

GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY
ENGINEERING MATERIALS FOR SUSTAINABILITY
(PROFESSIONAL ELECTIVE-3)

Course Code: GR18A4006

L T P C

IV Year I Semester

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Course Objectives: The objectives of this course is to make the student to

1. Have an increased awareness among students on issues in area of sustainability
2. Establish a clear understanding 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. Get a clear understanding of 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. Know about Integrated Life cycle design of Materials and Structures

Course Outcomes: After completion of this course, students will be able to

1. Understand the different types of environmental factors effecting materials
2. Work in sustainability for research and education
3. Having a 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 cost and performance of building materials with recycled components, non-petroleum-based materials, materials with low volatile organic compounds, materials with low embodied energy and salvaged materials and incorporate them into design.

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

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

UNIT III

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; Embodied Energy of Materials

UNIT IV

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 V

Green Building Planning and Specifications, Environment friendly and cost effective Building Technologies, Integrated Life cycle design of Materials and Structures, Green Strategies for Building Systems, Alternative Construction Methods, 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

TEXT/REFERENCE BOOKS:

1. Alternative Building Materials and Technologies – By K S Jagadeesh, B V Venkata Rama Reddy & K S Nanjunda Rao – New Age International Publishers
2. Integrated Life Cycle Design of Structures – By Asko Sarja – SPON Press
3. Non-conventional Energy Resources – By D S Chauhan and S K Srivastava – New Age International Publishers
4. Green Buildings (McGraw hill publication): by Gevorkian
5. Emerald Architecture: case studies in green buildings, The Magazine of Sustainable Design
6. Understanding Green Building Guidelines: For Students and Young Professionals, Traci Rose Rider, W. W. Norton & Company Publisher.
7. Understanding Green Building Materials, Traci Rose Rider, W. W. Norton & Company Publisher.