GOKARAJU RANGARAJU
INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREEN BUILDING TECHNOLOGY
(OPEN ELECTIVE)

Course Code: GR18A3128	L	T	P	C
III Year II Semester	3	0	0	3

COURSE OBJECTIVES: The objectives of this course is to make the student to

- Create awareness about the principles of green building technology and to have insight about the criteria for rating systems along with the established Indian codes and guidelines.
- Get a clear understanding of various renewable and non-renewable sources of energy along with their carbon foot prints and also enumerate the process of performance testing including building modeling and energy analysis.
- Discuss about the energy efficient green building materials and to have understanding on the cost effective Building Technologies, Strategies for Green Building Systems and Energy Conservation Measures.
- Describe the principles of sustainable development in green building design.
- Explain the best green building practices adopted along with cost/benefit and life-cycle analysis of green buildings.

COURSE OUTCOMES: After completion of the course the student will be able to -

- Know the underlying principles, history, environmental and economic impacts of green building technology and to identify the criteria for rating systems along with the established Indian codes and guidelines.
- Identify various Renewable and Non-renewable sources of energy along with their carbon foot prints and also comprehend the techniques and benefits of building performance testing such as building modeling and energy analysis, monitoring and metering.
- Recognize the energy efficient green building materials and explain the cost effective Building Technologies, Strategies for Green Building Systems and Energy Conservation Measures 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.
- Explain the application of design guidelines of Green Building considering the Energy Conservation Measures.Perform cost/benefit analysis and life-cycle analysis of green buildings.
- Summarize on the building codes, relevant legislation governing the consumption of resources and emission of environmental pollutants by buildings and be familiar with IGBC green building certification procedure.

UNIT-1

Concept of Green Buildings:

Definition of Green Buildings, typical features of green buildings, Necessity, Initiatives, Green buildings in India, Green building Assessment- Green Building Rating Systems (BREEAM,USGBC,LEED,IGBC,TERI-GRIHA, GREEN STAR),Criteria for rating, Energy efficient criteria ,environmental benefits economic benefits, health and social benefits , ,Contribution of buildings towards Global Warming. Life cycle cost of buildings, Codes and Certification Programs

UNIT-II

Sources of Energy:

Renewable and Non-renewable sources of energy ; Coal, Petroleum, Nuclear, Wind, Solar, Hydro, Geothermal sources; potential of these sources, hazards, pollution; Global scenario with reference to demand and supply in India, Global efforts to reduce carbon emissions, Building modeling , Energy analysis, Commissioning, Metering, Monitoring.

Carbon emission: Forecasting, Control of carbon emission, Air quality and its monitoring carbon foot print; Environmental issues, Minimizing carbon emission, Energy retrofits and Green Remodels.

UNIT-III

Green Building Materials: Sustainably managed Materials, Depleting natural resources of building materials; renewable and recyclable resources; energy efficient materials; Embodied Energy of Materials , 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.

Green Building Planning and Specifications: Environment friendly and cost effective Building Technologies, 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

UNIT-IV

Design of Green Buildings; Sustainable sites, Impact of building on environment, Life cycle assessment, Principles of sustainable development in Building Design ,Design on Bioclimatic and solar passive architecture, Considerations of energy consumption, water use, and system reliability, indoor air quality, noise level, comfort, cost efficiency in building design, Advanced Green building technologies and innovations.

UNIT-V

Construction of Green Buildings: Energy efficient construction, Practices for thermal efficiency and natural lighting. Eco- friendly water proofing; ECB codes building rating, Maintenance of green buildings, Cost and Performance Comparisons and Benchmarking, Green Project Management Methods and Best Practices, Cost/benefit analysis of green buildings, , Case studies of rated buildings (new and existing)

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 AskoSarja – SPON Press
3. Non-conventional Energy Resources – By D S Chauhan and S K Sreevasthava – 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.

List of free reference guides/resources available on the net:

1. IGBC reference guide/Rating systems
2. Free abridged versions of LEED reference guides
3. ECBC latest version
4. US GBC's Reference Material: