	CT117
CT 216	Electronic Circuits I	4	3	3	None
CT 214	Electrical Circuits II	4	3	3	CT113
MA 252	Differential Equations	4	4	0	MA151
EN262	English Language 3	4	4	0	EN161

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### المعالجات الدقيقة

Subject	Microprocessors	Course Code	CT 212	Theoretical	3 hrs / wk
Semester	3	Prerequisite	CT 117	Practical	3 hrs / wk

Program Learning Components			
	1- Introduction to microprocessors (mps).		
Week 1-2	<ul> <li>Historical background.</li> <li>Microprocessor tasks.</li> <li>Power of microprocessor.</li> <li>Microprocessor system concept.</li> <li>Microprocessor structure ( 8086 mp architecture ): <ul> <li>Execution unit.</li> <li>Bus interface unit.</li> </ul> </li> <li>Memory segmentation.</li> <li>Logical address and physical address calculation.</li> </ul>		
Week 3-6	<ul> <li>2- Introduction to assembly language:</li> <li>Assembly language vs high level languages.</li> <li>Assembly language program structure.</li> <li>Data movement instructions (MOV, XCHG, PUSH, POP).</li> <li>Arithmetic instructions (ADD, SUB, MUL, DIV, INC, DEC, etc).</li> <li>Logical instructions (AND, OR, XOR, NOT).</li> <li>Shift and rotate instructions (SHL, SHR, ROL,ROR, etc).</li> <li>Compare instructions (CMP, TEST)</li> <li>Program counter and control instructions.</li> </ul>		
Week	3- Addressing modes: (immediate, register, direct, register indirect, based		
7	relative, indexed relative, based index relative).		
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	4- 8086 Pins and signals:		
	Minimum mode.		
	• Maximum mode.		
Week	• Generation of control signal for memory and I/O ports		
8-10	○ ( MEMR, MEMW, IOR, IOW).		
	• Bus cycle and time states.		
	• Bus timing for a Read operation.		
	• Bus timing for a Write operation.		
	5. 8086 addressing and address decoding		
	5- 0000 addressing and address decoung.		
Week	• Memory interfacing to 8086 based system:		
11.12	<ul> <li>(Interfacing ROM, RAM, EPROM to mp).</li> </ul>		
11-12	• Read and Write (a byte & data word).		
	• Address decoding methods.		
	6- Introduction to 8086 interrupt		
XX/a a la	• Role of interrupts.		
<b>vveek</b>	<ul> <li>Interrupts categories: software interrupts and hardware interrupts.</li> </ul>		
13-14	• Interrupt service routine ISR.		
	• Interrupt vector table IVT.		
	• Processing interrupts.		
	Microprocessor I Lab:		
In the La	b, students learn assembly language programming and gain the necessary		

In the Lab, students learn assembly language programming and gain the necessary information and skills to use the language tools such as : Editor, assembler, Linker, debugger Moreover students should write simple programs to try and use all the instruction given in the lectures.

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### الدوائر الإلكترونية 1

Subject	Electronic Circuits I	Course Code	CT 216	Theoretical	3 hrs / wk
Semester	3	Prerequisite	None	Practical	3 hrs / wk

Program Learning Component					
	1- Introduction to Semiconductors				
Week 1-3	Specific Learning Outcomes	Resources	Practical		
	<ul> <li>Explain Semiconductors, Conductors and Insulators.</li> <li>Discuss conduction in semiconductor.</li> <li>Describe N-type and P-type semiconductor.</li> <li>Analyze Current-Voltage Characteristics of PN junction.</li> <li>Explain the PN junction and explain the three diode models.</li> </ul>	Projector. Simulation of hole & electron movement.	Identify diode packages. Test defective diodes using ohmmeter and DMM.		
Week 4-5	2- Diode Applications         Specific Learning Outcomes       Resources       Practical				
	<ul> <li>Explain the operation of a half wave rectifier.</li> <li>Explain the operation of a full wave rectifier.</li> <li>Analyze power supply filter</li> <li>Analyze the role limiting and clamping circuits.</li> <li>Analyze the operation of diode voltage multipliers.</li> <li>First Mid-term Evaluation Test</li> </ul>	Projector. Simulation using Multisim software package.	Reading diode data sheet. Troubleshoot diode circuits.		

	3- Special Diode and Two Terminal Devices			
	Specific Learning Outcomes	Resources	Practical	
Week 6-7	<ul> <li>Describe the characteristics of Zener diode.</li> <li>Zener diode application in limiting and regulation circuits.</li> <li>Explain varactor diode circuits.</li> <li>Discuss the operation of LEDs and Photodiodes.</li> <li>Describe the characteristics of Solar Cells and Thermistors.</li> </ul>	Projector. Simulation using Multisim software package.	Reading different diodes data sheets. Experiment with Zener regulations with varying input voltage.	
	4- Introduction to Bipolar Junction Tra	ansistor		
Week 8-10	Specific Learning Outcomes	Resources	Practical	
	<ul> <li>Describe the basic structure of BJT.</li> <li>Explain Transistor operation</li> <li>Discuss transistor bias and current-voltage relations, transistor rating and DC load line.</li> <li>Explain how BJT is used as voltage amplifier.</li> <li>Explain how BJT is used as a switch.</li> <li>Second Mid-term Evaluation Test</li> </ul>	Projector. Multisim Simulation package.	Recognize different BJT packages. Identify NPN or PNP transistors using DMM. Troubleshoot faulty BJTs.	
	5- Bipolar Junction Transistor Bias Circuits			
Week	Specific Learning Outcomes	Resources	Practical	
11-12	<ul> <li>Explain DC operating point.</li> <li>Explain Base bias, emitter bias, voltage divider bias and collector feedback bias.</li> </ul>	Projector. Multisim package.	Build and test real BJT circuits.	
Week	6- Field-Effect Transistors and Biasing			

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13-14	Specific Learning Outcomes	Resources	Practical
	<ul> <li>Explain the operation of FETs.</li> <li>Define and discuss important FET parameters.</li> <li>Analyze FET biasing circuits.</li> </ul>	Projector. Multisim. Package.	JFET packages. Build and test real BJT circuits.

Course Work	Mid-Term Tests	Final Practical Examination	Final Written Examination
10	30	20	40

NOTE: Course Work may include assignments, projects and practical activities.

**Textbook:** "ELECTRONIC DEVICES AND CIRCUIT THEORY "by: Robert Boylestad and Louis Nashelsky, Seventh Edition, Prentice Hall.

#### **References:**

- 1. Electronic Devices, 4th Edition by FLOYD.
- 2. Electronic Fundamentals circuits, devices and Applications, 4th Edition by FLOYD.

Note to students: Contact CCTT Library to get a free DVD e-book (Code: CT 216).

### الدوائر الكهربية 2

Subject	Electrical Circuits 2	Course Code	CT 214	Theoretical	3 hrs / wk
Semester	3	Prerequisite	CT 113	Practical	3 hrs / wk

Program Learning Component				
	Review the Sinusoidal Alternating Wav	eforms		
	Specific Learning Outcomes	Resources	Practical	
	SINUSOIDAL ac VOLTAGE			
Week	CHARACTERISTICS AND DEFINITIONS.		Experiments on how	
1	GENERAL FORMAT FOR THE SINUSOIDAL	Power point slide,	to generate the AC signal in voltage and current.	
	VOLTAGE OR CURRENT.	Whiteboard	Voltage versus	
	PHASE RELATIONS, AVERAGE VALUE, EFFECTIVE (rms) VALUES		current characteristic.	
	ac METERS AND INSTRUMENTS			
	Study The Basic Elements and Phasor			
Week	Specific Learning Outcomes	Resources	Practical	
2	THE DERIVATIVE, RESPONSE OF BASIC R, L, AND C ELEMENTS, FREQUENCY RESPONSE. AVERAGE POWER AND POWER	Power point slide, Whiteboard	Experiments on AC circuit using R,L,C and show it by oscilloscope.	
	FACTOR, COMPLEX NUMBERS, AND			

	RECTANGULAR FORM.				
	POLAR FORM.				
	Study the Series and Parallel ac Circuits and networks				
	Specific Learning Outcomes	Resources	Practical		
	SERIES CONFIGURATION				
	FREQUENCY RESPONSE OF THE R-C CIRCUIT.		Series circuit AC		
Week	ADMITTANCE AND SUSCEPTANCE		implementation.		
3-4	PARALLEL ac NETWORKS	Power point slide,	Parallel circuit AC		
	FREQUENCY RESPONSE OF THE PARALLEL R-L NETWORK	Whiteboard	Measure the current, voltage signal and show it>		
	PHASE MEASUREMENTS				
	LADDER NETWORKS				
	APPLICATIONS				
	Study the Methods of Analysis circuits				
	Specific Learning Outcomes	Resources	Practical		
	INDEPENDENT VERSUS DEPENDENT SOURCES.				
Week	SOURCE CONVERSIONS.				
wеек 5-6	MESH ANALYSIS, NODAL ANALYSIS, BRIDGE NETWORKS (ac), SUPERPOSITION THEOREM	Power point slide,	Implementation of Methods of Analysis circuits in the lab by		
	THE VENIN'S THEOREM,		several experiments.		
	NORTON'S THEOREM,				
	MAXIMUM POWER TRANSFER THEOREM,				

	Study the power (AC),Resonance				
	Specific Learning Outcomes	Resources	Practical		
Week 7-8	RESISTIVE CIRCUIT.APPARENT POWER, INDUCTIVE CIRCUIT ANDREACTIVE POWER, CAPACITIVE CIRCUIT,POWER TRIANGLE, TOTAL P, Q, AND S, POWER-FACTOR CORRECTION, 	Power point slide, Whiteboard	Experiments applied To measure the effect of parameter (R,L,C) resonance .		
	Study the Transformers				
	Specific Learning Outcomes	Resources	Practical		
Week 9	MUTUAL INDUCTANCE. IRON-CORE TRANSFORMER. REFLECTED IMPEDANCE AND POWER. FREQUENCY CONSIDERATIONS AIR-CORE TRANSFORMER TYPES OF TRANSFORMERS TAPPED AND MULTIPLE-LOAD	Power point slide, Whiteboard	Experiments applied on different transformer to study the effect parameter of transformer. Output voltage versus input voltage		

	TRANSFORMERS.		
	NETWORKS WITH MAGNETICALLY		
	COUPLED COILS.		
	Study the Polyphase Systems		
	Specific Learning Outcomes	Resources	Practical
	THREE-PHASE GENERATOR.		
	Y-CONNECTED GENERATOR.		
	PHASE SEQUENCE.		
	Y-CONNECTED GENERATOR		
Week	WITH A Y-CONNECTED LOAD.		Experiments available in lab about
10-11	Y△ SYSTEM.	Power point slide,	Single phase
	$\triangle$ -CONNECTED GENERATOR.	Whiteboard	induction Motor.
	THREE-PHASE SYSTEMS.		Three phase induction
	POWER.		motor.
	THREE-WATTMETER METHOD.		
	TWO-WATTMETER METHOD.		
	UNBALANCED, THREE-PHASE.		
	Study Filters, and Bode Plots		1
	Specific Learning Outcomes	Resources	Practical
Week	R-C LOW-PASS FILTER		Experiments on lab
12	R-C HIGH-PASS FILTER	Power point slide	about different types
	PASS-BAND FILTERS	Whiteboard	on filter.
	BODE PLOTS	Winteboard	How to draw the bode
	SKETCHING THE BODE RESPONSE		

	Study the Pulse Waveforms and the R-C Response				
	Specific Learning Outcomes	Resources	Practical		
Week 13	IDEAL VERSUS ACTUAL. PULSE REPETITION RATE. AND DUTY CYCLE AVERAGE VALUE. TRANSIENT R-C NETWORKS. R-C RESPONSE TO SQUARE-WAVE INPUTS. OSCILLOSCOPE ATTENUATOR	Power point slide, Whiteboard	Experiments on lab about different pulse wave generated , display these signals on oscilloscope in proper manner.		
	AND COMPENSATING PROBE.				
	Study System Analysis: An Introduction				
	Specific Learning Outcomes	Resources	Practical		
Week 14	INTRODUCTION. IMPEDANCE PARAMETERS Zi ,Zo. VOLTAGE, CURRENT GAINS. CASCADED SYSTEMS. IMPEDANCE , ADMITTANCE PARAMETERS. HYBRID (h) PARAMETERS	Power point slide, Whiteboard	Experiments on lab about different cascaded RLC circuits.		

