

<b>Course Title: Alternative Building Materials</b> As per Choice Based Credit System (CBCS) scheme] SEMESTER:VI			
Subject Code	15CV653	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
Total Number of Lecture Hours	40	Exam Hours	03
<b>CREDITS –03</b>		<b>Total Marks- 100</b>	
<b>Course objectives:</b> This Course will enable students to:			
<ol style="list-style-type: none"> <li>1. understand environmental issues due to building materials and the energy consumption in manufacturing building materials</li> <li>2. study the various masonry blocks, masonry mortar and structural behavior of masonry under compression.</li> <li>3. Study the alternative building materials in the present context.</li> <li>4. understand the alternative building technologies which are followed in present construction field.</li> </ol>			
<b>Modules</b>		<b>Teaching Hours</b>	<b>Revised Bloom's Taxonomy (RBT) Level</b>
<b>Module -1</b>			
<b>Introduction:</b> Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Green concepts in buildings, Green building ratings – IGBC and LEED manuals – mandatory requirements, Rainwater harvesting & solar passive architecture. Environmental friendly and cost effective building technologies, Requirements for buildings of different climatic regions		8 hours	L1,L2,L3
<b>Module -2</b>			
<b>Elements of Structural Masonry :</b> Elements of Structural Masonry, Masonry materials, requirements of masonry units' characteristics of bricks, stones, clay blocks, concrete blocks, stone boulders, laterite Blocks, Fal- G blocks and Stabilized mud block. Manufacture of stabilized blocks. <b>Structural Masonry Mortars:</b> Mortars, cementations materials, sand, natural & manufactured, types of mortars, classification of mortars as per BIS, characteristics and requirements of mortar, selection of mortar. Uses of masonry, masonry bonding, Compressive strength of masonry elements, Factors affecting compressive strength, Strength of Prisms/wallets and walls, Effect of brick bond on strength, Bond strength of masonry: Flexure and shear, Elastic properties of masonry materials and masonry, Design of masonry compression elements subjected to axial load.		8 Hours	L1,L2,L3
<b>Module -3</b>			
<b>Alternative Building Materials:</b> Lime, Pozzolana cements, Raw materials, Manufacturing process, Properties and uses. Fibers- metal and synthetic, Properties and applications. Fiber reinforced plastics, Matrix materials, Fibers organic and synthetic, Properties and applications. Building materials from agro and industrial wastes ,Types of agro wastes, Types of industrial and mine wastes, Properties and applications. Masonry blocks using industrial wastes. Construction and demolition wastes		8 Hours	L1,L2,L3
<b>Module -4</b>			
<b>Alternative Building Technologies:</b> Use of arches in foundation, alternatives for wall constructions, composite masonry, confined masonry, cavity walls, rammed earth, Ferro cement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications. Top down construction, Mivan Construction Technique. <b>Alternative Roofing Systems:</b> Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes		8 Hours	L1,L2,L3
<b>Module -5</b>			

<b>Equipment for Production of Alternative Materials:</b> Machines for manufacture of concrete, Equipments for production of stabilized blocks, Moulds and methods of production of precast elements, Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives.	8 Hours	L1,L2,L3
<b>Course Outcomes:</b> After studying this course, students will be able to: <ol style="list-style-type: none"> <li>1. Solve the problems of Environmental issues concerned to building materials and cost effective building technologies;</li> <li>2. Suggest appropriate type of masonry unit and mortar for civil engineering constructions; also they are able to Design Structural Masonry Elements under Axial Compression.</li> <li>3. Analyse different alternative building materials which will be suitable for specific climate and in an environmentally sustainable manner. Also capable of suggesting suitable agro and industrial wastes as a building material.</li> <li>4. Recommend various types of alternative building materials and technologies and design a energy efficient building by considering local climatic condition and building material.</li> </ol>		
<b>Program Objectives:</b> <ul style="list-style-type: none"> <li>• Engineering knowledge</li> <li>• Problem analysis</li> <li>• Interpretation of data</li> </ul>		
<b>Question paper pattern:</b> <ul style="list-style-type: none"> <li>• The question paper will have 5 modules comprising of ten questions. Each full question carrying 16 marks</li> <li>• There will be two full questions (with a maximum of three subdivisions, if necessary) from each module.</li> <li>• Each full question shall cover the topics as a module</li> <li>• The students shall answer five full questions, selecting one full question from each module. If more than one question is answered in modules, best answer will be considered for the award of marks limiting one full question answer in each module.</li> </ul>		
<b>Text Books:</b> <ol style="list-style-type: none"> <li>1. KS Jagadish, BV Venkatarama Reddy and KS Nanjunda Rao, “Alternative Building Materials and Technologies”, New Age International pub.</li> <li>2. Arnold W Hendry, “Structural Masonry”, Macmillan Publishers</li> </ol>		
<b>Reference Books:</b> <ol style="list-style-type: none"> <li>1. RJS Spence and DJ Cook, “Building Materials in Developing Countries”, Wiley pub.</li> <li>2. LEED India, Green Building Rating System, IGBC pub.</li> <li>3. IGBC Green Homes Rating System, CII pub.</li> <li>4. Relevant IS Codes.</li> </ol>		