SUSTAINABILITY IN ENGINEERING PRACTICES
(SYLLABUS)

Course Code	23CE2602	Year	III	Semester	II
Course Category	Open Elective-II	Branch	CIVIL	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	-
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks:	100

Course Objectives:

The objective of this course is to:

1. To introduce the fundamental concepts of sustainable development and engineering.
2. To create awareness about environmental issues at local and global scales and explore viable solutions.
3. To familiarize students with environmental tools such as EMS, LCA, and EIA for sustainable decision-making.
4. To understand the design and development of sustainable infrastructure and industrial practices.
5. To promote knowledge of renewable energy resources and green technologies for a sustainable future.

Course Outcomes:

Course will enable the student to:

CO	Statement	BL
CO1	Explain sustainable development and different environmental agreements and protocols	**L2**
CO2	Discuss real time activities causing environmental issues and different methods to use renewable energy resources	**L3**
CO3	Explain local and global environmental issues	**L3**
CO4	Differentiate between carbon emissions for regular and sustainable cities and explain different practices to move industries towards sustainability	**L3**
CO5	Discuss different renewable energy resources and explain methods to implement green technology	**L3**

Course Articulation Matrix:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	1	-	-	-	3	3	1	-	-	1	2	-
CO2	3	2	-	-	-	3	3	1	1	-	1	2	1
CO3	3	2	-	-	1	3	3	1	-	-	1	2	-
CO4	3	2	2	2	1	2	3	1	1	1	1	2	2
CO5	3	2	2	1	2	3	3	1	-	1	2	3	2

Syllabus

Unit No	Content	Mapped COs
I	**Introduction to Sustainable Engineering-** Sustainable development, concepts of sustainable development: three pillar model, egg of sustainability model, Atkisson's pyramid model, prism model, principles of sustainable development, sustainable engineering, threats for sustainability. **Environmental Ethics and Legislations** – Environmental ethics and education, multilateral environmental agreements and protocols, enforcement of environmental laws in India – The Water Act, The Air Act, The Environment Act.	**CO1**
II	**Local Environmental Issues-** Solid waste, impact of solid waste on natural resources, zero waste concept and three R concept, waste to energy technology: thermo-chemical conversion, biochemical conversion. **Global Environmental Issues-** Resource degradation: deterioration of water resources, land degradation, air pollution, climate change and global warming, ozone layer depletion, carbon footprint, carbon trading.	**CO2**
III	**Tools for Sustainability -** Environmental management System (EMS), concept of ISO14000, life cycle assessment (LCA): basic components, advantages, disadvantages, case study. Environmental impact assessment (EIA), environmental auditing, bio mimicking, case studies.	**CO3**
IV	**Sustainable Habitat -** Concept of green building, green building materials, green building certification and rating: green rating for integrated habitat assessment (GRIHA), leader ship in energy and environmental design (LEED) rating, energy efficient buildings, sustainable cities, sustainable transport, sustainable pavements, case studies in sustainability engineering: Green building, sustainable city, sustainable transport system. **Sustainable Industrialization and Urbanization –** Sustainable urbanization, industrialization, material selection, pollution prevention, industrial ecology, industrial symbiosis, poverty reduction.	**CO4**
V	**Renewable energy resources-** Conventional and non- conventional forms of energy, solar energy, fuel cells, wind energy, small hydroplants, biogas systems, biofuels, energy from ocean, geothermal energy, conservation of energy**.** **Green technology and Green Business:** Sustainable business, green technology, green energy, green construction, green transportation, green chemistry, green computing	**CO5**

Learning Resource(s)
Text Book(s)
1. R.L. Ragand Lekshmi Dinachandran Remesh. Introduction to Sustainable Engineering. 2ndEdition, PHI Learning Pvt. Ltd., 2016.
Reference Book(s)
1. D.T.AllenandD.R.Shonnard.SustainabilityEngineering:Concepts,DesignandCaseStudies, 1st Edition, Prentice Hall, 2011. 2. A.S.Bradley,A.O.Adebayo,P.Maria.Engineeringapplicationsinsustainabledesignand development, 1st Edition, Cengage learning, 2016.

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