Course Work	Mid-Term Tests	Final Practical Exam	Final Written Exam
10	30	20	40

NOTE: Course Work may include assignments, projects and practical activities.

### المعادلات التفاضلية

Subject	Differential Equations	Course Code	MA252	Theoretical	4 hrs / wk
Semester	3	Prerequisite	MA151	Practical	0 hrs / wk

	<b>Program Learning Com</b>	ponent			
	1. Review of Differentiation and Integration				
Week 1-3	Specific Learning Outcomes	Resources			
	<ul> <li>Review of basic differentiation rules.</li> <li>Review of derivatives of sine's and cosines.</li> <li>Review of derivatives of logarithmic and exponential functions</li> <li>Implicit differentiation.</li> <li>Review of Integration by substitution and by parts.</li> <li>Review of complex numbers.</li> </ul>	Projector.			
	2. First Order Differential Equations				
	Specific Learning Outcomes	Kesources			
Week	<ul> <li>Identify separable equations</li> <li>Homogenous and nearly homogenous D.E.</li> </ul>				
4-7	• Testing exact D.E.	Projector.			
	<ul> <li>Integration factors and Bernoulli equations.</li> <li>Linear First order D E</li> </ul>	Simulation using software			
	Application to RL and RC circuits.	package.			
	• First Mid-term Evaluation Test.				
Week	3. Linear Second Order Differential Equations				

8-10	Specific Learning Outcomes	Resources
	• Existence of Linear Second Order Differential	
	<ul><li>Finding general solution of :</li></ul>	
	$y'' + Ay' + By = 0$ for $A^2 - 4B \ge 0$	
	<ul> <li>Background on complex Exponential functions</li> <li>Finding general solution of :</li> </ul>	Projector
	$y'' + Ay' + By = 0 \text{ for } A^2 - 4B < 0$	Simulation using astronom
	<ul> <li>Reducing of order using absent dependent variable.</li> </ul>	packages.
	<ul> <li>Reducing of order using absent independent variable.</li> </ul>	
	• Second Mid-term Evaluation Test.	
	4. Higher Order Differential Equations	•
	Specific Learning Outcomes	Resources
Week	• Higher order linear homogenous D.E with	
11-12	<ul> <li>Solve nth order using characteristic equation.</li> </ul>	Projector.
	• Explain different roots of characteristic equation	
	<ul><li>distinct, repeated or complex.</li><li>Method of undetermined coefficients.</li></ul>	
	5. Laplace Transform	
	Specific Learning Outcomes	Resources
Week	Defining Laplace transform.	
13-14	<ul> <li>Shifting in the s and t-variable.</li> <li>Calculating the Loplace transform</li> </ul>	
	Calculating the Laplace transform.     Calculating the Inverse Laplace transform.	
	Solving typical Engineering Problem.	
	• Understanding Convolution.	

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Course Work	Mid–Term Test	Final Examination
20	30	50

**NOTE:** Course Work may include assignments, projects and practical activities.

#### **Textbooks:**

Elementary Differential Equation, by W.E. BOYCE and R.C. DIPRIMA

## لغة إنجليزية 3

Subject	English Language 3	Course Code	EN262	Theoretical	4 hrs / wk
Semester	3	Prerequisite	EN161	Practical	0 hrs / wk

	Program Learning Component
Week	3. Grammar:

	* Tenses
	** Present perfect continuous
	** Past perfect continuous
	** Future perfect continuous
	* If clause
	** Probable conditions
	** Improbable conditions
	** Impossible conditions
	* Gerund
	** As subject
	** After prepositions
	** The perfect gerund
	** The passive gerund
	** Direct and indirect speech (reported speech)
Week	<b>10.COMPREHENSION:</b>
6 10	* 8 units of (oxford of computing)
0-10	* Using dictionary
	11.BASIC LOGIC GATES:
Weels	* The mechanics of composition
week	** Methods of starting
11-14	** Continuity and paragraphing
	** Methods of ending



Course Work	Mid-Term Tests	Final Exam Practical
10	30	60

## الفصل الدراسى الرابع

Code	Subject	Credit Hours	Theoretical Hours	Practical Hours	Prerequisite
CT213	Microcontroller	4	3	3	CT 212
CT217	Electronic Circuits II	4	3	3	CT 216
NT220	Signals and Systems	4	3	3	MA 151
CT227	Fund. Of Control Sys.	4	4	0	MA 252
EN263	English Language 4	4	4	0	EN 262

## الحاكمات الدقيقة

Subject	Microcontroller	Course Code	CT 213	Theoretical	3 hrs / wk
Semester	4	Prerequisite	CT 212	Practical	3 hrs / wk

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Program Learning Component					
Week 1-2	<ul> <li>Appreciate the fundamental struct</li> <li>Specific Learning Outcomes</li> <li>Appreciate the differences between microprocessors and microcontrollers.</li> <li>Use the number systems (this including binary, hexadecimal, and BCD numbers, binary arithmetic and logical operations and coding).</li> <li>Draw a block diagram of a simple microcontroller-based system (CPU, memory, buses, Input/output).</li> <li>Explain a simplified memory organization.</li> <li>Appreciate the use of machine code, assembly and high level languages.</li> </ul>	Component         Resources         Power point slide         Whiteboard         Comprehensive         workbook for         students         PIC 16F84         development         board.         MP lab         development         software.         PIC Programmer         or a suitable         alternative	<ul> <li><b>f a microcontroller</b></li> <li><b>Practical</b></li> <li>Perform example calculations in binary and hexadecimal and conversions between hex and binary systems.</li> <li>Appreciate and use a simple to Microcontroller development system.</li> <li>Use a specific microcontroller (e.g: PIC 16F84)</li> </ul>		
Week	2. Use a software development system Specific Learning Outcomes	n for a particular r Resources	nicrocontroller. Practical		
3	<ul> <li>Microcontroller programming languages</li> <li>Binary arithmetic, use of ASCII codes</li> <li>Appreciate microcontroller</li> </ul>	Power point slide Whiteboard	• Write a simple program in assembly language		

	<ul> <li>characteristics.</li> <li>Read the data sheet of a microcontroller.</li> <li>Interpret the pin diagram and functions.</li> </ul>	Comprehensive workbook for students	<ul> <li>using an appropriate development system.</li> <li>Use appropriate assembly language style, directives and pseudo ops.</li> <li>Investigate assembly language instructions by writing and testing example programs.</li> </ul>	
	3. Write, test and simulate assembly Specific Learning Outcomes	language program Resources	s. Practical	
Week 4-5	<ul> <li>Define the function of some basic assembly language instructions.</li> <li>Define the function of jump and branch assembly language instructions</li> <li>Describe the function of a subroutine, its advantages, disadvantages and how to implement it in assembly language.</li> </ul>	Power point slide Whiteboard Comprehensive workbook for students	<ul> <li>Investigate the new assembly language instructions by writing and testing example programs.</li> <li>Use a simulator to test the programs.</li> </ul>	
	4. Explain the basic principles of add	ress decoding.		
	Specific Learning Outcomes	Resources	Practical	
Week 6	<ul> <li>Explain the basic principles of address decoding.</li> <li>Obtain memory address ranges from a particular design.</li> </ul>	Power point slide Whiteboard Comprehensive workbook for students	• Write and test simple programs with loops.	
Week	5. Program basic input/output devices and timers .			

7	Specific Learning Outcomes	Resources	Practical		
	• Describe how to use Input/Outputs of the microcontroller to perform simple functions.	Power point slide Whiteboard Comprehensive workbook for students	• Implement some programs with subroutines.		
	6. Program basic input/output device	es and timers			
	Specific Learning Outcomes	Resources	Practical		
Week 8	• Appreciate the issue of synchronization of I/O data transfers using polling or interrupts.	Power point slide Whiteboard Comprehensive workbook for students	• Write and test simple programs to write data to leds connected to an output port.		
	7. Program basic input/output devices and timers				
	Specific Learning Outcomes	Resources	Practical		
Week 9-10	<ul> <li>Appreciate the importance of hardware timers ,counters and their advantages.</li> <li>Outline the purpose and use of ADCs and DACs.</li> </ul>	Power point slide Whiteboard Comprehensive workbook for students	• Write and test simple programs to read data from switches connected to a port and using Input/output interface devices		
	8. Appreciate various microcontroller applications in process control.				
Week 11-12	Specific Learning Outcomes	Resources	Practical		
	• Appreciate various microcontroller applications such as process control, DC motor control and Stepper motor control,	Power point slide Whiteboard Comprehensive	•Programming the speed of a stepper and the DC motor .		

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		workbook for students	
	Specific Learning Outcomes	Resources	Practical
Week 13-14	• Appreciate various microcontroller applications such as applying PWM technique ,measurements and data display.	Power point slide Whiteboard Comprehensive workbook for students	<ul> <li>Use a microcontroller to measure and control temperature.</li> <li>Create a closed loop control system using the microcontroller</li> </ul>

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#### الدوائر الإلكترونية 2

Subject	Electronic Circuits II	Course Code	CT 217	Theoretical	3 hrs / wk
Semester	4	Prerequisite	CT 216	Practical	3 hrs / wk

Program Learning Component					
	Specific Learning Outcomes	Teachers activities	Resources		
Week 1-6	<ol> <li>Transistor Application</li> <li>Common base configuration</li> <li>Common Emitter configuration</li> <li>Common Collector configuration</li> <li>Transistor maximum rat</li> </ol>	<ol> <li>Define and Present of different transistor applications</li> <li>explain and study the transistor configurations</li> </ol>	<ul><li>Lesson Plan</li><li>Chalk board</li></ul>		
	Specific Learning Outcomes	Teachers activities	Resources		
Week 7-11	<ul> <li>FET Transistor:</li> <li>1. Construction ,characteristics, biasing</li> <li>2. Depletion, enhancement</li> <li>3. Small Signal Amplifier Bn bb</li> <li>4. Multistage Amplifier</li> <li>5. Frequency response</li> <li>Types, circuits, analysis, effect of Feedback</li> </ul>	<ol> <li>Study and explain the FET Transistor</li> <li>Present the FET-T characteristics and specifications</li> <li>Study of the small and multistage</li> <li>solve related problems definition Present and study of the Frequency response</li> </ol>	• Lesson Plan • Chalk board		
-	Specific Learning Outcomes	Teachers activities	Resources		
Week 12-16	<ul><li><i>1.</i> Power electronics Thyris tors, trace, disc</li><li><i>2.</i> DC Amplifiers</li></ul>	<ol> <li>Study and present of DC and</li> <li>operational Amplifiers</li> </ol>	<ul><li>Lesson Plan</li><li>Chalk board</li></ul>		
	Push-pull amplifier	3. solve related problems			

Amplifier with Feedback	Amplifiers	
differential Amplifier, rejection of common mode signals		
<b>3. Operational Amplifiers</b> I/P,O/P Impedance		
Frequency compensation		
I/P effect current		

Course Work	Mid-Term Tests	Final Practical Examination	Final Written Examination
10	30	2040	

NOTE: Course Work may include assignments, projects and practical activities.

**Textbook:** "ELECTRONIC DEVICES AND CIRCUIT THEORY "by: Robert Boylestad and Louis Nashelsky, Seventh Edition, Prentice Hall.

**Textbook:** Introductory Circuit Analysis 10th Edition by Boylestad.

Note to student: Contact CCTT Library to get a free DVD e-book (Code: CT 217).

## إشارات ونظم

Subject	Signals and Systems	Course Code	NT220	Theoretical	3 hrs / wk
Semester	4	Prerequisite	MA151	Practical	3 hrs / wk

Program Learning Component						
	1. Signal representation					
	Specific Learning Outcomes	Resources				
	Signal representation					
Week	• Definitions and classifications of signals					
1-2	• Elementary signals	Duciestor				
	• Average and effective value of a signal	Projector				
	• Energy and power of a signal					
	• Transformation of the independent variable					
	2. Continuous time systems					
	Specific Learning Outcomes	Resources				
Week	Continuous time systems					
3-4	• Introduction and classification of systems					
	• Linear time invariant systems	Projector				
	• Systems described by differential equations					
	• Transfer throw linear network					
Week	<b>3. Linear Second Order Differential Equations</b>					
5-8	Specific Learning Outcomes	Resources				

	The Lanlace Transform	
	Introduction	
	• The Unilateral Laplace transform	Projector
	Properties of LT	
	• Inverse LT	
	• Applications of LT	
	4. The Fourier series	
	Specific Learning Outcomes	Resources
	The Fourier series	
Week	• The periodic signals	
9-11	• The trigonometric form FS	<b>D</b>
	• The one sided spectrum	Projector
	• The exponential form FS	
	• The two sided spectrum	
	5. The Fourier transform	
	Specific Learning Outcomes	Resources
	The Fourier transform	
Week	Introduction	
12-14	• The continuous time FT	
	• Properties of FT	Projector
	Application of FT	
	Signal Filtering	

Course Work	Work Mid–Term Test Final Examina	
20	20	60

NOTE: Course Work may include assignments, projects and practical activities.

