جامعة البلقاء التطبيقية

كلية الهندسة التكنولوجية

الخطط الدراسية لبرنامج الشهادة الجامعية المتوسطة

تخصص نظم القوى الكهربائية

2008/2009

بإشراف عميد الكلية الأستاذ الدكتور قاظم جابر

Engineering Programs

Specialization	**Electrical Wiring**
Course Number	**20307213**
Course Title	**Applications of Programmable Logic Controller**
Credit Hours	**3**
Theoretical Hours	**3**
Practical Hours	**0**

Applications of Programmable Logic Controllers

Brief Course Description:

Numbering systems. Logic circuits. Conversion of control actions and algorithms into Boolean equations and logic circuits. Introduction to PLCs and their applications. Examples of control circuits. PLCs programming. Main functions. Timers, counters. Use of PLCs in control.

Course Objectives:

بعد الانتهاء من دراسة هذا المساق يتمكن الطالب من :-

1. **التمييز بين النظم المختلفة للأعداد.**
2. **التحويل من نظام لأخر.**
3. **إجراء العمليات الحسابية البسيطة باستخدام نظم الأعداد المختلفة.**
4. **استنتاج جدول الحقيقة للدوائر المنطقية.**
5. **كتابة المعادلات المنطقية.**
6. **تمثيل دوائر التحكم باستخدام المعادلات والدوائر المنطقية.**
7. **وصف مكونات الحاكم المنطقي المبرمج.**
8. **وصف مميزات استخدام الحاكم المنطقي المبرمج.**
9. **رسم بعض دوائر التحكم التقليدية.**
10. **كتابة برامج التحكم البسيطة على الحاكم المنطقي المبرمج بطريقة المخطط السلمي (Ladder Diagram Method) .**
11. **كتابة برامج التحكم البسيطة على الحاكم المنطقي المبرمج بطريقة الخريطة الدالية (Control System Flowchart).**
12. **كتابة برامج التحكم البسيطة على الحاكم المنطقي المبرمج بطريقة قائمة الإجراءات(Statement List).**
13. **كتابة برامج التحكم باستخدام الدوال مثل دالة الإبقاء والإلغاء/دالة التخزين/ المزمنات/العدادات/ دالة القفز/المقارنات.**

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	نظم الأعداد	1-1النظام العشري. 2-1النظام الثنائي. 1-2-1 تحويل الأعداد الثنائية إلى أعداد عشرية. 2-2-1 تحويل الأعداد العشرية إلى أعداد ثنائية. 3-1 النظام السداسي عشر. 1-3-1 تحويل من النظام الثنائي إلى السداسي عشر. 2-3-1 تحويل من النظام العشري إلى السداسي عشر.	
2.	الدوائر المنطقية	1-2 البوابات الأساسية. 1-1-2 البوابة المنطقية And 2-1-2 البوابة المنطقية Or. 3-1-2 بوابة النفي أو البوابة المعاكسة . 2-2 البوابات المنطقية الأخرى 1-2-2 البوابة المنطقية نفي الوصل Not And. 2-2-2 البوابة المنطقية Not Or 3-2-2 بوابة نفي النفي (الإثبات). 4-3-2 بوابة عدم التطابق 5-3-2 بوابة التطابق 2-2 تجميع البوابات المنطقية الأخرى .	
3.	مكونات الحاكم المنطقي المبرمج وأساسيات تشغيله.	1-3 ما الحاكم المنطقي 2-3 أهمية استخدام الحاكم المنطقي المبرمج في الصناعة. 3-3 مكونات الحاكم المنطقي المبرمج. 1-3-3 مصدر التغذية 2-3-3 وحدة الإدخال والإخراج. 3-3-3 وحدة التحكم المركزية 4-3-3 جهاز البرمجة 4-3 دوائر التحكم التقليدية.	
4.	برمجة الحاكم المنطقي المبرمج	1-4 البرمجة بطريقة المخطط السلمي. 2-4 البرمجة بطريقة الخريطة الدالية. 3-4 البرمجة بطريقة قائمة الإجراءات .	
5.	الدوال الأساسية والدوال	1-5 دالة التخزين.	

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	2-5 دالة الإبقاء والإلغاء. 3-5 المزمنات. 5-3-1المزمن النبضي 5-3-2 المزمن النبضي الممتد 5-3-3 مزمن التشغيل المتأخر 5-3-4 مزمن التشغيل المخزن المتأخر 5-3-4 مزمن الإلغاء المتأخر 4-5 العدادات. 5-4-1 استخدام العداد كعداد تنازلي . 5-4-2 استخدام العداد كعداد تصاعدي. 5-5 المقارنات. 6-5 وظيفة القفز. 5-6-1 عمليات القفز غير المشروطة. 5-6-2 عمليات القفز المشروطة . 5-6-3 عمليات القفز للبرامج الفرعية.	المساعدة	

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/--/----
	Second Exam	20%	• --/--/----
	Final Exam	50%	--/--/----
Homework and Projects		10%	
Discussions and lecture Presentations			

Teaching Methodology:

- ❖ **Lectures**

Text Books & References:

- **Programmable Logic Controllers, J. W. Wabb and R. A. Reis, 1994**
- **Programmable Logic Controllers, C.Simpson, 1993**
- **Programmable Logic Controllers and their Engineering Applications, A. Crispin, 1990**
- **The PLC workbook, Clement Jewery, 1993**
- أجهزة تحكم قابلة للبرمجة للمهندس عيد شحاذه هلاله – سلسلة الرضا للمعلومات .

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

Engineering Program

Specialization	**Electrical Wiring**
Course Number	**20307214**
Course Title	**Applications of Programmable Logic Controller Laboratory**
Credit Hours	**1**
Theoretical Hours	**0**
Practical Hours	**3**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

Brief Course Description:
Basic components and structure of PLC. Programming. Conversion of conventional control circuits into logic circuits. Motor control using PLCs.
Course Objectives
عند إكمال هذا المساق يكون لدى الطالب القدرة على:- 1. معرفة مكونات التحكم بالعمليات الصناعية PLC. 2. معرفة لغات البرمجة وأنواعها. 3. بناء دائرة التحكم لتشغيل محرك ثلاثي الأوجه. 4. تحويل دوائر التحكم من مخطط مسار التيار إلى دائرة PLCبالطرق الثلاثة – المخطط السلمي LAD البوابات المنطقيةFBD قائمة الإجراءات STL . 5. أن يعرف الطالب أنواع النظم الخاصة في التحكم بإضاءة المباني . 6. أن يكتب الطالب بعض البرامج للتحكم في إضاءة المباني. 7. أن يعرف الطالب كيف يتم عمل إشارة المرور. 8. أن يكتب الطالب برامج للتحكم في إشارة مرور نموذجية. 9. أن يعرف الطالب طريقة عمل الغسالة الكهربائية. 10. أن يكتب الطالب برنامج تشغيل الغسالة الكهربائية.

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	تطبيقات على البوابات الأساسية	1-إضاءة لمبة باستخدام بوابة And ,Or Nand ,nor. 2- رسم الدوائر العملية للبوابات مع اللمبة. 2-1 استكشاف جداول الحقيقة للبوابات .	
2.	كتابة برنامج للتحكم في تشغيل محرك حثي ثلاثي الأوجه مع عكس الحركة .	2- بناء دائرة التحكم لتشغيل محرك حثي ثلاثي الأوجه. 2-1 الدائرة الرئيسية . 2-2 دائرة التحكم . 2- تحويل دائرة التحكم من دائرة مسار التيار إلى دائرة PLC 2-1 المخطط السلمي.LAD 2-2 البوابات المنطقيةFBD 2-3 قائمة الإجراءات STL	
3.	المزمنات وأنواعها	3- طريقة عمل كل نوع من المزمنات 3-1 المزمن النبضي 3-2 المزمن النبضي الممتد. 3-3 مزمن التشغيل المتأخر. 3-4 مزمن التشغيل المتأخر المخزن 3-5 مزمن الفصل المتأخر.	
4.	تطبيقات على التحكم في إضاءة المباني.	4- كتابة بعض البرامج للتحكم في إضاءة المباني . 4- إضاءة المباني باستخدام PLC.	
5.	تطبيقات على التحكم في إشارة المرور	5- معلومات عامه عن إشارة مزدوجة مع إشارة المشاة وأماكن استخدامها . 5- تحويل دائرة التحكم من دائرة مسار التيار إلى دائرة PLC 5-1المخطط السلمي.LAD 5-2البوابات المنطقيةFBD 5-3 قائمة الإجراءات STL	
6.	تطبيقات على التحكم في تشغيل	6- 1 العدادات	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

