Program : **Diploma in Civil Engineering**	
Course Code : **6012B**	Course Title: **Sustainable Development**
Semester : **6**	Credits: **4**
Course Category: **Program Elective**	
Periods per week: **4 (L:3, T:1, P:0)**	Periods per semester:**60**

Course Objectives:

- To raise the students awareness of the various socio-economic and technical issues involved in sustainable development
- To give a broad overview of the different areas of concern as expressed by practitioners.

Course Prerequisites: Nil

Course Outcomes

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive Level
CO1	Develop an encompassing understanding of sustainability issues	13	Understanding
CO2	Identify how specific issues, such as particular renewable energies, are interrelated with other sustainability issues	15	Understanding
CO3	Identify various requirements for green building and construction using green materials.	15	Understanding
CO4	Describe the construction of green building	15	Understanding
	Series Test	2	

CO-PO Mapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1					3		
CO2					3		
CO3					3		3
CO4					3		3

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Develop an encompassing understanding of sustainability issues**		
M1.01	Explain the term sustainable development	3	Remembering
M1.02	Identify the fundamental issues in sustainable development	5	Understanding
M1.03	Compare population control methods	5	Understanding
Contents: Concept of sustainable development Sustainable development - definition - The sustainability crisis - Meeting the sustainability challenge-Fundamental issues in sustainable development - Population Growth and impact -Population control options. - Feeding the people using sustainable systems			
CO2	**Identify how specific issues, such as particular renewable energies, are interrelated with other sustainability issues**		
M2.01	Identify various natural resource management methods	5	Understanding
M2.02	Identify the methods of preserving biological diversity	5	Understanding
M2.03	Explain the need of energy conservation	5	Understanding
	Series test I	1	
Contents: Sustainable management strategies Natural resources management - Feeding the World's people in a sustainable manner, Land, soil and forest resources: - Water resources: preserving the liquid assets-Preserving biological diversity-Environmental economics and accounting - Food production			

resources - Farming systems analysis - support technologies-3R philosophy - Non renewable energy sources -Sustainable energy strategy - Energy conservation: Introduction, Specific objectives, present scenario- Need of energy conservation - LEED, GRIHA, IGBC Rating System and Energy Efficiency.

CO3	**Identify various requirements for green building and construction using green materials.**		
M3.01	Explain the term Green building	4	Remembering
M3.02	Identify environmental design strategies for building construction	6	Understanding
M3.03	Summarize green building materials and products	5	Understanding

Contents:

Introduction to Green Building

Introduction: Definition of Green building, Benefits of Green building, - Principles: Principles and planning of Green building - Features: Salient features of Green Building - Environmental design (ED) strategies for building construction - Process: Improvement in environmental quality in civil structure. Materials: Green building materials and products - Bamboo, Rice husk ash concrete, plastic bricks, Bagasse particle board, Insulated concrete forms. reuse of waste material-Plastic, rubber, Newspaper, wood, Nontoxic paint- Green roofing.

CO4	**Describe the construction of green building**		
M4.01	Identify the components of Green building	5	Understanding
M4.02	Summarize the materials and construction techniques	5	Understanding
M4.03	Explain waste reduction during construction	5	Understanding
	Series test II	1	

Contents:

Design Features of Green Building

Components/features of Green Building, Site selection, Energy Efficiency, Water efficiency, Material Efficiency, Indoor Air Quality - Site selection strategies, Landscaping, building form, orientation, building envelope and fenestration - material and construction techniques, roofs, walls, fenestration and shaded finishes, advanced passive heating and cooling techniques, waste reduction during construction

Text /Reference:

T/R	Book Title/Author
T1	Kibert, C.J., Sustainable construction: Green Building design and Delivery, John Wiley Hoboken, New Jersey.
R2	Chauhan, D S Sreevasthava, S K., Non-conventional Energy Resources, New Age International Publishers, New Delhi.
R3	Sam Kubba., Handbook of Green Building Design and Construction, Butterworth-Heinemann.
R4	Means R S, Green Building - Project Planning and Cost Estimating, John Wiley & Sons
R5	Jagadeesh, K S, Reddy Venkatta Rama & Nanjunda Rao, K S., Alternative Building Materials and Technologies, New Age International Publishers, Delhi.

Online resources:

Sl.No	Website Link
1	https://sustainabledevelopment.un.org/content/documents
2	https://inhabitat.com/11-green-building-materials-that-are-way-better-than-concrete/
3	http://www.unenvironment.org/explore-topics/sustainable-development-goals/about-sustainable-development-goals
4	https://www.worldgbc.org/what-green-building