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#### مبادئ أنظمة التحكم

Subject	Fund. Of Control Sys.	Course Code	CT227	Theoretical	4 hrs / wk
Semester	4	Prerequisite	MA252	Practical	0 hrs / wk

# **Program Learning Component**

### • To understand the principle of automatic control.

• The ability to introduce the concept of basic control systems.

# • To understand the concept of Controller design.

<b>XX</b> 7 1-	Specific Learning Outcomes	Resources	Practical			
Week	<ul> <li>To understand the: basic principle of automatic control. Types and Models of automatic control Systems Block diagrams and Signal flow charts.</li> <li>Comprehend an overview of: Relational data model</li> </ul>	A computer & data-show. White board				
	<ul> <li>To understand the methods of mathematical modeling of dynamic systems.</li> <li>To understand the differences between open loop and closed loop control Systems.</li> </ul>					
Week	Specific Learning Outcomes	Resources	Practical			
4-5	<ul> <li>Understanding of the: Methods of mathematical modeling of dynamic systems.</li> <li>Comprehend: The feedback control Systems. The response of different control</li> </ul>	A computer & data-show. White board	Ability to create a simulink control system model (linear & nonlinear)			

	systems.				
	<ul> <li>To understand the behavior of dynamic systems.</li> <li>To understand the Errors of steady state of the dynamic systems.</li> <li>To understand the Stability issues of control systems.</li> </ul>				
Week 6-11	Specific Learning Outcomes	Resources	Practical		
	• understanding the: Techniques of Laplace transform, the dynamic systems behavior. Signal flow chart, models of dynamic systems. Errors associated with steady state of dynamic systems. Stable and Unstable Control Systems.	A computer & data-show. White board.	Ability to simulate a simple control systems Ability to analyze and simulate a control system using Matlab program		
	<ul> <li>Ability to analysis in Frequency response domain.</li> <li>Ability to use simulation tools by MATLAB for control sytems.</li> </ul>				
	Specific Learning Outcomes	Resources	Practical		
Week 12-14	<ul> <li>Understanding the: Root locus methods for decomposition of control systems Controller design.</li> <li>Frequency response Bode Blot design.</li> <li>Simulation process of control systems using MAT LAB.</li> </ul>	A computer & data-show. White board	Ability to design the control systems using matlab. Obtain the transfer function practically		

## لغة إنجليزية 4

Subject	English Language 4	Course Code	EN263	Theoretical	4 hrs / wk
Semester	4	Prerequisite	EN262	Practical	0 hrs / wk

Program Learning Component					
	4. Grammar:				
	Affixes				
	Nouns.				
	Verbs.				
	Adjectives.				
	Adverbs.				
	Diagramming.				
<b>TT</b> 7 <b>1</b>	Subject, predicate and complement				
wеек 1-5	Kinds of complement				
	Direct object				
	Indirect object				
	Predicate adjective				
	Adjective and adverb modifiers				
	Adjective modify nouns or pronouns				
	Adjective phrases modify adjective, verbs				
	Adjective modify adjectives, verbs or other adverbs				
	Adjective phrases modify adjectives, verbs or other adverbs				

	Adjective clauses modify nouns or pronouns
	Noun clauses
	Verbal phrases
Week	12.COMPREHENSION:
6-7	Oxford Eng. for computing
	13.COMPOSITION
	Composition with practical purpose
	Writing short composition
Week	Writing friendly letters
8-10	Writing business letters
	Summarizing
	Paragraphs
	Letters
Week	4. Spelling and punctuation:
11	
Week	5. Abbreviations
12-14	Students are given the most common abbreviation with more concentration on those, which are related to computer science

Course Work	Mid-Term Tests	Final Examination
10	30	60

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## الفصل الدراسي الخامس

Code	Subject	Credit Hours	Theoretical Hours	Practical Hours	Prerequisite
CT 314	Programmable Logical Controller I	4	3	3	CT 212
CT 320	<u>Controllers</u>	4	3	3	CT 227
CT 318	Power Electronics	4	3	3	CT 217
CT 326	Graphical Prog. (Lab View)	4	3	3	IT 112
EN 364	English Language 5	2	2	0	EN 263
EN 300	English Technical Writing I	2	2	0	EN 263

## برمجة الحاكمات المنطقية 1

Subject	Programmable Logical Controller I	Course Code	CT314	Theoretical	3hrs / wk
Semester	5	Prerequisite	CT212	Practical	3hrs / wk

Program Learning Component					
	<ol> <li>Understanding the structure, programming and the application fields of a PLC system</li> <li>writing simple ladder logic programs</li> </ol>				
Week 1-3	<ul> <li>Specific Learning Outcomes</li> <li>Introduction to PLC</li> <li>Basics [hardware configuration] for a PLC system.</li> <li>Identification of input/output and bit addresses</li> <li>Programming device. (personal computer/software)</li> <li>PLC operation</li> <li>Ladder diagram programming</li> </ul>	<ul> <li>White board</li> <li>Data show</li> <li>Computers</li> <li>Text book</li> <li>Work book</li> </ul>	• PSIM software		
Week	3. Understanding the concept of memory in PLC systems4. Design basic input and output wiring.Specific Learning OutcomesResourcesPractical				
4-6	<ul> <li>PLC Memory</li> <li>Input interfaces</li> <li>Output interfaces</li> <li>Input/contact instructions</li> <li>Output/coil instructions</li> <li>System and I/O power</li> </ul>	<ul> <li>White board</li> <li>Data show</li> <li>Computers</li> <li>Text book</li> <li>Work book</li> </ul>	<ul> <li>MicroLogix 1000 PLC</li> <li>lamp control circuits</li> <li>Forward/Reverse Motor Circuit</li> </ul>		

	distribution wiring					
	<ul> <li>5. Using timer operations and the differentiate between timers.</li> <li>6. Understanding and using Latching instructions</li> <li>7. Operating principles of Program control instructions</li> </ul>					
Week	Specific Learning Outcomes	Resources	Practical			
7-9	<ul><li>Timing instructions</li><li>Latching instructions</li></ul>	<ul> <li>White board</li> <li>Data show</li> <li>Computers</li> <li>Text book</li> <li>Work book</li> </ul>	<ul> <li>Using timer instructions</li> <li>Traffic light control</li> </ul>			
	8. Design and operating principles of counters in PLC 9. Understanding the "Force" function					
Week	Specific Learning Outcomes	Resources	Practical			
10-12	<ul> <li>Counting instructions</li> <li>Forces</li> <li>Program control instructions</li> </ul>	<ul> <li>White board</li> <li>Data show</li> <li>Computers</li> <li>Text book</li> <li>Work book</li> </ul>	<ul> <li>Using Counter instructions</li> <li>Forcing inputs/outputs</li> </ul>			
	10. Interpreting the displays of the "Monitor" in LAD Editor and use them for troubleshooting					
Week	Specific Learning Outcomes	Resources	Practical			
13-14	<ul> <li>Programe Monitoring</li> <li>Error diagnostica/ error handling</li> <li>Documentation</li> </ul>	<ul> <li>White board</li> <li>Data show</li> <li>Computers</li> <li>Text book</li> <li>Work book</li> </ul>	<ul><li>Error diagnostica</li><li>Documentation</li></ul>			

#### الحاكمات

Subject	Controllers	Course Code	CT320	Theoretical	3hrs / wk
Semester	5	Prerequisite	CT227	Practical	3hrs / wk

Program Learning Component					
	1. Use of analog controllers in a feedback control system				
Week 1	Specific Learning Outcomes	Resources	Practical		
	<ul> <li>Introduction to controllers systems</li> <li>Operational amplifier circuits</li> <li>The Response in Time Domain and Frequency Domain specifications</li> </ul>	Power point slides whiteboard	<ul> <li>The selection of the electronic circuit components to apply analog control systems</li> <li>(simulation by electronic workbench</li> <li>And implementation in test board</li> </ul>		
	2. Study the proportional controller (design ,simulation and implementation)				
	Specific Learning Outcomes	Resources	Practical		
Week 2	<ul> <li>Proportional controllers</li> <li>The characteristics of proportional controller</li> <li>Design proportional controllers</li> <li>Advantages of proportional controllers</li> <li>The electronic circuit of the P controller</li> </ul>	Power point slides whiteboard	<ul> <li>Applying analog P controller to real process in the Lab</li> <li>Such as (speed control, level control, flow control, temperature control,etc)</li> </ul>		
Week	3. Study the proportional plus integral implementation)	controller (design	n ,simulation and		

3	Specific Learning Outcomes	Resources	Practical	
	<ul> <li>Proportional plus integral controllers</li> <li>The characteristics of roportional plus integration block</li> <li>Design proportional plus integration block</li> <li>Advantages proportional plus integration block</li> <li>The electronic circuit of the PI controller</li> </ul>	Power point slides whiteboard	<ul> <li>Applying analog PI controller to real process in a closed loop control system in the Lab</li> <li>Such as (speed control, level control, flow control and temperature control,etc)</li> </ul>	
	4. Study the proportional plus derivative controller (design ,simulation and implementation)			
Week 4	Specific Learning Outcomes	Resources	Practical	
	<ul> <li>Proportional plus derivative block</li> <li>The characteristics of proportional plus derivative block</li> <li>Design proportional plus derivative block</li> <li>Advantages proportional plus derivative block</li> <li>The electronic circuit of the PD controller</li> </ul>	Power point slides whiteboard	<ul> <li>Applying analog PD controller to real process in a closed loop control system in the Lab</li> <li>Such as (speed control, level control, flow control, temperature control,etc)</li> </ul>	
	5. Study the proportional plus integral plus derivative controller (design , simulation and implementation)			
	Specific Learning Outcomes	Resources	Practical	
Week 5	<ul> <li>Proportional plus derivative plus integral</li> <li>The characteristics of proportional plus integral plus derivative block</li> <li>Design proportional plus integral plus derivative block</li> <li>Advantages proportional plus integral</li> </ul>	Power point slides whiteboard	<ul> <li>Applying analog PID controller to real process in closed loop control systems in the Lab</li> <li>Such as (speed control,</li> </ul>	

	• The electronic circuit of the PID controller		control, temperature control,etc)	
	6. Study the digital control systems			
Week 6-7	Specific Learning Outcomes	Resources	Practical	
	<ul> <li>Introduction to the Digital control systems</li> <li>(Principles of Digital Control,</li> <li>Theory of Z-Transform and</li> <li>Principles of Z-Transform}.</li> <li>Stability and analysis of digital control systems</li> <li>Obtaining the difference equation of digital control system</li> <li>Selection of the sample time</li> </ul>	Power point slides whiteboard	• Simulation ,analysis and design of digital control Systems using MATLAB.	
	7. Study the digital PID controller design, simulation and implementation			
	Specific Learning Outcomes	Resources	Practical	
Week 8-9	• Digital PID controller (design ,simulation and implementation )	Resources Power point slides whiteboard	<ul> <li>Practical</li> <li>Applying digital PID controller to a real process in the Lab</li> <li>Such as (speed control, level control, flow control, temperature control, etc)</li> </ul>	
Week 8-9	<ul> <li>• Digital PID controller (design ,simulation and implementation )</li> <li>8. Study the state space representation of the state space s</li></ul>	Resources Power point slides whiteboard of dynamic control	Practical • Applying digital PID controller to a real process in the Lab • Such as (speed control, level control, flow control, temperature control,etc)	
Week 8-9 Week	<ul> <li>Specific Learning Outcomes</li> <li>Digital PID controller (design ,simulation and implementation )</li> <li>8. Study the state space representation of Specific Learning Outcomes</li> </ul>	Resources Power point slides whiteboard of dynamic contro	Practical         • Applying digital PID controller to a real process in the Lab         • Such as (speed control, level control, flow control, temperature control, etc)         • Systems         • Practical	

