GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3152113
Semester – V
Subject Name: Functional Materials

Type of course: Engineering/science

Prerequisite: Basic fundamentals of introduction to materials engineering

Rationale: The syllabus is design to introduce the student about functional materials and the science behind the performance of the functional material. To enable the student to understand the applications of functional materials.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Tutorial Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	1	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	Introduction to Functional Materials, Characteristics and types of functional materials. Crystal structure and Properties, Effect of size on properties, effect of interfaces on properties	05
2	Band structure, Semiconductor devices – Theory, examples and applications of Optically active materials	07
3	Dielectrics, piezo- and ferroelectric materials	07
4	Magnetic materials and storage applications.	04
5	Smart materials	03
6	Applications in electronic, communication, aerospace, automotive, energy, industries	02

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20%	**35%**	**30%**	**15%**	**0%**	**0%**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Functional Materials: Electrical, Dielectric, Electromagnetic, Optical and Magnetic applications; Deborah D L Chung, World Scientific Publishing, 2010

2. Material science and Metallurgy by Dr. C Daniel Yesudian and Dr D.G. Harris Samuel, Scitech publications (India) pvt.ltd, Chennai-Hyderabad-pune-Kolkata-Bangalore.

3. Materials science and Engineering by V.Raghvan,PHI publication Private Limited, New Delhi-110001,2012

4. Calisher's Materials Science and Engineering ,Adapted by, R. Bal;asubramaniam.Wiley India Pvt Ltd.4435-36/7, Ansari road Daryagani, New Delhi-110002,2013

Course Outcomes

After completing this course, students will able to,

Sr. No.	CO statement	Marks % weightage
CO-1	Illustrate the basic principle of operation of functional materials	35
CO-2	Identify the various types of Functional materials	35
CO-3	Predict the application of functional material	30

List of Tutorials:

1. Introduction to function materials
2. MCQ based on semiconductor materials
3. numerical based on mobility of charge carrier, density of donor electrons in conduction band., Conductivity measurement for semiconductor materials
4. MCQ based on dielectrics, piezoelectric, and Ferro electric materials
5. Numerical based on energy storage in dielectric materials
6. MCQ based on magnetic material
7. MCQ based on smart material
8. Chart preparation of functional materials Application
9. Power point Presentation on different topics of Functional materials
10. Applications of functional materials in electronic, communication,aerospace, automotive, energy, industries

List of Open Source Software/learning website:

I. http://nptel.iitm.ac.in/
II. www.ocw.mit.edu