	6-1 -1مقدمه عن العدادات 6-1-2 أنواع العدادات المداخل والمخارج. 6- 2 فكرة عمل الغسالة الكهربائية. 6-3 دائرة التحكم لعمل الغسالة الكهربائية 6-3-1تحويل دائرة التحكم من دائرة مسار التيار إلى دائرة PLC 6-3-1 المخطط السلمي.LAD 6-3-2البوابات المنطقيةFBD 6-3-3قائمة الإجراءات STL	الغسالة الكهربائية.	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Evaluation Strategies:

Exams		Percentage	Date
Exams	**30%**	**Assignment**	--/--/----
	20%	**Med- term Exam**	--/--/----
	50%	**Final Exam**	--/--/----
Homework and Projects			
Discussions and lecture Presentations			

Teaching Methodology:

- **Laboratory**

Text Books & References:

- Programmable Logic Controls (PLC I, II, III)

By K. Haase. May ١٩٩٢

- Reference Manual From Siemens.

Ladder Logic Programming.

Function Block Diagram Programming.

Statement List Programming

1- مذكرة التحكم المنطقي المبرمج - إعداد المهندس محمد العبد الحافظ – إعداد المهندس اشرف عامر.

2- دوائر التحكم الآلي (تصميم، تنفيذ، صيانة، إصلاح،) معهد الساليزان الايطالي (دن بوسكو) ترجمة وإعداد وجيه جرجس.

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

Engineering Program

Specialization	**Common Course**
Course Number	**20301113**
Course Title	**Electrical Circuits**
Credit Hours	**3**
Theoretical Hours	**3**
Practical Hours	**0**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

وصف المادة الدراسية:

- Voltage, Current, and Resistance, Ohm's Law, Energy and Power, Series-Parallel Circuits, Introduction to Alternating Current and Voltage, Capacitors, Inductors, RLC Circuits and Resonance. Electrical Measurements.

أهداف المادة الدراسية:

بعد دراسة هذه المادة يتوقع من الطالب أن يكون قادراً على تحقيق الأهداف التالية:

1. Define and study current and voltage sources.
2. Use Ohm and kirchoff's laws for analyzing DC electrical circuits.
3. Study the elements of AC circuits.
4. Study the RLC in AC circuits.

الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن بالاسبوع
1.	**Voltage, Current, and Resistance**	▪ Atomic Structure ▪ Electrical Charge ▪ Voltage, Current, and Resistance ▪ Voltage and Current Sources ▪ Resistors ▪ The Electric Circuit ▪ DC Circuit Measurements ▪ Electrical Safety	**2**
2.	**Ohm's Law, Energy and Power**	▪ The Relationship of Current, Voltage, and Resistance ▪ Calculating Current ▪ Calculating Voltage ▪ Calculating Resistance ▪ Energy and Power ▪ Power in an Electric Circuit ▪ Resistor Power Ratings ▪ Energy Conversion and Voltage Drop in Resistance ▪ Power Supplies	**2**
3.	**Series Circuits**	▪ Resistors in Series ▪ Current in a Series Circuit ▪ Total Series Resistance ▪ Application of Ohm's Law ▪ Voltage Sources in Series ▪ Kirchhoff's Voltage Law ▪ Voltage dividers ▪ Power in Series Circuits	**1**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

4.	**Parallel Circuits**	▪ Resistors in Parallel ▪ Voltage in a Parallel Circuit ▪ Kirchhoff's Current Law ▪ Total Parallel Resistance ▪ Application of Ohm's Law ▪ Current Sources in Parallel ▪ Current Dividers ▪ Power in Parallel Circuits	**1**
5.	**Series-Parallel Circuits**	▪ Identifying Series-Parallel Relationships ▪ Calculations of Series-Parallel Resistive Circuits ▪ Voltage Dividers with Resistive Loads ▪ The Wheatstone Bridge ▪ The Superposition Theorem	**3**
6.	**Introduction to Alternating Current and Voltage**	▪ The Sinusoidal Waveform ▪ Sinusoidal Voltage Sources ▪ Sinusoidal Voltage and Current Values ▪ Angular Measurement of a Sine Wave ▪ The Sine Wave Formula ▪ Introduction to Phasors ▪ Analysis of AC Circuits ▪ Superimposed DC and AC Voltages ▪ Nonsinusoidal Waveforms ▪ The Oscilloscope ▪ Concepts of phasors, complex numbers, rectangular and polar forms of complex numbers, mathematical operations. ▪ Three-phase voltage and current	**5**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

		▪ Y and Δ connections ▪ Line and phase voltages and currents ▪ Power calculations in three-phase circuits ▪ Generation of three phase voltage ▪ Inter connections of three ▪ phase voltage and currents in star connection (Y) and delta connection (Δ) ▪ Mesh method of connection loads with alternator ▪ Active, reactive and apparent power in three phase circuits ▪ Analysis of balanced phase circuits ▪ Balanced and unbalanced three-phase circuits. ▪ AC circuit measurement	
7.	**Capacitors**	▪ The Basic Capacitor ▪ Types of Capacitors ▪ Series Capacitors ▪ Parallel Capacitors ▪ Capacitors in DC Circuits ▪ Capacitors in AC Circuits	**1**
8.	**Inductors**	▪ The Basic Inductor ▪ Types of Inductors ▪ Series and Parallel Inductors ▪ Inductors in DC Circuits ▪ Inductors in AC Circuits	**1**
9.	**RLC Circuits and Resonance**	▪ RC Circuits ▪ RL Circuits ▪ RLC Circuits ▪ Resonance circuit	**2**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

طرق التقييم المستخدمة :

الامتحانات	نسبة الامتحان من العلامة الكلية	التاريخ
الأول	20%	
الثاني	20%	
أعمال الفصل	10%	
الامتحانات النهائية	50%	
المشروع و الوظائف		
المناقشات و تقديم المحاضرات		

طرق التدريس:

- يحدد عضو هيئة التدريس الطريقة المستخدمة من خلال (محاضرة، عرض، مناقشات، مختبرات).

الكتب و المراجع :

الكتاب المقرر:

1. Thomas L. Floyd " principles of electric circuits" ,Prentice Hall, 2007, ISBN-10: 0132383519

المراجع:

1. Robert L. Boylested "introductory circuit analysis" prentice-hall Inc 1997
2. Thomas L. Floyd " principles of electric circuits" charlese, Merrill publishing company,1981
3. Noel M. Morris and Frank W.Senior "electric circuits analysis" USA NY,1977

- **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

Engineering Program

Specialization	**Common Course**
Course Number	**20301114**
Course Title	**Electrical Circuits Lab**
Credit Hours	**1**
Theoretical Hours	**0**
Practical Hours	**3**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

وصف المادة الدراسية:

- DC circuit analysis, Ac circuit analysis, Resonance. Electrical measurements. The Oscilloscope and its applications in measurements.

أهداف المادة الدراسية:

بعد دراسة هذه المادة يتوقع من الطالب أن يكون قادراً على تحقيق الأهداف التالية:

1. Measure voltages and currents to verify KVL and KCL.
2. Identify shorts and opens in a malfunctioning circuit, and define and verify the equivalent resistance of a given network
3. Measure the inductance of an inductor.
4. Measure the capacitance of a capacitor.
5. To be familiar with an AC oscilloscope measurement
6. Identify resonance circuit.

الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن بالاسبوع
1.	Resistor and color code		2
2.	Series DC circuits		2
3.	Series and parallel DC circuits		2
4.	Superposition principles		2
5.	The Oscilloscope		3
6.	RLC components		3
7.	Resonant circuits		2

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

طرق التقييم المستخدمة :

الامتحانات	نسبة الامتحان من العلامة الكلية	التاريخ
التقارير و المشاركة	30%	
الامتحان المتوسط	20%	
الامتحان النهائي	50%	
المشروع و الوظائف		
المناقشات و تقديم المحاضرات		

طرق التدريس:

- تطبيقات عملية في المختبر

الكتب و المراجع :

الكتاب المقرر:

1. أدلة التجارب العملية الخاصة بالمختبر.