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	9. Study how to design and simulate sta	ate feedback cont	rol system
Week	Specific Learning Outcomes	Resources	Practical
11	• Controllability check of digital control systems and the design method of state feedback control system	Power point slides whiteboard	• Design and simulation of state feedback control system by Matlab.
	10.Study how design and simulate state	e estimator	
Week	Specific Learning Outcomes	Resources	Practical
12	• Observability check of digital control systems and the design method of state estimator	Power point slides whiteboard	• Design and simulation of state estimator control system by Matlab.
	11.Study the cascade control theory an	d application	
	Specific Learning Outcomes	Resources	Practical
Week 13-14	• Principles and application of the Cascade control systems	Power point slides whiteboard	<ul> <li>Applying different types of controllers to real process as a cascaded control systems in the Lab</li> <li>(water level and flow control system)</li> </ul>

- 73

# إلكترونات القدرة

Subject	Power Electronics	Course Code	CT318	Theoretical	3hrs / wk
Semester	5	Prerequisite	CT217	Practical	3hrs / wk

	Program Learn	ning Componen	<u>it</u>		
	<b>1. Understands the power electronic de</b>	evices, and its firing a	ng and protection techniques.		
	Specific Learning Outcomes	Resources	Practical		
Week 1-3	<ul> <li>Power electronics and power electronic devices:</li> <li>Explains PN junction, power diode and draws its characteristics. Defines their applications.</li> <li>Power transistors (BJT, MOSFET, IGBT,etc).</li> <li>Explains operation and protection of power transistors.</li> <li>Explains thyristor (SCR, traic, Gto, etc).Draws firing and protection circuits for thyristors.</li> <li>Operational Amplifier circuits</li> </ul>	A computer & data-show. White board	<ul> <li>By experiment the student should verify</li> <li>Interpreting the data sheets for power electronic devises.</li> <li>Interpreting the diode characteristics and diode testing,</li> <li>Interpreting thyristor characteristics and thyristor testing.</li> </ul>		
	2. Able to determine the average val the effect of the inductive load on	the rectification pr	ltage and current. Exams ocess.		
Week	Specific Learning Outcomes	Resources	Practical		
4-5	Power electronics circuits (controlled)	A computer & data-show.	By experiment the student should verify:		
	• Thyristors : characteristics, turn-on, turn-off, snubber circuits, firing	White board	• Operation of thyristor firing circuits.		

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	circuits, single phase half-wave semi-converter, full converter, dual converter, resistive and inductive loads, three phase converters		<ul> <li>Single phase controlled rectifier with resistive load.</li> <li>Demonstrates effect of inductive load on the single phase controlled rectifier.</li> <li>Three phase controlled rectifier with resistive load.</li> </ul>
	<b>3. Understands the AC voltage cont</b>	troller.	
	Specific Learning Outcomes	Resources	Practical
Week 6-7	AC voltage controllers • On-off control, single phase unidirectional, bi-directional, with inductive loads, three phase half- wave, full-wave cyclo-converters.	A computer & data-show. White board	<ul> <li>By experiment the student should verify:</li> <li>Speed control of AC motor using phase controllers.</li> <li>Speed control of universal motor using a traic.</li> <li>3- Build a test control circuits.</li> </ul>
	4. Understands the theory of opera	tion of different type	es of chopper circuits.
	Specific Learning Outcomes	Resources	Practical
Week 8-9	ChoppersPower transistors: characteristics, series and parallel operation, $\frac{di}{dt}$ and $\frac{dv}{dt}$ limitations, isolation of gate and base drives, step-up and step-down chopper operation, classification, regulators, thyristors chopper circuits.	A computer & data-show. White board	<ul> <li>By experiment the student should verify:</li> <li>Speed control of DC motor using choppers.</li> <li>Build a test circuits chopper circuits.</li> </ul>

	5. Understands the theory of opera and frequency	tion of inverters wi	th the control of voltage
	Specific Learning Outcomes	Resources	Practical
Week 10-12	<b>Inverters</b> Principle of operation, performance parameters, single phase and three phase PWM inverters.	A computer & data-show. White board	<ul> <li>By experiments the student should verify:</li> <li>Speed control of DC motors using controlled rectifier circuits (Thyristors).</li> <li>Build a test control circuit.</li> </ul>
Week	Specific Learning Outcomes	Resources	Practical
13-14	• Introduction to linear and switching mode Power supplies and the AC voltage stabilizer circuits.	A computer & data-show. White board	• Troubleshooting and maintenance of power supply and checking power electronic devices

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#### البرمجة الرسومية

Subject	Graphical Prog. (lab view)	Course Code	CT312	Theoretical	3hrs / wk
Semester	5	Prerequisite	IT112	Practical	3hrs / wk

	<b>Program Learning</b>	<u>component</u>			
	12. LabView Basics				
	Specific Learning Outcomes	Resources	Practical		
	Lab VIEW Basics				
Week 1-2	This introduces the Lab View environment and helps orient students when they open a				
	VI.	Projector.	Introducing students to		
	<ul><li>Windows</li><li>Toolbars</li></ul>	PCs and Lab View software	Software on desktops.		
	• Menus				
	• Palettes.				
-	13. Virtual Instruments				
	Specific Learning Outcomes	Resources	Practical		
Week	Virtual Instruments		This Lab illustrates the		
3	Virtual instrument components are introduced:	Projector. PCs and	concept of controls (inputs) and indicators		
	• front panel	LabView software	(outputs) and how to wire objects together in		
	block diagram		the block diagram.		

	• icon/connector		
	• subVIs		
	• Using VIs in other VIs or.		
	14. Math Script	-	
	Specific Learning Outcomes	Resources	Practical
	Math Script		
Week 4	<ul> <li>These classes introduces the new interactive Math Script environment, which combines:</li> <li>intuitive graphical dataflow programming</li> <li>Mathematics-oriented textual programming environment.</li> <li>Math Script Node for integrating textual scripts within the LabVIEW block diagram.</li> </ul>	Projector. PCs and Labview software	The Lab covers both the interactive MathScript environment for command line computation and programming
	<b>15.</b> Debugging Virtual Instruments		
	Specific Learning Outcomes	Resources	Practical
Week 5	Editing and Debugging VIs	Projector.	Students in this LAB can find errors using
	• Resizing	PCs and	execution highlighting,
	• Coloring	Labview	breakpoints, and other
	• labeling objects		debugging tools.
West	16. Sub-Vis		
6	Specific Learning Outcomes	Resources	Practical
	<u>Sub-VIs</u>	Projector.	The LAB shows parallels between

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	These classes emphasize the importance of	PCs and	LabVIEW and text-		
	reusing code and illustrate how to create a	LabView	based programming		
	VI icon/connector.	software	languages.		
	17. Structures				
Week	Specific Learning Outcomes	Resources	Practical		
7	<u>Structures</u>	Projector.	In this LAB, the		
	These Classes presents loops, case	PCs and	introduced as a way to		
	structures, and sequence structures	LabView	implement complex		
	governing the execution flow in a VI.	software	mathematical equations		
			matiematical equations.		
	18. Arrays and Clusters				
Ì	Specific Learning Outcomes	Resources	Practical		
Week	Arrays and Clusters		This LAB illustrates		
8-0		Projector.	how to create and		
0-7	Shows students how they can group data,	PCs and	manipulate arrays and		
	either with elements of the same type	LabView	clusters on the front		
	(arrays) or elements of a different type	software	panel as well as on the		
	(clusters).		block diagram.		
	19. Charts and Graphs	1			
Week	Specific Learning Outcomes	Resources	Practical		
10	Charts and Graphs	Projector.	This LAB covers the		
	This chapter shows how to display and	PCs and	annotation of short and		
	customize the appearance of single and	LabView	graph images		
	multiple charts and graphs	software	graph mages.		
	multiple charts and graphs.	soltware			
	20. Data Acquisition	soltware			
Week	20. Data Acquisition Specific Learning Outcomes	Resources	Practical		
Week 11	20. Data Acquisition Specific Learning Outcomes Data Acquisition	Resources Projector.	Practical This LAB introduces		

	<ul> <li>Discusses :</li> <li>Basic analog and digital signal characteristics</li> <li>Acquiring and generating digital signals.</li> </ul>	PCs and LabView software	Automation Explorer (MAX), simulated data acquisition, and the USB DAQ student kits.
	21.Analysis Specific Learning Outcomes	Resources	Practical
Week 12	Analysis         Students can use LabVIEW in a variety of ways to support signal and system analysis. This class discusses several important analysis topics including:         • how to use LabVIEW for signal generation         • signal processing         • linear algebra         • curve fitting         • formula display on the front panel         • differential equations         • finding roots (zero finder)         • Integration and differentiation.	Projector. PCs and LabView software	This LAB enforces all mathematical tools introduced in the theoretical part.
***	Specific Learning Outcomes	Resources	Practical
Week	Applications		
13-14	Applications The concluding classes briefly discusses other LabVIEW features, such as:	Projector. PCs and LabView	Students are introduced to instrument drivers, as well as the use of MAX to detect and install

Sound Card I/O	software	instrument drivers and
<ul><li>simulation and control</li><li>new shared variable</li></ul>		the use of Instrument I/O Assistant to communicate with
<ul> <li>Instrument control system</li> </ul>		traditional instruments.
• using a GPIB		
• serial interface		

#### **Course Assessment:**

Course Work	Mid-Term Tests	Final Exam Practical	<b>Final Examination</b>
10	30	20	40

**NOTE:** Course Work may include assignments, projects and practical activities.

#### **Textbook:**

Title: LabVIEW 7 Express Student Edition Author: Robert Bishop Publisher: Prentice Hall ISBN: 0-13-123926-0

## لغة إنجليزية 5

Subject	English Language 5	Course Code	EN364	Theoretical	2 hrs / wk			
Semester	5	Prerequisite	EN263	Practical	0 hrs / wk			
	Program Learning Components							
	COMPREHENSION:							
	Selections from magazines such	h as:						
Week	13.1. P.C. magazine							
1-4	13.2. Byte magazine							
	13.3. Data communication							
	13.4. Word of Computer							
	COMPOSITION:							
	Composition with creative angle:							
Week	• Writing the long compositio	n						
5-8	• Writing on specific topics							
	• Writing on general topics							
	• Organizing materials into pa	ragraphs						
	SUMMARIZNG THE TOPICS	TAKEN ABOV	E:					
XX7 1	• Definition of process							
Week	• Process states							
9-11	• Process transitions							
	• The context of a process							

	BUSINESS	
	**ACCT. ACCOUNT	**DEPT. DEPARTMENT
	**ADV. ADVERTIAEMENT	**EA. EACH
	**AMT. AMOUNT	**ENC. ENCLOSE
Week	**APPROX. APPROXIMATE	**EST. ESTABLISHED
12-14	**ASSN. ASSOCIATION	**BWD BACKWARD
	**BAL. BALANCE	**FWD FORWARD
	**BBL. BARREL	**INT. INTEREST
	**BROS. BROTHERS	**LTD. LIMITED
	**C.O.D EACH ON DELIVERY	**CORP. CORPORATE
	**C/O. CARE OF	**REC. RECEIPT

**Course Assessment:** 

### التقارير الفنية بالإنجليزية 1

Subject	Technical Documentation 1	Course Code	EN300	Theoretical	2hrs / wk
Semester	5	Prerequisite	EN263	Practical	0hrs / wk

### **COURSE OBJECTIVES**

On completion of this course, students should be able to:

- Identify and strategically target a desired audience for a given communication situation.
- Effectively integrate text and graphic elements to create document designs that clearly convey complex, technical information.
- Identify, incorporate, and accurately cite sources.
- Revise written technical documents for content, organization, and coherence as well as for grammar, tone, and style.
- Contribute meaningfully to collaborative writing projects such as instructions, definition, descriptions, and technical reports.

	Contents:	Resource
Week 1	<ul> <li>Course overview</li> <li>Writing process / Audience analysis</li> <li>Style and tone</li> </ul>	LCD projector with a laptop or desktop computer / Screen.
	Contents:	Resource
Week 2	<ul> <li>Organization: patterns, paragraphs,</li> <li>headings and grouping</li> <li>Grammar and mechanics</li> </ul>	LCD projector with a laptop or desktop computer / Screen.

