

| Course Code | Course Title | L | T | P | C |
|-------------|-----------------------------------|---|---|---|---|
| 17CE021 | SMART STRUCTURES AND APPLICATIONS | 3 | 0 | 0 | 3 |

Course Objectives:

1. To introduce passive and active systems.
2. To familiarize students with components of smart systems.
3. To make students exposed to different types of smart materials.
4. To make students understand control systems.
5. To introduce the methods and techniques for developing and designing multifunctional structures.

Course Outcomes:

At the end of the course student will be able

1. To understand the concept of passive and active systems.
2. To be familiar with components of smart systems.
3. To be exposed to different types of smart materials.
4. To better understand control systems.
5. To be familiar with the methods and techniques for developing and designing multifunctional structures.

Activities:

1. Presentation by students on the currently used Active and Adaptive Systems
2. Cost comparison for synonymously used Active & Passive Systems or Adaptive & Active Systems.
3. Debate on whether to integrate smart systems with the internet or not (IoT).

Skills:

1. Ability to gain knowledge on the available Smart Systems currently in practice.
2. Aptitude to choose a suited smart system based on requirement.
3. Ability to understand the economic, social and security implications of smart systems.

UNIT-I: Introduction:

Introduction to - passive and active systems - need for active systems - smart systems - definitions and implications - active control and adaptive control systems - examples.

UNIT –II: Components of Smart Systems:

Components of smart systems – system features and interpretation of sensor data – pro-active and reactive systems – demo example in component level – system level complexity.

UNIT-III: Materials and Modelling:

Materials used in smart systems – characteristics of sensors – different types of smart materials – characteristics and behavior of smart materials – modeling smart materials – examples.

UNIT-IV: Control Systems and Applications:

Control Systems – features – active systems – adaptive systems – electronic, thermal and hydraulic type actuators – characteristics of control systems – application examples.

UNIT-V: Integration of sensors and control systems:

Integration of sensors and control systems – modeling features – sensor - response integration – processing for proactive and reactive components – FE models – examples.

TEXT BOOKS:

1. Srinivasan, A. V. and Michael McFarland, D., “Smart Structures: Analysis and Design”, Cambridge University Press, 2000.
2. Yoseph Bar Cohen, “Smart Structures and Materials”, The International Society for Optical Engineering, 2003.

REFERENCES:

1. Brian Culshaw, “Smart Structures and Materials”, Artech House, Boston, 1996.
2. M. V. Gandhi and B. S. Thompson, “Smart Materials and Structures”, Chapman and Hall, 1992.
3. Afzal Suleman, “Smart Structures Applications and Related Technologies”, (International Centre for Mechanical Sciences, Courses and Lectures No. 429), Springer, 2014.