المراجع:

1. Robert L. Boylested "introductory circuit analysis" printce-hall Inc 1997
2. Thomas L. Floyd " principles of electric circuits" charlese, Merrill publishing company,1981
3. Noel M. Morris and Frank W.Senior "electric circuits analysis" USA NY,1977

- **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

Program	Engineering
Specialization	Electrical Power Systems
Course Number	20304112
Course Title	Electrical Machines (1)
Credit Hours	2
Theoretical Hours	2
Practical Hours	0

□ **Brief Course Description:**

This Course covers ; constructional features , principles of operation, classification , equivalent circuits , parameters evaluation , characteristics , testing and applications of DC machines and transformers .

□ **Course Objectives:**

The student should be able to ;

1. Explain the principles of electromagnetism.
2. Describe the construction of DC machines and methods of excitation.
3. Describe the characteristics of DC generators.
4. Describe the methods of; starting, speed control and reversing the direction of rotation of DC motors.
5. Describe the construction of single – phase transformers.
6. Determine the transformer equivalent circuit, parameters, voltage regulation and efficiency.
7. Explain the methods of connections of three- phase transformer windings.
8. Name the conditions of parallel operations of single – phase and three – phase transformer.

- **Detailed Course Description:**

Unit Number	Unit name	Unit Content	Time Needed
1.	**Electromagnetic**	▪ Introduction. ▪ Motional voltage, e. ▪ Electromagnetic Force,f. ▪ Basic Structure of Electric Machine	
2.	**DC Machine**	▪ Construction ▪ Evolution of DC Machine ▪ Armature Windings; Lap winding, wave winding ▪ Armature Voltage ▪ Electromagnetic Torque ▪ Magnetization (saturation) curve of a DC Machine	
3	**DC Generators**	▪ Separately Excited DC Generator ▪ Shunt Excited DC Generator ▪ Series Excited DC Generator ▪ Compound Excited DC Generator ▪ Armature Reaction of DC Generators ▪ Current commutation in DC Machine ▪ Characteristic of DC Generators	

4	**DC Motors**	▪ Separately Excited DC Motor ▪ Shunt Motor ▪ Series Motor ▪ Compound Motors ▪ Torque – speed characteristics of DC Motors ▪ Power flow and efficiency in DC Machines	
5	**Speed control of DC Motors**	▪ Armature Voltage control. ▪ Field control. ▪ Armature Resistance control	
6	**Magnetic circuits of Transformers**	▪ I-H Relation ▪ B-H Relation ▪ Magnetic Equivalent circuit ▪ Magnetic curve ▪ Inductance ▪ Hysteresis losses ▪ Eddy current losses ▪ Core losses	
7	**Transformers**	▪ Construction of single – phase Transformer ▪ EMF of Transformer ▪ Ideal Transformer ▪ Impedance Transfer ▪ Polarity of Transformer	

8	**Practical Transformer**	▪ Referred Equivalent parameters ▪ Determination of equivalent parameters ▪ Transformer Ratings ▪ No- Load Test ▪ Short – circuit Test ▪ Efficiency of Transformer; Maximum Efficiency, All – Day (Energy) Efficiency ▪ Voltage Regulation	
9	**Autotransformers**		
10	**Three – phase Transformer**	▪ Re Bank of three single-phase Transformers ▪ Three – phase Transformer on a common Magnetic core (Three – Phase Unit Transformer) ▪ Parallel Operation of Tree Phase Transformers	

□

- **Evaluation Strategies:**

		Percentage	Date
1. Exams	First Exam	20%	
	Second Exam	20%	
	Assignments	10%	
	Final Exam	50%	

- **Teaching Methodology:**

1. Lecture

- **Textbook**:
  Principles of Electric Machines and power Electronics; P.C. Sen.John Wiley & Sons, INC, 1997.

- **References:**
  1. Electric Machinery Fundamentals; Stephen J. Chapman, Mc GRAW – Hill, 1996.
  2. Small Electric motors; (Helmut Moczala, Jurgen Draeger, Herman Kraub, 1998.
  3. Electric Machines; M.S sarma, west publishing company, 1994.
  4. Electrical Power Technology; D. Tyler, 1998.

Program	Engineering
Specialization	Electrical Power Systems
Course Number	20304113
Course Title	Electrical Machines (2)
Credit Hours	2
Theoretical Hours	2
Practical Hours	0

□ **Brief Course Description:**

This Course covers constructional features, principles of operation, classification, equivalent circuits, parameters evaluation, characteristics, testing and applications of Induction & Synchronous Machines.

□ **Course Objectives:**

The student should be able to ;

1. Describe the construction, types and operation of single & three- phase induction motors.
2. Describe the methods of starting & speed control of single & three- phase induction motors.
3. Describe the construction, operation & application of synchronous machines.
4. Describe methods of starting of Synchronous motors
5. Explain the characteristics of synchronous generators.
6. Understand the parallel operation of synchronous generators.

- **Detailed Course Description:**

Unit Number	Unit name	Content	Time Needed
1.	Induction Machines (3-Phase)	▪ Constructional features ▪ Rotating Magnetic field ▪ Induced voltage	
2.	Polyphase Induction Machine	▪ Standstill operation ▪ Induction regulator ▪ Running Operation	
3	Modes of operation of Induction Machine	▪ Motoring ▪ Generating ▪ Plugging	
4	Equivalent circuit of Induction Machine	▪ Stator windings ▪ Rotor Circuit ▪ Complete Equivalent Circuit ▪ Approximate Equivalent Circuit	
5	Operation of Induction Motors	▪ No- Load Test ▪ Blocked – Rotor Test ▪ Performance Characteristics. ▪ Efficiency and Power Flow	

6		▪ Types of Induction Motors and speed control. ▪ Wound Rotor Motor. ▪ Squirrel – cage Motors; deep – Bar squirrel cage motor and double- cage squirrel- cage motor. ▪ Speed control; pole changing, line voltage control, line frequency control and Rotor resistance control. ▪ Starting of Induction Motors.	
7	Single – phase Induction Motors	▪ Introduction ▪ Double revolving field theory; Rotor at standstill, Rotor running, pulsating Torque. ▪ Types of 1- phase Induction Motors; split – phase Motors, capacitor- start Motor, capacitor – start capacitor- Run Motor, shaded – Pole Motor . ▪ Characteristics & typical application.	
8	Synchronous Machines	▪ Introduction. ▪ Construction of three- phase synchronous machine. ▪ Equivalent circuit of a synchronous machine	

9	Synchronous Machines	▪ Principle of operator & Types. ▪ Characteristic. ▪ Parallel Operation of Alternators. ▪ Armature Reaction.	
10	Determination of the Synchronous Reactance Xs	▪ Open- circuit test. ▪ Short – circuit test. ▪ Unsaturated synchronous reactance. ▪ Saturated synchronous reactance. ▪ Phaser diagram.	
11	Synchronous Motors	▪ Principle of operation ▪ Power & Torque characteristics ▪ Power factor control ▪ Starting of synchronous Motors; starting with variable – frequency supply, starting as an Induction Motor ▪ Speed control of synchronous motor. ▪ Applications	

□ **Evaluation Strategies:**

		Percentage	Date
1. Exams	First Exam	20%	
	Second Exam	20%	
	Assignments	10%	
	Final Exam	50%	

□ **Teaching Methodology:**

1. Lecture

□ **Textbook**:

Principles of Electric machines and power electrons; P.C.Sen, John Wiley & sons, Inc, 1997.

□ **References**:

1. Electric Machine Fundamentals, Stephen J. Chapman, Mc GRAW-Hill, 1996.
2. Small Electric Motors; (Helmut Moczzala, Jurgen Draeger, Herman KrouB, 1998.
3. Electric Machine; M.S Sarma, west publishing Company, 1994.
4. Electrical Power Technology; D.Tyler ,1998.

Engineering Program

Specialization	**Common**
Course Number	**20304111**
Course Title	**Electrical Machines**
Credit Hours	**3**
Theoretical Hours	**3**
Practical Hours	**0**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

وصف المادة الدراسية:

This course throws light on all types of electrical machines ,transformers ,motors, ,generators ,special machines ,These machines which may face a diploma holder in his practical life ,He must be aware of many related things about these machines ,construction ,principles of operation , characteristics , applications , maintenance .