Week	Contents:	Resource
3	<ul><li>Lists and parallel structure</li><li>Writing effective sentences (theory)</li></ul>	LCD projector with a laptop or desktop computer / Screen.
Week	Contents:	Resource
4	<ul> <li>Writing instructions</li> <li>Writing effective sentences (correction and feedback)</li> </ul>	LCD projector with a laptop or desktop computer / Screen.
Wook	Contents:	Resource
5	<ul><li>Collaborative writing</li><li>Assignment Conferences</li></ul>	LCD projector with a laptop or desktop computer / Screen.
	Contents:	Resource
Week 6	<ul><li>Document design and Illustration.</li><li>Introduction to definitions and descriptions</li></ul>	LCD projector with a laptop or desktop computer / Screen.
	Contents:	Resource
Week 7	<ul> <li>Writing Reports of Technical Objects</li> <li>Describing size, shape, design and utility</li> </ul>	LCD projector with a laptop or desktop computer / Screen.
	Contents:	Resource
Week 8	<ul> <li>Writing Reports of Technical Processes</li> <li>Describing steps, materials and equipment</li> </ul>	LCD projector with a laptop or desktop computer / Screen.
Week	Contents:	Resource

9	Active-passive voice / Your Viewpoint	LCD projector with a
	• MID-TERM TEST	laptop or desktop computer / Screen.
	Contents:	Resource
Week 10	Correspondence:     Writing Letter, Memos and Emails	LCD projector with a laptop or desktop computer / Screen.
	Contents:	Resource
Week 11	<ul><li>Writing Laboratory Reports</li><li>Assignment Due</li></ul>	LCD projector with a laptop or desktop computer / Screen.
	Contents:	Resource
Week 12	<ul><li>Research report components</li><li>Visuals for data display: selecting and creating.</li></ul>	LCD projector with a laptop or desktop computer / Screen.
	Contents:	Resource
Week 13	<ul> <li>Writing research reports:</li> <li>Clarity and conciseness. Credibility of</li> <li>web resources. Documenting sources</li> <li>and paraphrasing. Referencing.</li> </ul>	LCD projector with a laptop or desktop computer / Screen.
XX/col-	Contents:	Resource
Week 14	<ul><li>Writing complete reports</li><li>Course summary</li><li>Review Workshop</li></ul>	LCD projector with a laptop or desktop computer / Screen.

#### **Course Assessment:**

Course Work	Mid-Term Tests	<b>Final Examination</b>
10	30	60

**Textbooks:** 

- Markel, M. (2007). *Technical Communication*. (8th ed). Boston: Bedford/St. Martin's.
- Alred, G., Brusaw, C. and Oliu, W. (2009). *Handbook of Technical Writing*. (9th ed). Boston: Bedford/St. Martin's.

# الفصل الدراسي السبادس

Code	Subject	Credit Hours	Theoretical Hours	Practical Hours	Prerequisite
CT315	Programmable Logical Controller 2	4	3	3	CT314
CT322	Industrial Control System	4	3	3	NT220
CT324	Embedded Control Systems	4	3	3	СТ320
CT326	Sensors & Transducers	4	3	3	СТ220
EN365	English Language 6	2	2	0	EN364
EN301	English Technical Writing 2	2	2	0	EN300

### برمجة الحاكمات المنطقية 2

Subject	Programmable Logical Controller II	Course Code	CT315	Theoretical	3hrs / wk
Semester	6	Prerequisite	CT314	Practical	3hrs / wk

Program Learning Component					
	<ol> <li>Introduction to IEC 61131 standards</li> <li>The principle of FBD and STL programming languages</li> </ol>				
Week 1-3	Specific Learning Outcomes	Resources	Practical		
	• Standards and protocols	Board			
	<ul> <li>Standards and protocols</li> <li>IEC61131</li> <li>Advanced PLC programming, FBD statement list.</li> </ul>	Data show	• FBD, Statement list Programming		
		Text book	• using(S7-PLCSIM)		
		PC			
	3. Understanding the principle of "structured programming" 4. Using analog inputs and outputs in a PLC systems				
Week	Specific Learning Outcomes	Resources	Practical		
4-6		Board			
	<ul><li>Structured programming.</li><li>Analog input modules</li></ul>	Data show	<ul> <li>Structured program</li> <li>Analog-related</li> </ul>		
	• Analog output signals	Text book	program functions		
		PC			
Week	5. Studying the Diagnostics techn 6. Documenting tools used in PL	iques of PLC C system (software/	hardware)		
	o. Documenting tools used in PLC system (software/ hardware)				

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7-9	Specific Learning Outcomes	Resources	Practical
		Board	• Testing
	• Diagnostics	Data show	Monitoring
	• Documenting, Saving, Archiving	Text book	• Displaying the diagnostic buffer of
		PC	the CPU
	7. An overview of Data commun	ication	
	o. Introduction to Field bus syste		
	Specific Learning Outcomes	Resources	Practical
***	• Data communication.	Board	• Simple networking
Week	• Networking; hierarchical structures.	Data show	MPI • Profibus DP
10-12	• Introduction to Field bus	Text book	
	systems.	PC	
	Device-net		
	• Introduction to Industrial Ethernet		
	technology.		
	9. An introduction to process vis	ualization	
	10. Definition, explanation the D	CS systems in indus	trial application
	11. All over view of SCADA sysu		
Week	Specific Learning Outcomes	Resources	Practical
13-14	• Process visualization, The man	Board	
	(human)–machine interface (HMI)	Data show	
	• Distributed Control System	Text book	
	• SCADA system	PC	

#### منظومات التحكم الصناعية

Subject	Industrial Control Systems	Course Code	CT322	Theoretical	3hrs / wk
Semester	6	Prerequisite	NT220	Practical	3hrs / wk

Program Learning Component:			
	Theoretical classes		
	Specific Learning Outcomes	Resources	
	Introduction to pneumatics, i.e. Basic physical concepts.		
Week 1	<ol> <li>Fluid properties: compressibility, incompressibility; pressure, pressure scales, relative pressure, atmospheric pressure, vacuum pressure, pressure gages; flow rate, relation between flow rate, speed, and pressure.</li> <li>Gas laws: Boyle's law; Charles' law; gay-Lussac's law; the general gas law.</li> <li>Force transmission through a fluid, Pascal's law; the basic concept of a pneumatic system.</li> <li>Advantages and disadvantages of pneumatic systems.</li> </ol>	Data show	
	Specific Learning Outcomes	Resources	
Week 2-3	<ul> <li>Pneumatic energy control, control valves:</li> <li>1. Directional control valves DCV): <ul> <li>Symbols according to ISO 1219</li> <li>Different types of DCV: cross sections to show their internal parts, operating principles, methods of actuation.</li> </ul> </li> <li>2. Pressure valves: pressure reducing valve, quick exhaust valve, two - pressure valve, shuttle valve.</li> </ul>	Data show	

	<b>3.</b> Flow control valves: one-way valve, variable flow control	
	valve, one-way variable flow control valve.	
	4. Compound valves: time-delay valve, sequence valve,	
	vacuum valve.	
	<b>5.</b> Simple examples, simple pneumatic machines.	
	Specific Learning Outcomes	Resources
	Design of pneumatic machines:	
Week	6 Motion (stan) diagram	
WICK	<ul> <li>Wotion (step) diagram.</li> <li>Simple (one - cylinder) mechines</li> </ul>	
4-5	<ol> <li>Simple (one - cylinder) machines.</li> <li>Compound (many then a cylinder) machines.</li> </ol>	Data show
	<ul> <li>Compound (more than a cynnder) machines.</li> <li>Over lenned machines.</li> </ul>	
	<b>9.</b> Over-tapped machines. <b>10</b> Different exemples: methods of exerceming the problem	
	of over lapping	
	or over-tapping.	
	Specific Learning Outcomes	Resources
	Pneumatic energy generation.	
	<b>1.</b> General concepts: free air, air compression process.	
	2. Compressor design principles.	
	<b>3.</b> A brief description of the mechanism of different types	
	of compressors:	
	Positive displacement compressors: piston	
	compressor; diaphragm compressor; vane	
	compressor; screw compressor.	
Week	• Dynamic compressors: centrifugal compressor,	
6	axial flow compressor.	
U	4. Compressor staging.	Data show
	5. Compressor capacity control.	
	6. Compressor house ventilation.	
	7. Selecting a Compressor for a system.	
	8. Installation of Compressor.	
	9. Compressor ancillary equipments: intake/ silencer	
	filter; after cooler; moisture separator; intercooler; air	
	receiver( tank), air receiver sizing; compressed air	
	dryers, refrigeration dryers, absorption dryers;	
	compressed air distribution.	
	• Compressed air servicing ( service unit):	

	<ol> <li>The importance of the service unit for a pneumatic machine.</li> <li>The main parts of a service unit:         <ul> <li>Air filter.</li> <li>Pressure regulator.</li> <li>Pressure gauge.</li> <li>Lubricator</li> </ul> </li> </ol>	
	Specific Learning Outcomes	Resources
Week 7	<ol> <li>Linear pneumatic actuators(pneumatic cylinders):</li> <li>Single-acting cylinder, diaphragm cylinder.</li> <li>Double-acting cylinders:         <ul> <li>Pneumatic end-position cushioned cylinders.</li> <li>Rodless cylinders: magnetically coupled, mechanically coupled, belt coupled.</li> <li>Impact cylinders.</li> <li>Swivel (semi-rotary) cylinders.</li> </ul> </li> <li>Seals in linear actuators.</li> <li>Linear actuators sizing: calculation of external forces, static thrust force calculations, dynamic force calculation, piston rod buckling, air consumption calculation.</li> </ol>	Data show
	Specific Learning Outcomes	Resources
Week 8	<ol> <li>Rotary pneumatic actuators(pneumatic motors):</li> <li>Motor torque, motor output power, motor speed.</li> <li>Different types of air motors: vane motor; gear motor; radial piston motor; axial piston motor; turbine motor.</li> <li>Air motor sizing and torque calculations.</li> <li>Air motor performance.</li> <li>Pressure and flow regulation on air motors.</li> </ol>	Data show
Week	Specific Learning Outcomes	Resources
9	<ul> <li>Electropneumatics (electropneumatic systems):</li> <li>1. Components and assemblies in the electrical signal control section: power supply, switches different types),</li> </ul>	Data show

1		
	proximity switches: reed switch, capacitive switch,	
	inductive switch, optical switch), pressure switches.	
	2. Application of magnetic effect of electrical current.	
	solenoid	
	3 Control relays time delayed relays	
	<b>5.</b> Control relays, the delayed relays.	
	4. Solenoid directional control valves, brief study of	
	different types, piloted valves.	
	<b>5.</b> Over-lapped machines.	
	6. Different examples.	
	Specific Learning Outcomes	Resources
	Hydraulics (hydraulic systems):	
	Introduction to hydraulics, i.e. Basic physical concepts.	
	<b>1.</b> Pressure in liquids, flow rate and velocity, force	
Week	transmission by liquids (force multipliers). Pascal's law.	
WEEK	pressure intensifier viscosity flow types Reynold's	
10	number friction heat pressure drop through hydraulic	Data show
	systems, asvitations, near, pressure drop through hydraulic	
	systems, cavitations, power calculation in hydrautic	
	2. Hydraulic fluids, their task, types.	
	3. The concept of power transmission.	
	<b>4.</b> Advantages and disadvantages of hydraulic systems.	
	5. The main parts of a hydraulic system.	
	Specific Learning Outcomes	Resources
	Hydraulic power generation (Hydraulic power pack):	
	<b>1</b> . Hydraulic numps: the role of a nump in a hydraulic	
	system numping theory nump characteristics	
Wook	<ul><li>2 Pump types:</li></ul>	
WUUK	2. Tump types.	
11	• Fixed displacement pumps: vane pump, piston	Data show
	pump.	
	• Variable displacement pumps: variable	
	displacement vane pump, : variable displacement	
	vane pump.	
	• Control of variable displacement pumps.	
	<b>3.</b> Others: filter, neater, cooler, reservoir.	

