Semester: I/II			
Course Title	Introduction to Sustainable Engineering	**CIE Marks**	50
Course Code	BCVETC105/205C	**SEE Marks**	50
Course Type	Theory	**Total Marks**	100
Course Category	ETC	**SEE Duration**	03 hrs
Hours Per Week	3L: 0T: 0P	**SEE Type**	Written
Total Hours	40 hrs	**Credits**	03

Course Learning Objectives
This course will enable the students to
• Gain knowledge on the area of sustainability and concepts of sustainability engineering
• Understand the principles and framework of sustainable engineering
• Gain knowledge the application of sustainable concepts in environmental stream.
• Understand how to apply the principle and methodology of Life Cycle Assessment Tool to engineering systems.
• Gain knowledge the design process in sustainability
Pre-Requisites
1. Basic concept of sustainability (conservation of environment, human resource and pollution control)

Module-1	**(8 hrs)**
Sustainable Development and Role of Engineers: Introduction, Why and What is Sustainable Development, THE SDFs, Paris Agreement and Role of Engineering, Sustainable Development and the Engineering Profession, Key attributes of the Graduate Engineering. **Sustainable Engineering Concepts:** Key concepts – Factor 4 and Factor 10: Goals of sustainability, System Thinking, Life Cycle Thinking and Circular Economy.	
Module-2	**(8 hrs)**
Sustainable Engineering and Concepts, Principles and Framework: Green Economy and Low Carbon Economy, Eco Efficiency, Triple bottom Line, Guiding principles of sustainable engineering, Frameworks for sustainable Engineering. **Tools for Sustainability Assessment:** Environmental Management System, Environmental Auditing, Cleaner Production Assessment, Environmental Impact Assessment, Strategic Environmental Assessment.	
Module-3	**(8 hrs)**
Fundamentals of Life Cycle Assessment Introduction to LCA, LCA Goal and Scope, Life cycle inventory, Life Cycle Impact Assessment Interpretation and presentation of Results, Iterative Nature of LCA, Methodological Choices, LCI Databases and LCA Software's, Strength and Limitations of LCA	
Module-4	**(8 hrs)**
Environmental Life Cycle Costing, Social Life Cycle Assessment, and Life Cycle Sustainability Assessment: Introduction, Environmental Life Cycle Costing, Social Life Cycle Assessment, Life Cycle Sustainability, LCA Applications in Engineering: Environmental Product Declarations and Product Category Rules, Carbon and Water Foot Printing, Energy systems, Buildings and the Built Environment, Chemical and Chemical Production Food and Agriculture	

Introduction to Environmental Economics: Introduction – Environmental Economics, Valuing the Environment, Market-based Incentives (or Economic Instruments) for Sustainability, Command-and-Control versus Economic Instruments, A Simple Model of Pollution Control	
Module-5	**(8 hrs)**
Integrating Sustainability in Engineering Design: Problems Solving in Engineering, conventional to Sustainable Engineering Design Process, Design for Life Guidelines and Strategies, Measuring Sustainability, Sustainable Design through sustainable procurement criteria, Case studies on sustainable Engineering Design Process – Sustainable Process Design, Sustainable Production Design Sustainable product design in Electronic Engineering,	

Text Books	
1.	"Introduction to Sustainability for Engineers" by Toolseeram Ramjeawon, 1st Edition, CRC Press.
2.	"Sustainability Engineering: Concepts, Design and Case studies" by David Allen & David R Shonnard, 1st Edition, Prentice Hall.
3.	"System Analysis for sustainable Engineering: Theory and applications" by Ni bin Chang, 1st Edition, McGraw Hill Publications.
Reference Books:	
1.	"Engineering for Sustainable development: Delivery a sustainable development goals, UNESCO" by International Centre for Engineering Education, France, 1st Edition.
2.	"Introduction to Sustainable Engineering" by Rag. R.L. and Ramesh Lakshmi Dinachandran, 2nd Edition, PHI Learning Pvt. Ltd.

Course Outcome Statements: After the successful completion of the course, the student will be able to	
CO1	Explain the basics of sustainable development, sustainable engineering and its role in engineering.
CO2	Apply sustainable concepts and its principles in engineering.
CO3	Apply the principle and methodology of life cycle assessment tool to engineering systems
CO4	Explain the integration of sustainability in engineering design.
CO5	Prepare a report on the sustainable and environment friendly practices.

Course Articulation Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	-	1	-	2	2	1	-	-	-	1
CO2	2	1	-	1	-	2	2	1	-	-	-	1
CO3	2	1	-	1	-	2	2	1	-	-	-	1
CO4	2	1	-	1	-	2	2	1	-	-	-	1
CO5	2	1	-	1	-	2	2	1	2	2	-	1
Avg.	**2**	**1**	-	**1**	-	**2**	**2**	**1**	**2**	**2**		**1**

3: High, 2: Medium, 1: Low

Suggested Activity Based Assessment (ABA) Methods

- Case studies on real time problems.
- Group Discussion on case studies.
- Seminar/Poster Presentation.