أهداف المادة الدراسية:

بعد دراسة هذه المادة يتوقع من الطالب أن يكون قادراً على تحقيق الأهداف التالية:

1. Explain & describe the operating principles, construction of generators.
2. Explain & describe the operating principles, construction of three phase synchronous generators.
3. Explain & describe the operating principles, construction & excitation of DC & AC motors & generators.

الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن
1.	**Magnetic Circuits**	▪ I-H relation ▪ B-H relation ▪ Magnetic equivalent circuit ▪ Hysteresis losses ▪ Eddy current losses ▪ Core losses	**2 weeks**
2.	**Transformers**	▪ Construction and principle of operation ▪ EMF Equation ▪ Practical transformer; referred equivalent circuit ▪ Open – circuit test ▪ Short – circuit test ▪ Full – load copper losses. ▪ Efficiency ,all – day efficiency ,maximum efficiency ▪ Voltage regulation ▪ I deal transformer ▪ Auto transformer ▪ Three – phase transformers	**3 weeks**
3.	**Direct Current Machines**	▪ Construction and principle of operation ▪ Armature windings ▪ Developed torque ▪ DC generators, types; characteristics, interlopes, armature reaction , voltage regulation . ▪ DC Motors, types; mechanical characteristics; losses and efficiency speed control	**4 weeks**
4.	**Three – Phase Indication Motors**	▪ Introduction ▪ Construction and types ▪ Rotating magnetic field ▪ Induced E.M.F ▪ Slip	**1 weeks**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

		▪ Performance characteristics ▪ No – load test ▪ Blocked – rotor test ▪ Speed control ,pole changing , line voltage control; line frequency ▪ Control , rotor resistance control	
5.	**Single – phase Induction Motors** .	▪ Double revolving field theory ▪ Types , capacitor – start motor ,split – phase motor ; shade – ▪ Pole motor, capacitor – start and run motor, universal motor. ▪ Characteristics and typical applications ▪ Speed control	**2 weeks**
6.	**Synchronous Machines** .	▪ Construction of 3-ph synchronous machine ▪ Synchronous generators , principle of operation , types ▪ characteristics , armature reaction , voltage regulation ▪ Synchronous motors , principle of operation , power and torque ▪ characteristics , P.F control speed control , applications	**2 weeks**
7.	**Special Machines**.	▪ DC servomotor, construction and applications. ▪ AC servomotor, construction and applications. ▪ Stepper motor, types, construction and applications. ▪ Linear indication motor ,construction and applications ▪ Linear synchronous motor ,construction and applications	**1 week**
8.	**Vibration and Noise Problems in Electrical Machines**	▪ Introduction ▪ Sound field quantities ▪ Noise measurements ▪ Vibration measurements ▪ Vibration and noise reduction ▪ Sound damping ▪ Technical solutions	**1 week**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

طرق التقييم المستخدمة :

الامتحانات	نسبة الامتحان من العلامة الكلية	التاريخ
الأول	%20	
الثاني	%20	
أعمال الفصل	%10	
الامتحانات النهائية	%50	

طرق التدريس:

❖ يحدد عضو هيئة التدريس الطريقة المستخدمة من خلال(محاضرة، عرض، مناقشات، مختبرات).

الكتب و المراجع :

1. Principle of Electric Machines and Power Electronics , P.C. Sen , John Wiley and Sons , Inc , 1997
2. Small Electric Motors , Helmut Moczala , Jugen Draeger , Hermann Kraub , 1998
3. Electrical Machines , M.S.Sarma , West Publishing Company , 1994

Electrical machinery Fundamental, Stephen J. Chap man, Mc GRAW , Hill , 1996 .

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

Engineering Program

Specialization	**Common**
Course Number	**20304114**
Course Title	**Electrical Machines Lab**
Credit Hours	**1**
Theoretical Hours	**0**
Practical Hours	**3**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

وصف المادة الدراسية:

This course focus ,on connection of various types of electrical machines , measurement of losses and efficiency ,speed control and mechanical characteristics of types of motors ,external characteristics of generators.

أهداف المادة الدراسية:

Upon the completion of the course, the student will be able to:

1. Make connection of all type of electrical machines , motors , generators and transformers
2. Measure; power ,current, voltage and cosup of electrical machines
3. Measure sped of different types motor
4. Draw the characteristics of transformers ,motors and generators
5. Calculate the parameters of electrical machines

الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن
1.		Experiments on transformers no- load test, short- circuit test and loading test. Cage type , Capacitor-start motor, shaded- pole type	1 weeks
2.		Experiments on three – phase induction motors; wound rotor type and squirrel	2 weeks
3.		Experiments on single – phase induction motors split phase type ،	3 weeks
4.		Experiments on synchronous machines ; synchronous generator (alternator) and synchronous motor	2 weeks
5.		Experiments on DC motors ;shunt, series, compound	4 weeks
6.		Experiments on DC generators ;shunt, series, compound	4 weeks

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

طرق التقييم المستخدمة :

الامتحانات	نسبة الامتحان من العلامة الكلية	التاريخ
التقارير	30%	
الامتحان المتوسط	20%	
الامتحانات النهائية	50%	

طرق التدريس:

- تجارب عملية في المختبر

الكتب و المراجع :

المراجع:

1. Lab. Sheets Prepared by Instructor
2. Manuals of each type of machines.
3. Electric machinery fundamentals, Stephen J.Chapman, 1996.

Specialization	Electrical Power System
Course Number	20301141
Course Title	Electrical Measurements
Credit Hours	2
Theoretical Hours	2
Practical Hours	0

□ **Brief Course Description:**

This course provides an introduction to Measurements science; and you will study: Electrical quantities, classifications of electrical and electronic instruments, *DC* & *AC* measuring instruments, bridges, electronic and digital measuring instruments, oscilloscope, recording instruments, power energy.

□ **Course Objectives:**

Upon the completion of the course, the student will be able to :

1. Distinguish electrical quantities and *SI* units.
2. Investigate errors in measurements.
3. Explain the principles of work of various measuring devices.
4. Measure various electrical quantities.
5. Use *DC* and *AC* measuring bridges.
6. Use Oscilloscope in measuring electrical quantities.
7. Use Digital measuring devices.

- **Detailed Course Description:**

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Introduction to Measurements**	▪ Measurements science. ▪ Electrical Units. ▪ Errors in measurement. ▪ Limiting errors. ▪ Selection, care and use of instruments.	
2.	**Electrical and Electronic Instruments Classification**	▪ D'Arsonval meter movement (Permanent magnet moving coil). ▪ Electrodynamometer movement. ▪ Iron – vane meter movement. ▪ Thermocouple meter. ▪ Induction meter.	
3	**Ohmmeters**	▪ Basic ohmmeter circuit, ohmmeter's classification, multiple – range ohmmeter, ohmmeter's applications.	
4	**Bridges**	▪ Introduction. ▪ Direct current bridges. ▪ Whetstone Bridge. ▪ Slide Wire Bridge. ▪ Kelvin Bridge. ▪ Alternating current bridge. ▪ Maxwell bridges. ▪ Wein Bridge. ▪ Schering Bridge. ▪ Radio- Frequency Bridge.	

5	**Oscilloscopes**	▪ Basic oscilloscope. ▪ Cathode – ray tube. ▪ Oscilloscope amplifiers. ▪ Sweep generator. ▪ Vertical input and sweep generator signal synchronization. ▪ Attenuators. ▪ Dual channel oscilloscope. ▪ Oscilloscope applications. ▪ Period and frequency measurement. ▪ Determining frequency with Lissajous patterns. ▪ Phase angle computation.	
6	**Recording Instruments**	▪ Introduction. ▪ Self- Balancing system. ▪ Strip – chart recorders. ▪ Selecting a recorder. ▪ Recorder specifications.	
7	**Digital Instruments**	▪ Digital instruments versus analog instruments, Analog-to-digital converters. ▪ Counting circuit: (The binary counter & the decade counter). ▪ Electronic counters: (The frequency mode, the period mode, the ratio mode and the time interval mode) . ▪ Digital multimeter.	

