



Shoubra Faculty
of Engineering

Model No.12

Course Specifications : Electrical Properties of Materials

Alfarabi for Quality Assurance and Accreditation System.

University : Benha university

Faculty : Shoubra Faculty of Engineering

Department : Electrical Engineering Department

1- Course Data

Course Code: EPE113 Course Title : Electrical Properties of Materials

Specialization : Study Year : First Year

Teaching Hours:

Lecture : 4

Tutorial : 2

Practical :

Date of specifications approval: 20/6/2010

2- Course Aim

For students undertaking this course, the aims are to:

- 2.1- • Demonstrate the concepts, principles of materials classifications and basic electrical and magnetic properties of materials.
- 2.2- • Demonstrate of basic principles of electrons theory and influence of D.C. and A.C. electric field and magnetic field on the materials.
- 2.3- • Compare between the influence of D.C. and A.C. electric field and magnetic field on the materials.
- 2.4- • Apply the modern concepts of the electrical and thermal conductivity and smart materials.

3- Intended Learning Outcomes of Course (ILOS)

a- Knowledge and Understanding

On completing this course, students will be able to:

- a- a.1) Demonstrate the concepts and theories of properties of material.
- a- a.2) List the characteristics of engineering materials related to electrical and magnetic
- a- a.3) Use Methodologies of solving engineering problems of using electrical material
- a- a.4) Apply principles of operation and performance specifications of properties of electrical and electromechanical engineering systems.
- a- a.5) Describe basic electrical power materials.

b- Intellectual Skills

At the end of this course, the students will be able to:

- b- b.1) Use appropriate solutions for engineering problems based on analytical thinking for electrical materials.
- b- b.2) Use a creative and innovative way in problem solving and design conducting and insulation materials.

c- Professional Skills

On completing this course, the students are expected to be able to:

- c- c.1) Apply knowledge of electrical and magnetic properties of material to solve engineering problems.

c- c.2) Use professionally merge the design of insulation material
 c- c.3) Use computational facilities and techniques, measuring instruments, workshops and laboratories equipment to design electrical power system

4- Course Contents

No.	Topics	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.	6	a.1, a.2, a.3, a.4, b.1, b.2, c.1, c.2	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
2	Influence of D.C. electric field on dielectrics, dielectric constant, Dipole moments, Polarizations, Electrostriction and Piezoelectricity, Ferroelectric materials.	12	a.1, a.2, a.3, a.4, b.1, b.2, c.1, c.2	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
3	Influence of A.C. E. field on dielectrics, The complex dielectric con., Orientational Polarization, Dielectric Losses	12	a.1, a.2, a.3, a.4, a.5, b.1, b.2, c.1, c.2	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
4	Influence of the electric and magnetic field on magnetic materials, Classifications of magnetic materials, Ferromagnetic materials.	12	a.1, a.2, a.3, a.4, a.5, b.1, b.2, c.1, c.2, c.3	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
5	Bohr's theory for structure of atom and its applications for different types of materials (conductors, insulators, semi-cond.).	6	a.1, a.2, a.3, a.4, a.5, b.1, b.2, c.1, c.2	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
6	Energy Band theory and its applications for different types of materials (conducting, insulating, semi-conducting).	12	a.1, a.2, a.3, a.4, a.5, b.1, b.2, c.1, c.2	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
7	Factors affecting on the resistivity & conductivity of materials, Marts of semi-conductors, Optical properties.	12	a.1, a.2, a.3, a.4, a.5, b.1, b.2, c.1, c.2	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam
8	Thermal Effects, Superconductivity and Applications.	12	a.1, a.2, a.3, a.4, a.5, b.1, b.2, c.1, c.2, c.3	Classroom board, computer and data show	Home Assignments, Quizzes, Oral Exam

5- Teaching and Learning Methods

- 5.1- Modified Lectures
- 5.2- Class activity
- 5.3- Case study
- 5.4- Assignments / homework

6- Teaching and Learning Methods of Disables

None

7- Student Assessment

a- 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.

b- Assessment Schedule

No.	Assessment	Week
1	Assignments	3, 5, 10, 12, 13
2	Quiz	4, 6, 9, 11, 13
3	Mid-term exam	7
4	Final exam	15

c- Weighting of Assessments

Assessment	Weight
Midterm Examination	23.33 %
Final Term Examination	66.67 %
Oral Examination	0 %
Practical Examination	0 %
Semester work	10 %
Other types of assessment	0 %
Total	100 %

8- List of References

a- Books

- 1- Course Notes By Prof. Dr. Mohamed Moenes Salama, By Prof. Dr. Abdel-Salam Hafez Hamza
- 2- H. COTTON, " Applied Electricity", London.
- 3- ADRIANUS J DEKKER, " Electrical Engineering Materials", Prentice-Hall of India Private Limited, New Delhi, 1967.
- 4- C. KITTEL, " Introduction to solid state physics", Wiley, New York.
- 5- J.R. EATON, " Electrons, Neutrons and Protons in Engineering", Pergamon Press.

- Course Coordinator : **Mohamed Moenes Mohamed Salama**

Matrix of Knowledge and Skills of the course

No.	Topics	No. of hours	Basic Knowledge	Intellectual Skills	Professional Skills
1	Microscopic and macroscopic domains, Properties of the atoms, Interactions between particles, Chemical Bond, Classifications of Solids.	6	a.1, a.2, a.3, a.4	b.1, b.2	c.1, c.2
2	Influence of D.C. electric field on dielectrics, dielectric constant, Dipole moments, Polarizations, Electrostriction and Piezoelectricity, Ferroelectric materials.	12	a.1, a.2, a.3, a.4	b.1, b.2	c.1, c.2
3	Influence of A.C. E. field on dielectrics, The complex dielectric con., Orientational Polarization, Dielectric Losses	12	a.1, a.2, a.3, a.4, a.5	b.1, b.2	c.1, c.2
4	Influence of the electric and magnetic field on magnetic materials, Classifications of magnetic materials, Ferromagnetic materials.	12	a.1, a.2, a.3, a.4, a.5	b.1, b.2	c.1, c.2, c3
5	Bohr's theory for structure of atom and its applications for different types of materials (conductors, insulators, semi-cond.).	6	a.1, a.2, a.3, a.4, a.5	b.1, b.2	c.1, c.2
6	Energy Band theory and its applications for different types of materials (conducting,	12	a.1, a.2, a.3, a.4, a.5	b.1, b.2	c.1, c.2

Matrix of course aims and ILO's

Course Code : EPE113 Course Title : Electrical Properties of Materials
 Specialization : Study Year : First Year
 Teaching Hours:
 Lecture : 4 Tutorial : 2 Practical :
 Date of specifications approval: 20/6/2010

Course Aims	ILO a's					ILO b's		ILO c's		
	1	2	3	4	5	1	2	1	2	3
To understand the concepts, principles of materials classifications and basic properties				✓	✓		✓	✓	✓	✓
To understand of basic principles of electrons theory and influence of D.C. and A.C. electric field and magnetic field on the materials	✓	✓	✓			✓	✓	✓	✓	
To compare between the influence of D.C. and A.C. electric field and magnetic field on the materials.				✓	✓		✓	✓	✓	✓
To analyze the modern concepts of the electrical and thermal conductivity and smart materials.	✓		✓				✓			✓

Head of department: Prof. Dr. Sayed A. Ward