	Specific Learning Outcomes	Resources
Week 12	<ul> <li>Hydraulic valves:</li> <li>1. Directional control valves DCV): <ul> <li>Symbols according to ISO 1219</li> <li>Different types of DCV: cross sections to show their internal parts, operating principles, methods of actuation.</li> </ul> </li> <li>2. Pressure valves: pressure relief valve, pressure regulating valve, shuttle valve.</li> <li>3. Flow control valves: one-way valve (check valve), piloted-check valve, variable flow control valve, one-way variable flow control valve, two-way flow control valve with throttle, .two-way flow control valve with orifice, three-way flow control valve, on-off valve.</li> </ul>	Data show
	Specific Learning Outcomes	Resources
Week 13	<ul> <li>Linear hydraulic actuators(hydraulic cylinders):</li> <li>1. Cylinder construction.</li> <li>2. Actuator types: <ul> <li>✓ Single-acting cylinder, telescopic cylinder.</li> <li>✓ Double-acting cylinders: <ul> <li>Double-acting cylinder with rods on both ends.</li> <li>Double-acting cylinder with cushioning.</li> <li>Double-acting cylinder with adjustable cushioning.</li> <li>Double-acting telescopic cylinder.</li> <li>Tandem cylinder.</li> </ul> </li> <li>3. Seals in linear hydraulic actuators, stop tubes.</li> <li>4. Actuators sizing</li> <li>5. Piston rod buckling.</li> </ul></li></ul>	Data show
Week	Specific Learning Outcomes	Resources
14	Rotary hydraulic actuators(hydraulic motors):	Data show
	<b>1.</b> Motor torque, motor displacement (geometric volume),	

	<ul> <li>motor output power, motor speed.</li> <li>2. Different types of air motors: vane motor; external gear motor; internal gear motor; radial piston motor; axial piston motor.</li> <li>3. Hydraulic motor sizing and torque calculations.</li> <li>4. Hydraulic motor performance.</li> <li>5. Motor sizing.</li> <li>6. Hydraulic motor control: speed control, reversal control.</li> </ul>	
	Specific Learning Outcomes	Resources
Week 15	<ol> <li>Hydraulic accumulators:</li> <li>Role of a hydraulic accumulator in a hydraulic machine.</li> <li>Accumulator sizing.</li> <li>Accumulator calculation.</li> <li>Types of accumulator:         <ul> <li>Spring accumulator.</li> <li>Weight-loaded accumulator.</li> <li>Piston accumulator.</li> <li>Diaphragm accumulator.</li> </ul> </li> <li>Accumulators in hydraulic circuits.</li> </ol>	Data show
Week	Specific Learning Outcomes	Resources
16	Examples of hydraulic and electrohydraulic machines.	Data show
	Practical classes	
Week	Specific Learning Outcomes	Resources
3	Performing some experiments to practice the function of directional control valves, and how they control the motion of pneumatic cylinders and motors.	Lab.
Week	Specific Learning Outcomes	Resources
4	Experimenting the function of the variable flow control valve, and how it controls the speed of pneumatic cylinders	Lab.

	and motors.	
Week	Specific Learning Outcomes	Resources
5	Controlling the advance and return of pneumatic cylinders with time-delay and sequence valve.	Lab.
Week	Specific Learning Outcomes	Resources
6	Design, simulation and realization of some compound pneumatic machines.	Lab.
Week	Specific Learning Outcomes	Resources
7	Experimenting the function of electrically actuated (solenoid) directional control valves, and how they control the motion of pneumatic cylinders.	Lab.
Week	Specific Learning Outcomes	Resources
8	Simple electropneumatic machines with different types of limit switches.	Lab.
Wook	Specific Learning Outcomes	Resources
9	Performing some experiments to practice the function of control relays, and how they control Simple electropneumatic machines.	Lab.
	Specific Learning Outcomes	Resources
Week 10-11	<ul> <li>Realization of simple hydraulic machines.</li> <li>Determining the operating pressure by adjusting the pressure relieve valve.</li> <li>Practicing the function of hydraulic directional control valves, and how they control the motion of hydraulic cylinders and motors.</li> </ul>	Lab.
Week	Specific Learning Outcomes	Resources

12	Practicing the function of pressure regulating valves, and how they control they regulate the pressure in hydraulic machines.	Lab.
Week	Specific Learning Outcomes	Resources
13	Practicing the function of flow control valves, and how they control they regulate the flow in hydraulic machines.	Lab.
Week	Specific Learning Outcomes	Resources
14	Practicing the role of hydraulic accumulator in hydraulic machines.	Lab.
Week	Specific Learning Outcomes	Resources
15-16	Different examples of hydraulic and electrohydraulic machines.	Lab.

#### Text books:

- Pneumatic Control for Industrial Automation, by: Peter Rohner& Gordon Smith.
- Industrial Hydraulic Control, by: Peter Rohner.
- Prepared by engineer Emhemmed Al-dardar.

#### أنظمة التحكم المضمنة

Subject	Embedded Control Systems	Course Code	CT324	Theoretical	3hrs / wk
Semester	6	Prerequisite	CT320	Practical	3hrs / wk

### **Course Description:**

This course introduces students to the basics of models, analysis tools, and control for embedded systems operating in real time. Students learn how to combine physical processes with computation. The course has a strong laboratory component, with emphasis on a semester-long sequence of projects.

#### Topics to be covered include the following:

- 1. Models of computation: finite state machines, threads, ordinary differential equations, hybrid systems, actors, discrete-events, data flow
- 2. Basic analysis, control, and systems simulation: Bisimulations, reachability analysis, controller synthesis, approximating continuous-time systems.
- 3. Interfacing with the physical world: sensor/actuator modeling and calibration, concurrency in dealing with multiple real-time streams, handling numerical imprecision in software
- 4. Mapping to embedded platforms: real-time operating systems, execution time analysis, scheduling, concurrency
- 5. Distributed embedded systems: Protocol design, predictable networking, security

Week	Specific Learning Outcomes	Lab
1	<ul><li>Introduction.</li><li>Cyber-Physical Systems.</li></ul>	
Week	Specific Learning Outcomes	Lab
2	<ul><li>Sensors and Actuator.</li><li>Memory Architectures.</li></ul>	Interfacing with the WiiMote

Week	Specific Learning Outcomes	Lab
3	<ul><li>Interfacing to Sensors and Actuators.</li><li>Interrupts.</li></ul>	Embedded Development Tools
	Specific Learning Outcomes	Lab
Week 4	<ul><li>Model-Based Design.</li><li>Model Modal Behavior.</li></ul>	Generate Music and Program an ADC in MicroBlaze
Week	Specific Learning Outcomes	Lab
5	<ul><li>Extend and Timed Automata.</li><li>Composition of State Machines.</li></ul>	Cal Climber Navigation in C
Week	Specific Learning Outcomes	Lab
6	<ul><li>Hierarchical State Machines.</li><li>Multitasking.</li></ul>	Cal Climber Hill Climb in C
	Specific Learning Outcomes	Lab
Week 7	<ul><li>Operating systems, Microkernels, and Scheduling.</li><li>Scheduling Anomalies.</li></ul>	Model-Based Cal Climber Navigation and Hill Climb
Week	Specific Learning Outcomes	Lab
8	<ul><li>Specification; Temporal Logic.</li><li>Comparing State Machines.</li></ul>	Project Management
Week	Specific Learning Outcomes	Lab
9	Midterm I	
Week	Specific Learning Outcomes	Lab

10	<ul><li>Reachability Analysis.</li><li>Execution Time Analysis.</li></ul>	
Week	Specific Learning Outcomes	Lab
11	Synchronous/ Reactive Models	
Week	Specific Learning Outcomes	Lab
12	<ul><li>Execution Time Analysis</li><li>Dataflow Models 1</li></ul>	
Week	Specific Learning Outcomes	Lab
13	Midterm II	
Week	Specific Learning Outcomes	Lab
14	Project Presentation	

#### **Course Assessment:**

Course Work	Mid-term Tests	Final Examination	Final Exam Practical
10	30	40	20

**NOTE:** Course Work may include Assignments, Lab reports, Projects and Practical Activities.

#### **Textbooks:**

1. Introduction to Embedded Systems, by E. A. Lee and S. A. Seshia, 2011-2012.

Note: This is the same course teaching at Berkeley University Of California.

Course Link: <u>http://chess.eecs.berkeley.edu/eecs149/index.html</u>

#### الحساسات والمجسات

Subject	Sensors & Transducers	Course Code	CT326	Theoretical	3hrs / wk
Semester	6	Prerequisite	CT220	Practical	3hrs / wk

#### **General Objectives:**

- 1. Understanding the various types of Signals.
- 2. Studying the different types of Sensors and presenting of practical applications.
- 3. Definition and explanation the signal conditioning.
- 4. Introduction to sensors and their elements.
- 5. Study and presentation of thermal sensors (features and specifications.
- 6. Study and presentation of mechanical, motion and pressure sensors.
- 7. Study and presentation of Level, Force, optical and Flow sensors.
- 8. Presentation of practical applications.

### **Program Learning Component**

	<b>1.</b> Study and presentation of Sensor, Classification of sensors (features and specifications)				
	Specific Learning Outcomes	Resources	Practical		
Week 1-2	To understand and define the Sensory Devices and Instrumentation Ability to understand and define the sensors and Measuring elements. To understand the Signal conditioning. To state the sensor features and	Power point Slide White board. Comprehensive workbook for students	Ability to Understand the Signal conditioning. Understanding the sensors and elements . Understanding the features and specifications of sensors		

	specification data.					
	2. Study and presentation of Thermal Sensor, Classification, features and specifi					
	Specific Learning Outcomes	Resources	Practical			
Week 3-5	To understand the thermal sensors(RTD, Thermistor, Thermocouple, Semiconductor sensor)And Signal conditioning. To state the sensor features and specification data. 	Power point Slide . white board. Comprehensive workbook for students	Present practical applications. Calibration of : RTD. Thermocouple. Thermistor.			
	3. Study and presentation of Displacen specifications Specific Learning Outcomes	nent Sensor, Classific Resources	ation, features and Practical			
Week 6-7	To understand the Displacement sensors: (Potentiometers, LVDT, Optical Encoders) To state the sensor features and specification data. Present practical applications Solve related Problems on the above mentioned sensors.	Power point Slide white board. Comprehensive workbook for students	Present practical applications. Calibration of : Potentiometers. LVDT. Optical Encoders.			
	4. Study and presentation of Level Sensor, Classification, features and specifications					
Week	Specific Learning Outcomes	Resources	Fracucal			
8-10	To understand the Level sensors: (Float, Static pressure level	Power point Slide white board.	Present practical applications.			
	sensor , Differential pressure Level sensor, Ultra sonic level	Comprehensive workbook for	Calibration of :			

	sensor) To state the sensor features and specification data. Present practical applications Solve related Problems on the above mentioned sensors.	students	Float. Static pressure level sensor
	5. Study and presentation of Flow Sen	sor, Classification, fe	eatures and specifications
	Specific Learning Outcomes	Resources	Practical
Week 11-12	To understand the Flow sensors: (Variable area , Turpin flow meter , Differential pressure flow meter, ) To state the sensor features and specification data. Present practical applications Solve related Problems on the above mentioned sensors.	Power point Slide white board. Comprehensive workbook for students	Present practical applications. Calibration of : Variable area . Turpin flow meter. Differential pressure flow meter.
	6. Study and presentation of Pressure specifications	& Force Sensor, Cla	ssification, features and
	Specific Learning Outcomes	Resources	Practical
Week	To understand the Pressure And Force sensor and their features and	Power point Slide	
13-14	To state the sensor features and specification data. Present practical applications Solve related Problems on the above mentioned sensors.	white board. Comprehensive workbook for students	Present practical applications.

