

Course Type	Course Code	Name of the Course	L	T	P	Credits
DE	NESD505	Green Engineering Concepts and Life Cycle Analysis	3	0	0	3

Course Objectives

- To enable the students to acquire knowledge and skills needed to address concepts of sustainability and cleaner production.

Learning Outcomes

Upon successful completion of this course, students will be able to:

- Understand the concept of life cycle analysis (LCA) and the basic principles of the methods.

Unit No.	Topics to be covered	Lecture Hours	Learning outcomes
1.	Green Engineering: Principles; System Approach; An Introduction to Sustainability Concepts and Life Cycle Analysis (Introduction, Material flow and waste management). Risk and Life Cycle Framework for Sustainability: Introduction, Environmental Risk Assessment, Example Chemicals and Health Effects, Environmental Problems etc.	10	Students will get the understanding of the concepts of sustainability and cleaner production, and the challenges that engineers face in applying these concepts in an industrial and societal context.
2.	Introduction to LCA: Historical Development of LCA; Goal Definition, Life Cycle Inventory, Life Cycle Impact Assessment, Life Cycle Interpretation, LCA Software tools. ISO Framework for LCA.	10	Students will get an overview of LCA, its associated software tools and ISO Framework.
3.	Overview of LCA Methodology: Life Cycle Inventory and Impact Assessments;Unit Processes and System Boundary; Data Quality; Procedure for Life Cycle Impact Assessment; Impact Category definition; Impact category classification, characterization, and weighting. Interpretation of LCIA Results; Sensitivity Analysis; LCIA Practices.Factors for Good LCA Study. Benefits and Drawbacks LCA.	10	Students will learn various LCA methodologies, their practices, benefits and drawbacks.
4.	Design for Sustainability and Case Studies: Environmental Design for Sustainability: Economic, Environmental, and Social Performance Indicators, Sustainable Engineering Design Principles and Environmental Cost Analysis. Case Studies of LCA applications.	12	Students will be able to critically analyze environmental emissions and develop simple methodologies to apply LCA with suitable case studies.
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Text Books:

- Life Cycle Assessment Handbook-A Guide for Environmentally Sustainable Products- Mary Ann Curran, John Wiley & Sons, Inc. Hoboken, New Jersey, 2012.
- Life cycle Assessment Inventory Guidelines and Principles-B.W. Vigon, C.L. Harrison and U.S.E.P.A. Risk Reduction Engineering Laboratory, Lewis Publishers 1994.

Reference books:

- Environmental Life- Cycle Assessment- Marry and Curran, McGraw Hill. 1996.
- The Computational Structure of Life Cycle Assessment- ReinoutHeijungs and Sangwon Suh, Springer-Science+Business Media, B.V, 2002.
- Background and Future Prospects in Life cycle Assessment-Walter Klopffer, Springer,2014.