Sustainability in Engineering Practices

Course Code	23CE2602	**Year**	III	**Semester**	II
Course Category	OE- II	**Branch**	CIVIL	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	-
tinuous rnal Evaluation	30	**Semester End Evaluation**	70	**Total Marks:**	100

Course Outcomes		
Upon successful completion of the course, the student will be able to		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

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)
Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation
* - Average value indicates course correlation strength with mapped PO

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

Syllabus		
Unit No	**Contents**	**Mapped CO**
1	**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

2	**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
3	**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
4	**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
5	**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 Resources
Text Books
1. R.L. Ragand Lekshmi Dinachandran Remesh. Introduction to Sustainable Engineering. 2nd Ed., PHI Learning Pvt. Ltd., 2016.
References
1. D.T.Allenand, D.R.Shonnard, Sustainability Engineering: Concepts, Design and Case Studies, 1stEd., Prentice Hall, 2011. 2. A.S.Bradley, A.O.Adebayo, P.Maria. Engineering applications in sustainable design and development, 1st Ed., Cengage learning, 2016.