# لـغة إنجليزية 6

Subject	English Language 6	Course Code	NT365	Theoretical	2hrs / wk
Semester	Six	Prerequisite	NT364	Practical	0 wk

	Program Learning Component			
Week 1	<b>Food: fuel and pleasure. Grammar:</b> 1.1. Present simple & continuous, action and non-action verbs.         1.2. Vocabulary:         1.3. Food and pleasure.			
Week	<ul> <li>2.</li> <li>If you really want to win, cheat.</li></ul>			
2	Grammar: <li>2.1. Past tenses: simple, continuous, and perfect.</li> <li>2.2. Vocabulary:</li> <li>Sport</li>			
Week	<ul> <li>3.</li> <li>We are family.</li></ul>			
3	Grammar: <ul> <li>3.1. Future forms: going to, present continuous, will/ shall.</li> <li>3.2. Vocabulary: <ul> <li>Family, personality.</li> <li>Each other or reflexive pronouns.</li> </ul> </li> </ul>			
Week 4	4.1. Practical English: Introductions         4.2. Writing Describing person.         4.3. Exercises in class			
Week	<ul> <li>5.</li> <li>Ka- ching!</li></ul>			
5	Grammar: <li>5.1Present perfect and past simple.</li> <li>5.2. Vocabulary:</li> <li>Money, phrasal verbs.</li>			

	6.
Week 6	Changing your life. Grammar: 6.1Present perfect continuous. 6.2. Vocabulary: • Strong adjectives.
	7
Week 7	Race to the sun.         Grammar:         7.1Comparatives and superlatives.         7.2. Vocabulary:         • Transport and travel         • How long+ take.
Week	8.
8	Midterm Exam
Week 9	9.1. Writing:       9.2. Telling stories.       9.3. Revising and checking.
	10.
Week 10	Modern manners.Grammar:10.1.Must, have to, should (obligation)10.2.Vocabulary:•Mobile phones.
	11.
Week 11	Judging by appearances.Grammar:11.1.Must, may, might, can't (deduction)11.2.Vocabulary:•Describing people
	12.
Week 12	If at first you don't succeed Grammar: 12.1. Can, could, be able to (ability and possibility) 12.2. Vocabulary: • Ed/ ing adjectives
Week	13.
13	13.1. Writing:

	13.2. 13.3.	An informal letter. Revising and checking.
Week	14.	
14	14.1.	Revision

#### **Course Assessment:**

Course Work	Mid-Term Exams	Final Examination
20	30	50

**NOTE:** Course Work may include assignments, projects and practical activities.

Textbooks: New English File
# التقارير الفنية بالإنجليزية 2

Subject	Technical documentation 2	Course Code	NT301	Theoretical	2hrs / wk
Semester	Six	Prerequisite	NT300	Practical	0 wk

	Program Learning Component
Week 1	1.         1.1. The development of the paragraph:         1.2paragraph support & development.         1.3Writing concluding sentences.
Week 2	2.1 Peer editing.         2.2Using linking words         2.3 Exercise (Writing a topic in class)
Week 3	3.         3.1. Descriptive & process Paragraph:         3.2Descriptive paragraphs and reasons for writing them.         3.3Organizing and writing descriptive paragraphs using adjectives and prepositions.
Week 4	<ul> <li>4.</li> <li>4.1 Process paragraphs and reasons for writing them.</li> <li>4.2Using transition words to write a process paragraph.</li> <li>4.3 Exercise (Writing a topic in class)</li> </ul>
Week 5	5.       5.1. Writing reports       5.2 Different types of reports       5.3 Stages in report writing
Week 6	6.6.1Terms of reference6.2 Planning your report6.3 Collecting information
Week 7	7.       7.1. Midterm Exam

	8.		
Week	8.1. Organizing information		
8	8.2Structuring your report. 8.3 -Exercise (writing a part of a report)		
***	9.		
Week	9.1Style of writing		
9	9.2Layout		
	9.3 Presentation		
Week	10.		
10	10.1. Redrafting and checking		
Week	11.		
11	11.1. Exercise ( writing report in a class)		
Week	12.		
12	12.1. Exercise ( writing report in a class)		
Week	13.		
13	13.1. Exercise ( writing report in a class)		
Week	14.		
14	14.1. Exercise ( writing report in a class)		

#### **Course Assessment:**

Course Work	Mid-Term Exams	Final Examination
20	30	50

NOTE: Course Work may include assignments, projects and practical activities.

#### **Textbooks:**

1- Handbook for Technical Writing, by James H. Shelton, published in 1994 USA.

2- Academic Writing from paragraph to essay. by Lisa A Rumisek. Published in 2005 MACMILLAN.



Code	Subject	Credit Hours	Theoretical Hours	Practical Hours	Prerequisite
CT430	Fuzzy Logic	4	3	3	CT 227
CT432	Electrical Drives & Appls.	4	3	3	CT 214
CT434	Data Acquisition System	4	3	3	CT 326
IT470	Project Management	4	3	3	None
CT436	Research Methods	2	2	0	None

#### المنطق الضبابي

Subject	Fuzzy Logic	Course Code	CT430	Theoretical	3hrs / wk
Semester	7	Prerequisite	CT227	Practical	3hrs / wk

# **Course Discription:**

This course introduces the student to intelligent control theory. The course material is divided in two main parts: Fuzzy Logic and Artificial Neural Networks techniques. Emphasize is provided for intelligent control applications of control systems.

Week	Specific Learning Outcomes	Note
1	Introduction: History, Background and Applications	Reference 2 Chapter 1
Week	Specific Learning Outcomes	Note
2	Review of Classical Control: Math Models, Controller Design, PID Control	Reference 3
Week	Specific Learning Outcomes	Note
3	Fuzzy Sets Basic Definition: Classical Set Theory, Fuzzy Sets, Fuzzy Operations, Properties and Relations	Chapter 8
Week	Specific Learning Outcomes	Note
4	Fuzzy logic: Predicate Logic, Fuzzy Logic, Approximate Reasoning	Chapter 9
Week	Specific Learning Outcomes	Note
5	Fuzzy Control: Fuzzification, Fuzzy Rules	Chapter 10

Week	Specific Learning Outcomes	Note
6	Fuzzy Control: Inference Engine (Mamdani and Larsen), Defuzzification	Chapter 10
Week	Specific Learning Outcomes	Note
7	Fuzzy Control: Fuzzy Control Design, MATLAB Simulation	Chapter 10
Week	Specific Learning Outcomes	Note
8	Fuzzy Control Application: Autonomous Robots, HVAC	Chapter 11, Chapter13
Week	Specific Learning Outcomes	Note
9	Fundamentals of Neural Networks: Definitions/Elements, Single Layer Perceptron	Chapter 2
Week	Specific Learning Outcomes	Note
10	Fundamentals of Neural Networks: Perceptron Architecture and Algorithm	Chapter 2
Week	Specific Learning Outcomes	Note
11	Neural Network Architecture: Different Architectures, Backpropagation Algorithm	Chapter 3
Week	Specific Learning Outcomes	Note
12	Neural Network Architecture: Radial Basis Functions	Chapter 3
Week	Specific Learning Outcomes	Lab
13	Neural Network Architecture: Self-Organizing Networks, Hopefield Networks	Chapter 3
Week	Specific Learning Outcomes	Lab
14	Neural Control: Design and Examples, MATLAB Simulation	Reference 4

#### **Course Assessment:**

Course Work	Mid-term Tests	Final Examination	Final Exam Practical
10	30	40	20

**NOTE:** Course Work may include Assignments, Lab reports, Projects and Practical Activities.

#### **Textbooks:**

- 2. A First Course in Fuzzy and Neural Control by Nguyen, Prasad, Walker, and Walker. CRC 2003.
- 3. Artificial Intelligence by Negnevisky. Addison-Wesley.
- 4. Automatic Control Systems by Colnaraghi and Kuo. 9th edition. Wiley Publisher. 2010.
- 5. "An Introduction to the use of Neural Networks in Control Systems" white paper by Martin Hagan, Demuth, and De Jesus.
- 6. MATLAB Fuzzy Logic Toolbox: user's guide.
- 7. MATLAB Neural Network Toolbox: user's guide.

## تطبيقات كهربية

Subject	Electrical Drives & Apps	Course Code	CT432	Theoretical	3hrs / wk
Semester	7	Prerequisite	CT214	Practical	3hrs / wk

Program Learning Component						
	Review the analysis of AC and DC Electric circuits					
Week 1	Specific Learning Outcomes	Resources	Practical			
	AC and DC Electric circuits analysis and formulas for calculating the impedance, current, voltage and power and phase shift.	Power point slide, Whiteboard	Power circuits experiments available in the lab			
	Study the function and the types of the Transformers					
Week	Specific Learning Outcomes	Resources	Practical			
2	Magnetic circuits and Transformers	Power point slide, Whiteboard	Experiments on magnetic circuits and Transformers			
	Study the DC motors parts, operation	on and types				
	Specific Learning Outcomes	Resources	Practical			
Week 3-4	<ul><li>Principles of operation of the DC motor</li><li>Shunt motor, series motor and compound motor</li><li>Torque versus speed characteristic for the DC motor</li></ul>	Power point slide, Whiteboard	Self excited and separately excited shunt, series and compound DC motor Electronic devices used for driving the DC motor			

	Study the Driving techniques for the DC motor in control applications				
	Specific Learning Outcomes	Resources	Practical		
Week 5-6	<ul> <li>Drive and Control of the DC motors speed and rotation</li> <li>Chopper controlled of DC motor drives</li> <li>Theory of PWM technique used to control the motor speed</li> <li>Dc motor operation on Ac power supply</li> <li>Thyristor speed controller for DC motors.</li> </ul>	Power point slide, Whiteboard	<ul> <li>H-bridge for driving the DC motor to control the speed and the direction ofrotation</li> <li>Implementation of PWM technique used to control the motor speed</li> <li>Experiments applied to the Dc motor operation on Ac power supply</li> <li>Thyristor speed controller for DC motors</li> </ul>		
	Study the Universal Motor operation using AC and DC power supply				
	Specific Learning Outcomes	Resources	Practical		
Week 7-8	<ul> <li>Principles of operation for the Universal Motor using AC and DC power supply</li> <li>Direction of rotation of the universal motor</li> <li>Effect of the compensating winding for the universal motor</li> <li>Torque versus speed characteristic of an AC powered universal motor</li> </ul>	Power point slide, Whiteboard	Experiments applied to the Universal Motor using AC and DC power supply Direction of rotation of the universal motor Effect of the compensating winding for the universal motor Torque versus speed characteristic of an AC powered universal motor		
Week	Study the operation and the use of I	DC generator	1		
9	Specific Learning Outcomes	Resources	Practical		

	Separately excited shunt ,series and compound DC generator output voltage V versus speed characteristic Output voltage versus field current Voltage versus current characteristic	Power point slide, Whiteboard	Experiments applied to the Separately excited shunt ,series and compound DC generator output voltage V versus speed characteristic Output voltage versus field current Voltage versus current characteristic
	Study the AC motors operation and	types	
	Specific Learning Outcomes	Resources	Practical
	Theory of operation for the AC Induction motors		
Week 10-11	Types of the AC induction motors. Induction motor (construction ,starting and speed versus torque curves). Three phase induction motor squirrel cage torque versus speed characteristic Torque and load characteristics of an induction motor Direction of Rotation and change in direction of squirrel cage induction motor.	Power point slide, Whiteboard	Experiments available in lab about Single phase induction Motor. Three phase induction motor.
	Comparison between the operation of different types of the single phase AC motors		
	Study the techniques used for the A	C motors in contro	l applications
Week	Specific Learning Outcomes	Resources	Practical
14	Introduction to Ac Induction motor	Power point slide,	Experiments on lab about different types on induction

	speed control techniques Describing the operation of the IGBT Inverter for the DC to AC converter . Description of Vector control drive converter Motor speed versus the mechanical load variations under vector drive operation.	Whiteboard	motor speed control.				
	effect of varying the frequency on the output current waveforms						
	Study the synchronous motors operation and application						
	Specific Learning Outcomes	Resources	Practical				
Week 13	Introducing the principles of operation of the synchronous motors The relation between the reactive power versus the field current for the three phase synchronous motor under no load operation. The relation between the line current versus the field current for the three phase synchronous motor operating without load.	Power point slide, Whiteboard	Starting of the synchronous motor Measuring the Synchronous motor pull-out torque Relationship between the pull-out torque and the field current				
	Study the synchronous generators o						
	Specific Learning Outcomes	Resources	Practical				
Week 14	Introducing the synchronous generators No load operation of synchronous	Power point slide	Frequency and voltage regulation of synchronous generator				
	generators (effect of speed on amplitude and frequency of the generated voltage)	Whiteboard	Effect of the load on the output voltage and the frequency				
	of field current as a regulator		Generator synchronization				

mechanism).	

