



## A. Basic Information

**Course Title:** Properties of Electrical Materials      **Code:** EP 113  
**Lecture:** 4      **Tutorial:** 2      **Practical:** -      **Total:** 6  
**Program on which the course is given:** B.Sc. Electrical Engineering (Power)  
**Major or minor element of program:** Major  
**Department offering the program:** Electrical Engineering Department  
**Department offering the course:** Electrical Engineering Department  
**Academic year / level:** First Year / First Semester  
**Date of specifications approval:** 10/5/2006

## B. Professional Information

### 1. Overall aims of course

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

- 1- Understand the concepts, principles of materials classifications and basic properties.
- 2- Understand of basic principles of electrons theory and influence of D.C. and A.C. electric field and magnetic field on the materials.
- 3- Analyze the modern concepts of the electrical and thermal conductivity and smart materials.

### Intended Learning outcomes of Course (ILOs)

#### a. Knowledge and Understanding:

- a.1) Concepts and theories of mathematics and sciences, appropriate to the discipline.



- a.3) Characteristics of engineering materials related to discipline.
- a.5) Methodologies of solving engineering problems, data collection interpretation.
- a.15) Principles of operation and performance specifications of electrical and electromechanical engineering systems.
- a.17) Basic electrical power system theory.

**b. Intellectual Skills**

- b.2) Select appropriate solutions for engineering problems based on analytical thinking.
- b.3) Think in a creative and innovative way in problem solving and design.

**c. Professional and Practical Skills**

- c.1) Apply knowledge of mathematics, science, information technology, design, business context and engineering practice to solve engineering problems.
- c.2) Professionally merge the engineering knowledge, understanding, and feedback to improve design, product and/or services.
- c.5) Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design experiments, collect, analyze, and interpret results.

**d. General and Transferable Skills**

- d.2) Work in stressful environment and within constraints.
- d.7) Search for information and engage in life-long self learning discipline.

**2. Contents**

No	Topic	No. of hours	ILOs	Teaching / learning methods and strategies	Assessment method
----	-------	--------------	------	--	-------------------



1	Microscopic and macroscopic domains, Properties of the atoms, Interactions between particles, Chemical Bond, Classifications of Solids.	8	a.1, a.3, a.5, a.15, b.2, b.3 c.1, c.2, d.7	Lectures Class activity homework	Assignments Quizzes Mid-term exam Final exam
2	Influence of D.C. electric field on dielectrics, dielectric constant, Dipole moments, Polarizations, Electrostriction and Piezoelectricity, Ferroelectric materials.	10	a.1, a.3, a.5, a.15, b.2, b.3 c.1, c.2, d.2, d.7	Lectures Class activity Case study homework	Assignments Quizzes Mid-term exam Final exam
3	Influence of A.C. electric field on dielectrics, The complex dielectric constant, Orientational Polarization, Dielectric Losses.	12	a.1, a.3, a.5, a.15, a.17 b.2, b.3, c.1, c.2, d.2, d.7	Lectures Class activity Case study homework	Assignments Quizzes Mid-term exam Final exam
4	Influence of the electric and magnetic field on magnetic materials, Classifications of magnetic materials, Ferromagnetic materials.	12	a.1, a.3, a.5, a.15, a.17 b.2, b.3, c.1, c.2, c.5, d.2, d.7	Lectures Class activity homework	Assignments Quizzes Mid-term exam Final exam



5	Bohr's theory for structure of atom and its applications for different types of materials (conducting, insulating, semi-conducting).	8	a.1, a.3, a.5, a.15, a.17 b.2, b.3 c.1, c.2, d.7	Lectures Class activity homework	Assignments Quizzes Mid-term exam Final exam
6	Energy Band theory and its applications for different types of materials (conducting, insulating, semi-conducting).	12	a.1, a.3, a.5, a.15, a.17 b.2, b.3 c.1, c.2, d.7	Lectures Class activity homework	Assignments Quizzes Mid-term exam Final exam
7	Factors affecting on the resistivity and conductivity of materials, Marts of semi-conducting materials, Optical properties.	12	a.1, a.3, a.5, a.15, a.17 b.2, b.3 c.1, c.2, d.2, d.7	Lectures Class activity Case study homework	Assignments Quizzes Mid-term exam Final exam
8	Thermal Effects, Superconductivity and Applications.	10	a.1, a.3, a.5, a.15, a.17 b.2, b.3 c.1, c.2, c5 d.2, d.7	Lectures Class activity homework	Assignments Quizzes Mid-term exam Final exam
9					
10					



	Final exam
--	------------

**3. Teaching and Learning Methods**

- Lectures
- Class activity
- Case study
- Assignments / homework
- Other : \_\_\_\_\_

**4. Student Assessment Methods**

- 1- Assignments to assess knowledge and intellectual skills.
- 2- Quiz to assess knowledge, intellectual and professional skills.
- 3- Mid-term exam to assess knowledge, intellectual, professional and general skills.
- 4- Final exam to assess knowledge, intellectual, professional and general skills.

**5- Assessment schedule**

- Assessment 1 on weeks 3, 5,7, 10, 12, 13
- Assessment 2 Quizzes on weeks 2, 4, 6, 9, 11, 14
- Assessment 3 Mid-term exam on week 8
- Assessment 5 Final exam on week 15

**6- Weighting of Assessments**

- 05% Home assignments
- 05% Quizzes
- 23.33% Mid-term examination
- 0% Oral examination
- 66.67% Final-term examination



100% Total

### 7- List of References

#### 7.1 Course Notes

By Prof. Dr. Mohamed Moenes Salama

By Prof. Dr. Abdel-Salam Hafez Hamza

#### 7.2 Essential Books (Text Books)

Materials Science for Electrical and electronic Engineering.

#### 7.3 Recommended Books

(i) C. KITTEL, *Introduction to solid state physics*, Wiley, New York.

(ii) ADRIANUS J DEKKER, *Electrical Engineering*

*Materials*, Prentice-Hall of India Private Limited, New Delhi , 1967.

#### 7.4 Periodicals Web sites, etc

### 8. Facilities required for teaching and learning

Lecture room equipped with overhead projector

Presentation board, computer and data show

**Course coordinator:** Dr. Prof. Dr. Mohamed Moenes M. Salama, Prof. Dr. Abdel-Salam Hafez Hamza

**Course instructor:** Dr. Prof. Dr. Mohamed Moenes M. Salama

**Head of Department:** Prof. Dr. MousaA. Abd-Allah

**Date:** March 20, 2012