8	**Power Energy Measurements:**	▪ Introduction. ▪ Power measurement. ▪ Electrodynamometer movement used in wattmeter. ▪ Power measurement in single – phase circuit. ▪ Power measurement in three- phase circuits. ▪ Energy measurement. ▪ The inductive watt- hour meter. ▪ Energy measurement in single and three – phase circuit. ▪ Power factor meter ▪ Frequency meter	

- **Evaluation Strategies:**

		Percentage	Date
1. Exams	First Exam	20%	
	Second Exam	20%	
	Assignments	10%	
	Final Exam	50%	

- **Teaching Methodology:**

1. Lectures

- **References**:

1. Sawomir Tumanski, principles of Electrical Measurements, CRC Press, 2006.
2. Robert B. Northrop, Introduction to Instrumentation and Measurement, CRC Press, 2nd edition, 2005.
3. A.D.V.N. Kularatna, digital and Analogue Instrumentation: Testing and Measurement, IET, 2002.
4. Jones, Chin F.- Electronic Instruments and Measurements –Prentice Hall-1991.
5. الاجهزة الالكترونية وطرق القياس – مهند صبري وسناء فيصل –1990.

Program	Engineering
Specialization	Electrical Power Systems
Course Number	20304162
Course Title	Electrical Measurements Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3

□ **Brief Course Description:**

Experiments have to cover: measurements errors, measurements in DC & AC circuits, load effects, using electronic and digital instruments, calibration and power measurements.

□ **Course Objectives:**

Upon the completion of the course, the student will be able to :

1. Distinguish electrical quantities and *SI* units.
2. Investigate errors in measurements.
3. Explain the principles of work of various measuring devices.
4. Measure various electrical quantities.
5. Use *DC* and *AC* measuring bridges.
6. Use Oscilloscope in measuring electrical quantities.
7. Use Digital Measuring Ddevices.

- **Detailed Course Description:**

Lab Number	Lab Content	Time Needed
1.	Electrical and electronic measuring instruments	
2.	Current and voltage measurements, error calculations	
3	Resistance measurements using: ohmmeter, color code, divider – voltage method (up and down stream connections), error calculations	
4	Resistance measurements using: Whetstone bridge, Kelvin bridge	
5	*RLC* measurements using *AC* bridges.	
6	Power and power factor measurements in single – phase circuits.	
7	Oscilloscope (particle hands on session).	
8	Using Oscilloscope in measurements of : voltage , current , frequency and phase difference.	
9	Measuring of phase – shift and frequency using Lissajous patterns.	
10	Measurement of current, voltage, resistance and frequency using digital measuring devices, error calculations.	
11	Energy measurements in single and three phase circuits.	

- **Evaluation Strategies:**

		Percentage	Date
1. Exams	Assignments	30%	--/--/----
	Med- term Exam	20%	
	Final Exam	50%	--/--/----
2. Homework and Projects			
3.Discussions and lecture Presentations			

- **Teaching Methodology:**

1. Laboratory

- **References**:

1. Stanley Wolf, Richard F.M. Smith, Student Reference Manual for Electronic Instrumentation Laboratories, Prentice Hall, 2nd edition, 2003.
2. Robert B. Northrop, Introduction to Instrumentation and Measurements, CRC Press,2nd edition, 2005.
3. A.D.V.N. Kularatna, Digital and Analogue Instrumentation: Testing and Measurement, IET, 2002.

Engineering Program

Specialization	**Electrical Power System**
Course Number	**20304221**
Course Title	**Electrical Power Plants**
Credit Hours	**3**
Theoretical Hours	**3**
Practical Hours	**0**

Brief Course Description:

- This Course focuses on; construction & operation of ; steam power stations, hydraulic power station ,gaseous power stations , diesel power station & renewable power stations .

Course Objectives:

The student should be able to;

1. Explain the generation of electrical energy.
2. Describe construction & operation of steam power plants.
3. Describe construction & operation of gaseous power plants.
4. Describe construction & operation of diesel power plants.
5. Describe construction & operation of renewable power plants.

□ **Detailed Course Description:**

Unit Number	Unit name	Unit Content	Time Needed
1.	**Introduction**	▪ Generation of electrical energy ▪ Types of power plants. ▪ Capacity of power plant.	
2.	**Stream power plants**	▪ Steam generators (bookers); Types & Auxiliaries ▪ Evaporators ▪ Feed water & water heaters. ▪ Condensers; type & operation. ▪ Super heaters and reheaters ▪ Auxiliary devices; pumps, cooling towers fuel feeders. ▪ Steam turbine ▪ General plan of steam plants.	
3	**Gaseous power plants**	▪ Applications of gaseous power plants. ▪ Advantages & disadvantages of gaseous plants. ▪ Elements of gaseous turbine; gas turbine, compressor, combustor, open cycle & closed cycle. ▪ Auxiliary parst, lubrication & cooling	
4	**Diesel power plants**	▪ Advantages & disadvantages of diesel engine ▪ Applications, contraction & principle of operation ▪ Fuel system, cooling system, lubrication system, general plan of diesel engine	

5	**Hydraulic power plants**	▪ Classification of hydraulic power plants. ▪ Advantages & disadvantages & applications. ▪ Water head, water tank & dams ▪ Construction & principle of operation	
6	**Renewable power plants**	▪ Geothermal plants; construction & applications ▪ Solar plants; construction & applications ▪ Wind plants ▪ Advantages & disadvantages	
7	**Economical constructions of energy generation.**	▪ production costs ; fixed costs , year costs , ▪ Total price of energy. ▪ Load curves & continuous load curves. ▪ Peak demand, utilization factor, diversity factor & peak diversity factor.	

□ **Evaluation Strategies:**

		Percentage	Date
1. Exams	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Assignments	10%	
	Final Exam	50%	--/--/----

□ **Teaching Methodology:**

1. Lecture

□ **Textbook**:
Power Generation Technology; Paul Breeze , 2005 ISBN 0-7506 – 6313-8

□ **References**:
1. Wind power; renewable Energy for home, farm & Business; Paul Gipe, 2004 .
2. Renewable Energy ; Bent Sorensen , 2004
ISBN 0-12-656153 -2

Program	Engineering
Specialization	Electrical Power Systems
Course Number	20304244
Course Title	Electrical Protection Systems Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3

□ **Brief Course Description:**

This Course covers experiments on; fuses , circuit breakers, relays; operation and application of ; electromagnetic relays , electronic relays, differential relays, timers; mechanical ,thermal mercury and electronic timers, contactors.

□ **Course Objectives:**

The student should be able to ;

1. Describe the construction, operation & connection of different types of relays.
2. Describe the construction, operation & connection of circuit breakers & fuses.
3. Describe the construction, operation & connection of timers and contactors.
4. Determine the characteristics of all protection & control devices.
5. Know the requirement of protection systems.

□ **Detailed Course Description:**

Lab Number	Unit Name	Unit Content	Time Needed
1.		Experiments of single & three-phase current transformers	
2.		Experiments of summation current transformer	
3		Experiments of single & three – phase voltage transformers	
4		Experiment of electromagnetic overcurrent relay	
5		Experiment of over-voltage & under-voltage relays	
6		Experiment of earth fault relay.	
7		Experiment of directional power relay	
8		Experiment of differential relay	
9		Experiment of circuit breakers	
10		Experiment of fuses	
11		Experiment of uninterruptible supplies	
12		Experiment of timers & contactors	

□ **Evaluation Strategies:**

		Percentage	Date
1. Exams	Reports	30	
	Midterm Exam	20%	
	Final Exam	50%	

□ **Teaching Methodology:**

1. Laboratory

□ **Textbook**:

1. Manuals of each type of relays, circuit breakers, timers & contactors.
2. Manuals of current & voltage transformers.

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

Program	Engineering
Specialty	Electrical Power Systems
Course Number	20304243
Course Title	Electrical Protection Systems
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

□ **Brief Course Description:**

This Course throws lights on; components of electrical power system, protective relays, protection of feeders, networks, generators, motors, transformers & bus bars ; calculations of faults.

□ **Course Objectives:**

The student should be able to ;

1. Know faults calculations.
2. Explain many kinds of protection systems of system components.
3. Describe the construction & operation of protection systems.
4. Determine relays .
5. Connect & supply relays through VTs & CTs.