#### تحصيل وأستخلاص البيانات

Subject	Data Acquisition System	Course Code	CT434	Theoretical	3hrs / wk
Semester	7	Prerequisite	CT326	Practical	3hrs / wk

#### **General Objectives:**

- 1. To understand the different types of Filters and Amplifiers.
- 2. To understand the signal sampling and conditioning.
- 3. To understand the D/A Converters.
- 4. To understand the data acquisition methods.
- 5. To understand the design of Data Acquisition systems.
- 6. To understand the process of signal converting devices

## **Program Learning Component**

-	To understand the data acquisition system.				
	Specific Learning Outcomes	Resources	Practical		
Week 1	To understand the data acquisition system data acquisition methods. Analog data. Operational amplifier.	Power point Slide. White board. Comprehensive workbook for students	Present practical applications of Operation Amplifier		
Week 2-5	To understand the design of Data Acquisition systems       Specific Learning Outcomes     Resources     Practical				

	To understand the signal conditioning circuit: Scaling circuit Voltage to current & current to voltage circuit (V/I) & (I/V). Alarm circuit. Voltage to Frequency & Frequency to voltage circuit (V/F) & (F/V).	Power point Slide white board. Comprehensive workbook for students	Ability to design and use the Signal conditioning circuits. (V/V), (V/I), (I/V), Alarm circuit, (V/F), (F/V).
	To understand the different types o	f Filters & Samplin	ng / Hold techniques
	Specific Learning Outcomes	Resources	Practical
Week 6-8	<ul> <li>Type of filters:</li> <li>Passive &amp; Active filters.</li> <li>Selecting the filter.</li> <li>Using the filters in DAS</li> <li>Sampling theory</li> <li>Sample and Hold circuits</li> <li>Ability to design the S/H circuits.</li> </ul>	Power point Slide white board. Comprehensive workbook for students	Ability to design and use the Filter circuits. Ability to design the S/H circuits. Analog multiplexers and demultiplexers.
	To comprehend fully the concept of	: ADC & DAC	
	Specific Learning Outcomes	Resources	Practical
Week 9-12	<ul> <li>Features and specifications of A/D.</li> <li>Types of A/D:</li> <li>Counting A/D converter</li> <li>Successive approximation A/D</li> <li>Flash converter ADC</li> <li>features and specifications of D/A.</li> </ul>	Power point Slide white board. Comprehensive workbook for students	Ability to Choose and use analog to digital (A/D) converters. Ability to Choose and use analog to digital (A/D)converters

	Types of D/A: R-2R Ladder DAC. In-integrated DAC. Ability to use all types of D/A and A/D converters.		
	Specific Learning Outcomes	Resources	Practical
Week 13-14	Understand the: Digital sampling techniques. Multiplexing and demultiplexing of analog signals. Multi - channel data acquisition systems.	Power point Slide white board. Comprehensive workbook for students	Ability to design and use Analog multiplexers and demultiplexers. Multi - channel data acquisition systems.

#### إدارة المشاريع

Subject	Project Management	Course Code	IT470	Theoretical	3hrs / wk
Semester	7	Prerequisite	None	Practical	3hrs / wk

### **Course Objectives**

This intensive course provides the practical knowledge and hands-on exercises that are required to prepare for starting and completing a project successfully. The success of the project manager depends on his/her understanding of the competencies and structure of project management. Through discussion, facilitation and practical exercises, the course participants will understand the basic concepts of the nine areas of the project management body of knowledge (PMBOK®) during a project's lifecycle (concept, development, implementation, and termination).

## Participants

Individuals from various industries directly involved in project management including Project Managers, Project Team Leaders, Team Members and other staff aspiring to become project managers.

## Learning objectives

By the end of the course the participants will be able to:

- Understand the basics of the processes and relationships of the nine areas of the Project Management Body of Knowledge.
- Understand the Project lifecycle.
- Generate project requirements and determine the operational success criteria to be achieved by the project's outcome.
- Create a project Work Breakdown Structure (WBS).
- Design a project schedule with activities, duration, and interdependencies.
- Use the Critical Path Method (CPM) and the Program Evaluation and Review Technique (PERT) to create time and resource schedules.

• Develop and document a comprehensive and integrated project plan.

## **Course Outline**

- 1. An introduction to the field of Project Management and its development.
- 2. An introduction to the Processes of the Project Management Body of Knowledge.
- 3. The project lifecycle.
- 4. Project Manager's Role Define project manager/project sponsor/functional manager/team member roles and responsibilities and understand the impact of different organizational structures and reward/recognition strategies.
- 5. Document Relationships Relate the Statement of Work (SOW), Work Breakdown Structure (WBS) and Specifications to each other.
- 6. Scheduling Processes Identify activities, estimate duration, and establish logical relationships.
- 7. Time scheduling using CPM and PERT techniques.
- 8. An introduction to resource planning using CPM.
- 9. Project Control and Reporting.

# طرق بحثية

Subject	Research Methods	Course Code	CT436	Theoretical	2hrs / wk
Semester	7	Prerequisite	None	Practical	Ohrs / wk

الهدف من المادة	
، المادة هي تعليم الطرق العلمية الصحيحة لأساسيات البحث العلمي وكيفية	إن هدف هذ
العلمية ومشاريع التخرج	كتابة التقارير
مقدمة عن الفكر والبحت:	
<ul> <li>مفهوم الفكر وأساليبه.</li> </ul>	الأسبوع
<ul> <li>المعرفة والعلم.</li> <li>مدخل في الدحث العلم ممشادية التخرج</li> </ul>	1
• منصل في البحث العلم، الناجج ومشاريع التخرج	
التعريف بنظام المكترية مالخدمات المكترية.	
	- <u></u>
<ul> <li>النظم المحدبية.</li> <li>تقويم المصادر والمراجع والإفادة منها</li> </ul>	الاسبوع
<ul> <li>نظام البطاقات والإعارة المؤقتة</li> </ul>	-
<ul> <li>استخدام الدوريات</li> </ul>	
طرق ومناهج البحث والمشاريع العلمية:	
<ul> <li>الطريقة التاريخية.</li> </ul>	-
• دراسات المسح	الأسبوع
<ul> <li>دراسات الحالة.</li> </ul>	3
<ul> <li>تحليل المحتوى</li> </ul>	
<ul> <li>الطريقة الاحصائية.</li> </ul>	
<ul> <li>طريقة التجربة.</li> </ul>	
مراحل إعداد البحث ومشاريع التخرج:	
<ul> <li>اختيار مشروع البحث أو المشروع.</li> </ul>	الأسبوع
<ul> <li>الاطلاع على البحوث والدر اسات السابقة.</li> </ul>	5-4
<ul> <li>خطة البحث العلمي ومشروع التخرج.</li> </ul>	
<ul> <li>القراءات الأولية وتسجيل المعلومات.</li> </ul>	

المجتمع الإحصائي في البحوث والمشاريع:	الاسبوع
<ul> <li>العينة وعلاقتها بالمجتمع الإحصائي.</li> </ul>	6
<ul> <li>طرق اختيار العينة في المجتمع الإحصائي.</li> </ul>	
عمليات جمع وتصنيف وتحليل المعلومات	
<ul> <li>مصادر جمع البيانات</li> </ul>	الاسبوع
<ul> <li>تصنيف البيانات ووسائل تبويبها.</li> </ul>	8-7
<ul> <li>عرض البيانات وتحليلها.</li> </ul>	
اختبارات الفرضيات في البحث والمشاريع	
<ul> <li>الاختبارات المستندة إلى التوزيع الطبيعي.</li> </ul>	الاست ع
<ul> <li>الاختبارات المستندة الى توزيع مربع كاى</li> </ul>	10-9
<ul> <li>اختبارات المعنويات المستندة إلى توزيع ستورنيت T</li> </ul>	
<ul> <li>اختبار فرضيات حول تساوي عدة أوساط حسابية.</li> </ul>	
انواع وخصائص التقارير العلمية والعملية	
<ul> <li>أهمية التقارير العملية وأهم أهدافها وميزاتها.</li> </ul>	الاسبوع
<ul> <li>أنواع التقارير وأهم استخداماتها.</li> </ul>	12-11
<ul> <li>خصائص التقرير الجيد.</li> </ul>	
متطلبات كتابة التقارير والبحوث والعلمية ومشاريع التخرج	
<ul> <li>أسلوب كتابة التقارير والبحوث والمشاريع العلمية.</li> </ul>	
<ul> <li>تنظيم صفحة العنوان والمقدمة والمحتويات.</li> </ul>	الاسبوع
<ul> <li>متن التقارير او البحث وطريقة توثيق المعلومات.</li> </ul>	14-13
<ul> <li>الاستنتاجات والتوصيات</li> </ul>	
<ul> <li>إعداد قائمة المصادر والملاحق.</li> </ul>	

**Course Assessment:** 

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Course Work	Mid-Term Tests	Final Examination
10	30	60

NOTE: Course work may include assignments, projects and practical activities.

#### **Textbooks:**

أساسيات البحث ومشاريع التخرج وكتابة التقارير في الإدارة د. علي هادي جبرين



Code	Subject	Credit Hours	Theoretical Hours	Practical Hours	Prerequisite
CT438	Professional issues	4	3	3	None
NT403	On Field Practice	2	1	3	None
CT444	Research Thesis	1	0	3	All Sub

## مواضيع إحترافية مختارة

Subject	Professional issue	Course Code	CT 438	Theoretical	3hrs / wk
Semester	8	Prerequisite	None	Practical	3 hrs / wk

# **Course Objectives**

- Be familiar with some of the issues you may face as a member of a complex technological society.
- Be able to discuss the benefits offered by computing technology in many different areas and the risks and problems associated these technologies.
- Understand some social, legal, philosophical, political, constitutional and economical issues related to computers and the historical background of these issues
- Be able to determine the impact of the privacy laws on information security policies.
- Understand the issues related to intellectual freedom, intellectual property, and copyright law as they relate to electronic publishing.
- Be able to determine and identify ethical procedures and behaviors in the organization related to information security.
- Be able to identify issues of professional conduct in information technology case studies.
- Learn the areas most impacted by ethical decisions by professionals in the computing field and will gain skills in making such decisions.
- Apply theories of ethics to case situations in the context of organizational use of information technology.
- Understand the ethical issues associated with gathering, storing and accessing genetic information in databases.

• Recognize the differences in ethical codes of conduct in different cultures and countries.		
Weeks	Торіс	
1-2	Introduction, Course Syllabus and Course Requirements Catalysts for Change	
	Introduction to Ethics	
3-4	Networked Communications	
5	Intellectual Property	
6-7	Privacy	
8-9	Computer and Network Security	
10-11	Computer Reliability	
12	Professional Ethics	
13-14	Work and Wealth	
15	Discussions of papers	

## **Course Assessment:**

Course Work	Mid-Term Tests	Final Exam Practical	Final Examination
10%	30%	20%	40%

**NOTE:** Course work may include assignments, projects and practical activities.

## **Textbook:**

Title: Ethics for the Information Age Author(s): Michael J. Quinn Edition: 4th Edition **Publisher:** Prentice Hall/ Pearson Education **Year:** 2011

### التدريب الميداني

Subject	On Field Practice	Course Code	NT403	Theoretical	1hrs / wk
Semester	8	Prerequisite	None	Practical	3 hrs / wk

One of the requirements of Bachelor of Science Degree / Higher Diploma Degree in any major is the fulfillment of on field practice during the last term.

## Objectives

- 1. Expose the students to real working environments
- 2. Involve the students with job search of the available positions relating to their specialization
- 3. Teach students the skills needed in a team work
- 4. Raise the chances of graduates to be placed in a highly paid jobs related to their field of studies
- 5. Improve the presentation skills of students
- 6. Build a strong relationship between the faculty and the private and public sectors.
- 7. Refine the program curriculum with the needed skills required for today's technicians and engineers obtained from the inputs of the students and the feedbacks from the facilitators.

## **Course Requirements**

- 1. Class attendance: 2 hours/weekly in faculty with the instructor
- 2. One presentation during the semester arranged by the instructor
- 3. Complete a 60 hours on field job with a schedule approved by the instructor
- 4. Submit the Proof of Completion Form approved and signed by the facilitator
- 5. Submit a final report at the end of the semester(including one page feedback).

#### **Guideline for Grading**

As any other course, the instructor grades the students work and submit the results.

Assessed Activity

Mark %

	Class attendance	10	
	Presentation	20	
	On Field attendance	20	
	Facilitator Observations and feedback	40	
	Final Report	10	
	Total	100%	
The student will be marked as (Fail) if:			

- Received less than 50 % of the total mark.
- Failed to complete one of the requirements of the course.
- Submitted a forged document.

#### Procedures

- 1. Students register for the class at the registrar office or the related departments as any other course.
- 2. In first class meeting, students obtains a *Contract Forms* bytheir names. They can choose from a list of participated companies or they may choose their own.
- 3. After job placement, students return <u>*Contract Forms*</u> signed by the facilitator to the instructor.
- 4. After a completion of 30 hours on field practice, students can give a presentation on their duties and he may invite co-workers and the facilitator to the presentation.
- 5. All presentations will be conducted during the class hours and students attendance is compulsory.
- After completion field practice, the student submits the sealed <u>Proof of Completion</u> <u>From</u> approved and signed by the facilitator along with the student final report summarizing his experience, duties, working environment, satisfaction, learning outcomes.

## General Remarks

- 1. Number of Forms: <u>Contact Form and Proof of Completion</u> Form
- 2. Students may suggest their own field practice location provided the approval of the instructor.
- 3. If Instructor is in doubt about the legitimacy of the company and the commitment of the student, he may pay a field visit and speaks to co-workers and the facilitator.
- 4. Occasional on-field visits must be stated clearly to students on the first day of classes

and should be formally written in the Contact Form.

5. For privacy, the facilitator should seal <u>*Proof of Completion*</u> Form