

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING MATERIALS FOR SUSTAINABILITY

(OPEN ELECTIVE-I)

Course Code: GR20A3009

L/T/P/C: 3/0/0/3

III Year I Semester

Pre-requisites: Building materials and construction planning

Course Objectives:

1. Discover on awareness among students on issues in area of sustainability
2. Establish a clear idea of the role and impact of various aspects of engineering and engineering decisions on environmental and materials
3. Discuss about the energy efficient green building materials and to have understanding on the cost-effective Building Technologies
4. Differentiate various renewable and non-renewable sources of energy along with their carbon foot prints and enumerate the process of performance testing including building modelling and energy analysis
5. Correlate the Integrated Life cycle design of Materials and Structures

Course Outcomes:

1. Describe the different types of environmental factors effecting materials
2. Analyze the work in sustainability for research and education
3. Illustrating the broad perspective in thinking for sustainable practices by utilizing the engineering knowledge and principles gained from this course
4. Perform cost/benefit analysis and life-cycle analysis of green buildings.
5. Identify and compare Building Planning Specifications.

UNIT I

Sustainability – Introduction, Need and concept of sustainability, Social- environmental and economic sustainability concepts. Sustainable development, Nexus between Technology and Sustainable development, Challenges for Sustainable Development. Multilateral environmental agreements and Protocols – Clean Development Mechanism (CDM), Environmental legislations in India – Water Act, Air Act

UNIT II

Green Building Materials, Basic concepts of sustainable habitat, green buildings, green materials for building construction, material selection for sustainable design, green building certification, Methods for increasing energy efficiency of buildings. Sustainably managed Materials, Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials.

UNIT III

Green cement, Biodegradable materials, Smart materials, Manufactured Materials, Volatile Organic Compounds (VOC's), Natural Non-Petroleum Based Materials, Recycled materials, Renewable and Indigenous Building Materials, Engineering evaluation of these materials

UNIT IV

Green Building Planning and Specifications, Environment friendly and cost effective Building Technologies, Green Strategies for Building Systems, Energy Conservation Measures in Buildings, Waste & Water management and Recycling in Sustainable Facilities, Heating, Ventilation and Air Conditioning, Passive Solar & Daylight, Plumbing and its Effect on Energy Consumption.

UNIT V

Environmental management standards, ISO 14000 series, Life Cycle Analysis (LCA) – Scope and Goal, Bio-mimicking, Environment Impact Assessment (EIA) – Procedures of EIA in India with reference to construction related projects.

TEXT BOOKS:

1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao – New Age International Publishers, 2017.
2. Integrated Life Cycle Design of Structures – By Asko Sarja – SPON Press, 2007.
3. Non-conventional Energy Resources – By D S Chauhan and S K Srivastava – New Age International Publishers, 2012.

REFERENCES:

1. Green Buildings (McGraw hill publication): by Gevorkian
2. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design
3. Understanding Green Building Guidelines: For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.
4. Understanding Green Building Materials, Traci Rose Rider, W. W. Norton & Company Publisher.