□ **Detailed Course Description:**

Unit Number	Unit Name	Unit Content	Time Needed
1.	**Introduction**	▪ Basic principles of electrical systems ▪ Protection requirements ▪ Protection zone ▪ Primary & back – up protection	
2.	**Calculation of short-circuit currents**	▪ Modeling for short – circuit current calculations ▪ Effect of the system impedance. ▪ Effect of rotating machinery ▪ Types of fault duty ▪ Importance and construction of sequence networks ▪ Calculation of asymmetrical faults using symmetrical components. ▪ Supplying current & voltage signals to protection systems	
3	**current and voltage Transformers**	▪ Voltage transformers; equivalent circuit, burden, selection of VTs, capacitor voltage transformers ▪ Current transformers; equivalent circuit, AC saturation, burden, selection of CTs, precautions when working with CTs	

4	**Over current protection**	▪ General ▪ Types of over current relays; definite – current relays definite – time relays, inverse – time relays ▪ Setting over current relays ▪ Co –ordination across Dy transformers ▪ Co- ordination with fuses.	
5	**Fuses, Recluses and sectionalizes**	▪ Equipments; recluses; fuses; sectionalizes ▪ Criteria for co-ordination of time / current devices; (fuse- fuse; recluses – fuse; recluse - recloser; recloser- relay; recluse – sectionalize; recluse – sectionaliser –fuse) co-ordination	
6	**Directional over current relays**	▪ Construction. ▪ Principle of operation. ▪ Relay connection. ▪ Directional earth- fault relates. ▪ Setting of time – delay directional over current units.	
7	**Differential protection.**	▪ Classification of differential protection. ▪ Selection of CTs ▪ Using differential protection in; transformers; generators; lines; busbars	

8	**Distance Protection**	▪ Type of distance relay; impedance relay ; directional relay; reactance relay;mho relay ▪ Setting the reach and operating time of distance relay ▪ the effective cover of distance relays ▪ Distance relays on series – compensated lines ▪ Impedances seen by distance relays; phase units; earth- fault units	
9	**Protection of Industrial Systems.**	▪ Protection devices ; over current relays ; moulded case circuit breaker; combined thermal relay fuse and contactor. ▪ Criteria for setting over current protection devices associated with motors; thermal relays and low voltage breakers.	
10	**Protection schemes and substation Diagrams**	▪ Generators protection. ▪ Motors protection. ▪ Transformers protection. ▪ Lines protection.' ▪ Substation diagrams; single line diagrams, layout diagrams, AC connections diagrams, DC connection diagrams, wiring diagrams.	
11	**Installation , testing & maintenance of protection systems**	▪ Installation of protection equipments. ▪ Testing Protection schemes, factory tests, precommissioning tests, periodic maintenance.	

Evaluation Strategies

		Percentage	Date
1. Exams	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Assignments	10%	
	Final Practical Exam	50%	--/--/----

□ **Teaching Methodology:**

1. Lectures

□ **Textbook**:

1. Protection of Electricity Distribution Networks; J. Gers & E. Holmes, 2nd edition, 2005.

□ **References**:

1. Power system protection and switchgear ; B. Ravin – dranath, 2004.
2. Power System Protection (1) : Principle and Components; Edited by the Electricity Training Association , 1995 .
3. Power System Protection (2) : Systems and Methods; Edited by the Electricity Training Associated , 1995.
4. Power System Protection (3) : Application; Edited by the Electricity Training Associated , 1995 .

Engineering Program

Specialization	**Common**
Course Number	**20403111**
Course Title	**Electronics**
Credit Hours	**3**
Theoretical Hours	**3**
Practical Hours	**0**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

وصف المادة الدراسية:

- This course covers the basic subjects in electronics and you will study: Semiconductor theory , the diode , special purpose diodes , diode applications , bipolar junction transistor (BJT) , field effect transistor (FET) , operational amplifiers, thyristor and other devices.

أهداف المادة الدراسية:

Upon the completion of the course, the student will be able to:

1. Explain the basic structure of atoms.
2. Define and discuss semiconductors, conductors, insulators .
3. Identify the bias and applications of diode, zener ,varactor, and other special diodes.
4. Study of BJT & FET ,oscillators ,operational amplifiers, thyristors and other devices

الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن
1.	**Introduction to Semiconductors**	▪ Atomic structure ▪ Semiconductors ▪ Conductors ▪ Insulators ▪ Covalent bonds ▪ Conduction in semiconductors ▪ Intrinsic and extrinsic semiconductors ▪ N-type and p- type semiconductors	**2 weeks**
2.	**The Diode**	▪ P-N junction ▪ Biasing the diode ▪ Voltage – current characteristic of diode ▪ DC load line ▪ Operating point ▪ DC and AC resistance ▪ Comparison between silicon and germanium diodes ▪ Data sheet of diode	**3 weeks**
3.	**Special – Purpose Diode**	▪ Zener diode (symbol , structure , principle of operation ▪ Zener diode applications (regular and limiter) ▪ Varactor diode. Light- emitting diode (LED), photodiode	**2 weeks**
4.	**Applications of The Diode**	▪ Half – wave and full – wave rectifiers ▪ Filters and regulators in power supply circuits.	**1 weeks**
5.	**Bipolar Junction Transistor (BJT)**	▪ Introduction ▪ Structure and principle of operation ▪ Characteristics and parameters.	**3 weeks**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

		▪ Regions of operation ▪ The DC operation point)load line) ▪ BJT as an amplifier and as switch ▪ Voltage divider bias and other bias methods ▪ Basic circuits connection ▪ (C.E, C.C, C.B) amplifier ▪ Data sheet of a BJT	
6.	**Field – Effect Transistor(FET)**	▪ Introduction. ▪ Structure and principle of operation of junction field effect transistor (JFET). ▪ JFET characteristics, Parameters and biasing. ▪ Structure and principle of operation of metal oxide semiconductor field effect transistor (MOSFET). ▪ Enhancement and depletion types. ▪ MOSFET characteristics, Parameters and biasing. ▪ FET amplification, connections modes (C.S, C.D, C.G,) amplifiers, data sheet of a JFET and a MOSFET.	**2 week**
7.	**Oscillators**	▪ Introduction ▪ Negative and positive feedback, (basic circuit, principle of operation, oscillation frequency calculation for the following oscillators. Phase – shift oscillator ▪ Colpitts and Hartley oscillators	**1 week**

8.	**Operational Amplifiers**	▪ Symbol, terminals and basic op-amp representations (idea and practical)	**1 week**
9.	**Thyristor and Other Devices**	▪ Structure ,principle of operation ▪ Characteristics curves and applications of the following devices: (Four – layer device, SCR (Silicon – controlled rectifier), siac, triac, Uninjunction transistor (UJT), and phototransistor	**1 week**
10.	**Introduction to Electronic Measurements**	▪ Applications of oscilloscope in electronic measurements	**1 week**

طرق التقييم المستخدمة :

الامتحانات	نسبة الامتحان من العلامة الكلية	التاريخ
الأول	%20	التاريخ : / /
الثاني	%20	التاريخ : / /
أعمال الفصل	%10	التاريخ : / /
الامتحانات النهائية	%50	التاريخ : / /

طرق التدريس:

❖ Lectures

الكتب و المراجع :

1. Thomas L. Floyd, electrical devices, prentice hall international, 6th edition , 2002.
2. Basic operational Amplifiers and Linear Integrated Circuits , David Buchla ,Prentice Hall , 1999.
3. Electronics fundamental and Experiments, Cynthia B. Leshin, David Buchla, Tjomas L. Floyd, prentice hall international ,1999.

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

Engineering Program

Specialization	**Common**
Course Number	**20403112**
Course Title	**Electronics Lab.**
Credit Hours	**1**
Theoretical Hours	**0**
Practical Hours	**3**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

وصف المادة الدراسية:

- Lab in support of the basic electronics course, experiments in basic electronics have to cover all electronics devices (diode, zener diode, diode applications, BJT,op – amp ,oscillators ,SCR).

