

VASAVI COLLEGE OF ENGINEERING
(Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Physics
SMART MATERIALS AND APPLICATIONS

SYLLABUS FOR B.E. III-SEMESTER

(Open elective Course)

L : T : P (Hrs./week): 02 :0 :0	SEE Marks :60	Course Code : U19OE310PH
Credits :02	CIE Marks :40	Duration of SEE : 03Hours

COURSE OBJECTIVES	COURSE OUTCOMES <i>On completion of the course, students will be able to</i>
1 grasp the concepts of piezo and ferro electric materials	1 summarize various properties and applications of piezo and ferro electric materials
2 Learn fundamentals of pyro and thermo electric materials	2 apply fundamental principles of pyro and thermo electricity in relevant fields of engineering
3 gain knowledge on shape memory alloys	3 acquaint with various types of shape memory alloys and their properties and applications
4 acquire fundamental knowledge on chromic materials	4 appreciate the importance of chromic materials in engineering field.

UNIT I: PIEZO AND FERRO MATERIALS

Piezo electric effect and inverse piezoelectric effect, Piezo electric materials, Structure of Quartz crystal, Piezoelectric oscillator, Magnetostriction, Magnetostriction oscillator, piezo-electric sensors, applications of Piezo-electric materials.

Characteristics and properties of ferro-electric materials, Structure of Barium Titanate, Curie-Weiss law, applications of Ferro electric materials

UNIT II: PYRO AND THERMO-ELECTRIC MATERIALS

Pyroelectricity: pyro electric effect, pyro electric materials, pyro-electric sensors.

Thermoelectricity: thermoelectric effect, Seebeck effect, Peltier effect, thermoelectric sensor, Properties and applications of thermoelectric materials, thermoelectric generator and Thermoelectric cooler.

UNIT III: SHAPE MEMORY MATERIALS

Introduction to shape memory alloys (SMA)- Shape Memory Effect (SME) different phases of Shape memory alloys, Austenite, Martensite, Properties and characteristics of engineering SMAs, Super elasticity, one and two way shape memory effects, Properties of Ni-Ti shape memory alloy, Cu-based shape memory alloys, biomedical Materials, Advantages, disadvantages of SMAs, Applications of SMAs.

UNIT-IV: CHROMIC MATERIALS Electro-chromaticity, Electro-chromic materials, Electro-chromic sensors and devices.

Photo-chromaticity, Photo-chromic materials, Photo-chromic sensors and devices.

Thermo-chromaticity, thermo-chromic materials, thermo-chromic sensors and devices.

Smart fluids: Magneto-rheological and Electro-rheological fluids.

Learning Resources:

1. K. Otsuka and C M Wayman, Shape memory materials, Cambridge university press, 1998.
2. T W Duerig, K N Melton, D Stockel, C M Wayman, Engineering aspects of shape memory alloys, Butterworth-Heinemann, 1990
3. A.K. Sawhney, A Course in Electronic Measurements and Instrumentation, Dhanpat Rai & Sons, 2015
4. D. Patranabis, Sensors and Transducers, PHI Learning Pvt. Ltd., 2013

The break-up of CIE : Internal Tests + Assignments + Quizzes

1	No. of Internal Tests	:	<div>2</div>	Max. Marks for each Internal Tests	:	<div>30</div>
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With effect from the Academic Year 2019-20

2	No. of Assignments	:	<input type="text" value="2"/>	Max. Marks for each Assignment	:	<input type="text" value="5"/>
3	No. of Quizzes	:	<input type="text" value="2"/>	Max. Marks for each Quiz Test	:	<input type="text" value="5"/>

Duration of Internal Tests : 1 Hour 30 Minutes

Asst. Prof. Dr. A. S. Al-Sayid
11/7/19