أهداف المادة الدراسية:

Upon the completion of the course, the student will be able to:

1. Become familiar with electronics devices and using data sheet.
2. Demonstrate how to test electronic devices by using AVO meter or through DC measurements.
3. Construct electronic circuit.
4. Investigate characteristics curves.
5. Calculate the value the values of currents and voltage and compare them with measured values

الوصف العام:

رقم الوحدة	اسم الوحدة	محتويات الوحدة	الزمن
1.	**The diode**	▪ Forward and reverse biasing. ▪ Characteristic curve. ▪ Data sheet.	**2 weeks**
2.	**The zener Diode.**	▪ Breakdown voltage. ▪ Regulation. ▪ Characteristic curve. ▪ Data sheet	**2 weeks**
3.	**Rectification Circuits with Filter and Regulator**	▪ Half- wave and full- wave. ▪ Ripple factor. ▪ Line and load regulation	**1 week**
4.	**A BJT testing by using AVO meter , and how to determine the specifications of transistor through data sheets**		**1 week**
5.	**A BJT with Voltage – Divider Bias**		**1 week**
6.	**A BJT as a switch**		**1 week**
7.	**Common Emitter Amplifier Circuit**		**1 week**
8.	**Common collector Amplifier circuit**		**1 week**
9.	**Common Base Amplifier Circuits**		**1 week**
10.	**Common source Amplifier Circuits**		**1 week**
11.	**Operational Amplifier as Inverting and Noninverting Amplifier**		**1 week**
12.	**Operational Amplifier as Differentiator and Integrator**		**1 week**
13.	**RC phase-shift Oscillator**		**1 week**
14.	**SCR as a switch**		**1 week**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

طرق التقييم المستخدمة :

الامتحانات	نسبة الامتحان من العلامة الكلية	التاريخ
التقارير	30%	
الامتحان المتوسط	20%	
الامتحانات النهائية	50%	

طرق التدريس: تجارب عملية في المختبر

❖

الكتب و المراجع :

1. Instructional Lab. Sheets
2. Thomas L. Floyd – " Principles of electric circuits" Electron flow version - prentice hall International – eighth edition 2006.
3. Robert L. Boy listed - Introductory circuit analysis - prentice hall International 1997.
4. Experiments in electronics Fundamentals and electric circuits fundamentals – David Buchla -. prentice hall 2000.

Program	Engineering
Specialization	Electrical Power Systems
Course Number	20304251
Course Title	High Voltage Technology
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

□ **Brief Course Description:**

This Course focuses on; main concepts of breakdown, types of insulators , breakdown & conduction in insulators, applications of insulating materials, over voltage and lightning arrestors.

□ **Course Objectives:**

The student should be able to ;

1. Know the different types of insulators.
2. Know the application of insulating materials in the elements of electrical power system.
3. Explain the electrical field characteristics.
4. Describe internal & external over voltage.
5. Describe the breakdown in; gaseous, solid and liquid insulators.
6. Know methods of earthing of high voltage apparatus that used electrical power system.

□ **Detailed Course Description:**

Unit Number	Unit name	Content	Time Needed
1.	**The insulating materials & their applications**	▪ Insulators, polarization, suscepility of polarization & dielectric constant. ▪ Electric field stress and effect of temperature on insulators. ▪ Electrical conductivity of insulators. ▪ Electrical breakdown of insulators. ▪ Applications of insulting materials in ; transformers, rotating machines, circuit breakers, cable & power equipments.	
2.	**Electric Field**	▪ Electric field stresses. ▪ Gaseous insulators. ▪ Liquid & solid insulators breakdown. ▪ Estimation and control of electric stresses in; parallel plats, concentric cylinders & parallel cylinders with equal diameters. ▪ Electric field in cominated insulators. ▪ Surge voltages; distribution & control.	

3	**Conduction and breakdown in Gases**	▪ Ionization processes. ▪ Townsen's equation & Townsend's criterion of breakdown. ▪ Breakdown in electro- negative. ▪ Streamer theory of breakdown in gases. ▪ Paschen's law; breakdown in non uniform fields and corona discharges. ▪ Post breakdown phenomena and applications. ▪ Practical consideration in using gases for insulating purposes.	
4	**Conduction and breakdown in liquid dielectrics**	▪ Pure liquids and commercial liquids. ▪ Purification and breakdown tests. ▪ Conduction and breakdown in pure liquids. ▪ Conduction and breakdown in commercial liquids suspended particle theory; thermal mechanism of breakdown, stressed volume theory.	
5	**Breakdown in solid dielectrics**	▪ Variation of breakdown strength with time. ▪ Intrinsic, streamer, electromechanical, electrochemical, thermal and chemical breakdown. ▪ Breakdown due to internal discharges. ▪ Breakdown of composite insulation. ▪ Solid dielectrics; papr, fiber, glass, ceramic, rubber, plastic and mica.	

6	**Over voltages phenomenon and Insulation coordination in Electrical Power Systems.**	▪ External overvoltage and lightning phenomenon. ▪ Charge formation in clouds. ▪ Mechanism of lightning storkes. ▪ Parameters and characteristics of lightning storkes. ▪ Internal overvoltage. ▪ Origin of switching surges and their characteristics. ▪ Control of overvoltage due to switching. ▪ Protection of transmission lines against over voltages. ▪ Protection devices; expulsion gabs, tubes & lightning arrestors. ▪ Principle of insulation coordination of high voltage and extra high voltage power systems. ▪ Insulation coordination of substations.	
7	**Earthing of high voltage apparatus**	▪ Definition of earthing, earthing resistance, electrical characteristics & electrical conductivity of soil. ▪ Types of earthing; working & safety earthing. ▪ Static resistance of simple earthing; tubular, flats, rings. ▪ Working and safety earthing in power stations & substations.	

- **Evaluation Strategies:**

		Percentage	Date
1. Exams			
	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Assignments	10%	
	Final Exam	50%	--/--/----
2. Homework and Projects			
3.Discussions and lecture Presentations			

- **Teaching Methodology:**

1. Laboratory

- **Textbook**:
Advanced in high voltage Engineering; M.Haddad & D. Warne, 2004.

- **References**:
1. The lightning Flash; G.V. Cooray, 2003.
2. High voltage Engineering & testing; Hugh M.Ryan, 2001.
3. High voltage Engineering Fundamentals; E.Kuffel; 2000 .

Engineering Program

Specialization	**Common**
Course Number	**20304241**
Course Title	**Protection and Control Devices**
Credit Hours	**2**
Theoretical Hours	**0**
Practical Hours	**2**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

وصف المادة الدراسية:

* The target of the course is to give the student the basic information and skills related to the most common control and protection devices ,The student shall gain the experience of selection and wiring and troubleshooting different control and protection devices such as fuses, circuit breakers , relay ,contactors ,and switches.

أهداف المادة الدراسية:

بعد دراسة هذه المادة يتوقع من الطالب أن يكون قادراً على تحقيق الأهداف التالية:

1. Use select & trouble shooting of fuses, relays, C.B.
2. Operate and check different types of relays.
3. Connect & investigate current & voltage transformers.

الوصف العام:

رقم الوحدة	محتويات الوحدة	اسم الوحدة	الزمن
1.	**The Philosophy of Protective Relaying**	▪ The function of protective relaying. ▪ Electrical sub-station. ▪ Fault calculations. ▪ Protective relaying. ▪ Essential qualities of protection.	**2 weeks**
2.	**Fuses**	▪ The construction & types of low voltage fuses.	**3 weeks**
3.	**Circuit Controlling Devices**	▪ Switches. ▪ Toggle, Push, and rotary switch. ▪ Micro switches, Rheostat. ▪ Time switch, Mercury, Pressure & Thermal switches.	**3 weeks**
4.	**Relays**	▪ Induction relays. ▪ Over current relay. ▪ Over & under voltage relay. ▪ Moving coil relays. ▪ Thermal relays.	**2 weeks**
5.	**Current Transformer (CT)**	▪ Voltage transformer ▪ Liner coupler. ▪ Connection of rectifiers. ▪ Rectifier, Amplifier & Oscillator.	**1 week**
6.	**Sulphur Hexafloride (SF_6) Circuit Breaker**	▪ Introduction. ▪ Physical properties of SF6 gas. ▪ Dielectric properties of SF6 gas. ▪ Arc extension in SF6 C.B. ▪ Minimum oil C.B.	**2 weeks**
7.	**Air Break C.B.**	▪ Introduction. ▪ Construction of Air-Break C.B. ▪ Arc extension in Air-Break C.B. ▪ Air blast C.B. ▪ Principle of arc quenching in ABCBS	**3 weeks**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

طرق التقييم المستخدمة :

الامتحانات	نسبة الامتحان من العلامة الكلية	التاريخ
الأول	%20	
الثاني	%20	
أعمال الفصل	%10	
الامتحانات النهائية	%50	

طرق التدريس:

❖ يحدد عضو هيئة التدريس الطريقة المستخدمة من خلال(محاضرة، عرض، مناقشات، مختبرات).

الكتب و المراجع :

- Textbook:
  1. Applied protective relaying. USA. Flourida, WH 1982.

- References:
  1. Protective relaying, N.C
  2. Power system protection, second edition, England, 1981.

Engineering Program

Specialization	**Common**
Course Number	**20304242**
Course Title	**Protection and Control Devices Lab.**
Credit Hours	**1**
Theoretical Hours	**0**
Practical Hours	**3**

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

وصف المادة الدراسية:

* The course aims at giving the students practical skills in order to select ,wire troubleshoot and maintain the most common control and protection devices like fuses ,circuit breakers , relays ,contactors ,timers ,switches ,and measuring transformers.

أهداف المادة الدراسية:

بعد دراسة هذه المادة يتوقع من الطالب أن يكون قادراً على تحقيق الأهداف التالية:

1. Use & select relays, circuit breakers.
2. Contactors and different types used in power supplies & control circuits.
3. Construct and investigate protection and control circuits.

الوصف العام:

رقم الوحدة	محتويات الوحدة	اسم الوحدة	الزمن
1.	**The Equipments That Used in Protection and Control Devices**	▪ Fuses. ▪ Switches. ▪ Circuit Breakers. ▪ Timers. ▪ Relays. ▪ Power Transformer & Current transformer.	**8 weeks**
2.	**Star – Delta Control Box**	▪ Introduction. ▪ Equipment Required. ▪ Procedure. ▪ Controlling Connection. ▪ Meters & indication lights. ▪ Trouble shooting.	**8 weeks**

طرق التقييم المستخدمة :

الامتحانات	نسبة الامتحان من العلامة الكلية	التاريخ
التقارير	30%	
الامتحان المتوسط	20%	
الامتحانات النهائية	50%	

طرق التدريس:

❖ تجارب عملية في المختبر

الكتب و المراجع :

المراجع:

Laboratory Sheets Prepared by Instructor

❖ **تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008**

Program	Engineering
Specialization	Electrical Power Systems
Course Number	20304232
Course Title	Transmission and distribution networks Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3

□ **Brief Course Description:**

This Course covers different experiments on transmission line model; open & short circuit tests, short & medium lines, power losses, voltage drop, loading of transmission line.

□ **Course Objectives:**

The student should be able to ;

1. Study & explain open & short circuit tests of transmission lines.
2. Determine transmission line parameters
3. Measure & calculate power losses & voltage drop of the line.
4. Explain balanced & unbalanced loading of the line.

□ **Detailed Course Description:**

Lab Number	Content	Time Needed
1.	Experiments of open – circuit on three – phase transmission line.	
2.	Experiments of short- circuit on three- phase transmission line.	
3	Experiments of voltage drop on single & three- phase transmission lines.	
4	Experiments of short transmission line.	
5	Experiments on medium transmission line (π and T forms) .	
6	Experiments losses experiments on single & three – phase transmission lines.	
7	Experiments of loading transmission by ; different types of loads (R,L,C), balanced & unbalanced loads.	
8	Experiment for comparison between DC & AC transmission lines.	
9	Experiment of asymmetrical faults of transmission line.	

- **Evaluation Strategies:**

		Percentage	Date
1. Exams	reports	30%	
	Midterm Exam	20%	
	Final Exam	50%	

- **Teaching Methodology:**

1. Laboratory

- **Textbook:**
The manual of transmission line model.

- **References**:
Electrical power transmission and distribution; M. Faulkenberry, 1996, ISBN 0132499479 .

Program	Engineering
Specialization	Electrical Power System
Course Number	20304231
Course Title	Transmission and Distribution Networks
Credit Hours	3
Theoretical Hours	3
Practical Hours	0

□ **Brief Course Description:**

This Course covers ; calculation of networks parameters " R-L-C" for 1- phase and 3- phase networks, equivalent circuits for transmission lines, representation of lines, types of conductors & cables.
Calculation of; power, voltage drop, efficiency and voltage regulation for transmission & distribution networks. Towers, insulators, AC & DC distribution networks, Substations; types, equivalents & devices.

□ **Course Objectives:**

The student should be able to ;

1. Name & describe the components of power system.
2. Know the materials used in, cables, towers and overhead lines.
3. Determine the span between two towers & factors effecting it.
4. Detect the faults in system components.
5. Describe and maintain substations.
6. Describe the different types of distributors & feeders.
7. Calculate; the voltage, voltage drop, current, power & efficiency of transmission & distribution networks.

□ **Detailed Course Description:**

Unit Number	Unit name	Content	Time Needed
1.	**Overhead Transmission lines**	▪ Introduction. ▪ Parameters and characteristics (r-L-C) ▪ Conductors used in overhead lines; clamp & joint. Equilibrium of suspended wire, conductor screep, wind and ice load on conductors, ampacity. ▪ Corona phenomenon in overhead lines ▪ Skin effect phenomenon of conductors	
2.	**Luped parameters of transmission lines & equivalent circuits**	▪ Short transmission lines and its equivalents circuit ▪ Medium transmission lines and its equivalent circuits ▪ Long transmission line identification ▪ Sending values versus to receiving values of lines. ▪ Vectorial diagram for each type of transmission lines	

3	**Towers and poles**	▪ Types of towers and poles according to its material. ▪ Span between two towers & the factors affecting it. ▪ Tower head determination. ▪ Single circuit towers. ▪ Double circuit towers. ▪ The sag of conductor & factors affecting it	
4	**Insulators**	▪ General ▪ Material properties. ▪ Types of insulators; cap and pin insulators, long rod insulators, post type, barrel type, insulator sets ▪ Electrical characteristics	
5	**High voltage cables**	▪ Introduction; structure, voltage ratings, uses of cables, AC&DC cables ▪ Cables type ▪ The components of polymeric cable; conductors, insulation system, containment and protection. ▪ Medium voltage distribution cables; conductors; insulation system, containment and protection ▪ Testing of cables; special testing, routing testing & site testing ▪ Cable manufacture; stages of cable manufactures; methods of core manufacture	

6	**Electrical substations and components**	▪ The power transformers; types, winding arrangements, cooling, oil considerations ▪ Commissioning, faults and maintenance of power transformers ▪ Tap change and automatic voltage control, commissioning and maintenance ▪ Switch gear control systems; interlocking, synchronizing and auto switching ▪ Circuit breakers; types, commissioning and maintenance	
7	**Substation power supplies**	▪ Accumulative batteries; function & importance ▪ Battery system fundamentals ▪ Battery commissioning ▪ Methods of battery charging ▪ DC relays and trip coils	
8	**Electrical distribution systems**	▪ AC & DC Two – wires systems; (voltage drop, currents power losses & materials weight) calculations ▪ AC&Dc three wires systems; (voltage drop, currents, power losses & materials weight) calculations ▪ Three- phase four – wires system ;(voltage drop, currents, power losses & materials weight) calculations. ▪ Comparison between previous systems	

9	**Transmitted Electrical Power and Losses**	▪ Apparent power ▪ Active power ▪ Reactive power; causes, results, compensation, generation and consumption ▪ Power losses; active power losses, reactive power losses and efficiency of transmission lines	
10	**Electrical diagrams of generation & distribution stations**	▪ Primary diagram (one line diagrams) ▪ Secondary diagrams ▪ Operation diagrams ▪ Bus bars systems; single bus bars system, divided single bus bars system, double bus bar system and ring bus bars system	

□ Evaluation Strategies:

		Percentage	Date
1. Exams	First Exam		--/--/----
	Med- Term Exam	20%	--/--/----
	Assignments	30%	
	Final Exam	50%	--/--/----

□ Teaching Methodology:

1. Lectures

- **Textbook**:
  Electrical Power Transmission & distribution; Luces M.Faul- Kenberry, 1996.

- **References**:
  1. Electrical Power Technology; D. Tyler, 1998.
  2. Power system commissioning g & maintenance; K. Harker, 1998.
  3. High voltage Engineering & testing; H.M. Ryan, 2001.
  4. Distribution switchgear; S.Stewart, 2004.
  5. Advanced in High Voltage Engineering; M. Haddad & D. Warne, 2004.