

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme	Diploma Engineering				Branch	Civil Engineering			
Semester	VI				Version	1.0.0.0			
Effective from Academic Year			2020-21		Effective for the batch Admitted in			July 2018	
Subject code	1CI2606		Subject Name		MAINTENANCE & REHABILITATION OF STRUCTURES				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

**Pre-requisites:**

The students have to know about basic components of building & their function and basic knowledge of different types of defects in structures.

**Course Learning Outcomes:**

The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes.

CO1. Assess the health condition of structures.

CO2. Inspect and evaluate damage structures.

CO3. Test the assess the condition of properties of existing concrete structures.

CO4. Implement the techniques for repairing of concrete structures.

The practical should be carried out in such a manner that students are able to acquire different learning out Comes from covered course.

**Course Content**

Name of UNIT	Unit Content	Unit Learning Outcomes	Marks	Hr
<b>UNIT – 1 MAINTENANCE OF BUILDINGS</b>	1.1 Introduction. 1.2 Importance of maintenance 1.3 Types of maintenance - daily, weekly, monthly, Annually 1.4 General Maintenance - Painting of Buildings - Home Electricity System	1a Explain the requirement of Maintenance in building. 1b Explain various types of Maintenance in building. 1c Assess the quality aspects Of existing building.	10	07
<b>UNIT – 2 REPAIR STRATEGIES</b>	2.1 Causes of distress in structures. 2.2 Construction and design failures. 2.3 Condition assessment and distress- diagnostic techniques. 2.4 Inspection and evaluating damaged structure	2a Explain distress diagnostic Techniques 2b Carry out inspection and evaluation of damaged Structure.	10	08
<b>UNIT – 3 MATERIALS AND TECHNIQUES FOR REPAIR</b>	3.1 Materials for Repair - Special concretes and mortar - concrete chemicals - construction chemicals - Expansive cement - polymer concrete - sulphur infiltrated concrete - Ferro cement - Fibre reinforced concrete	3a Identify materials for repair in Building. 3b Explain techniques for Repairs.	15	11

	<ul style="list-style-type: none"> <li>- Rust eliminators and polymers coating for rebars</li> <li>- foamed concrete</li> <li>- dry pack</li> <li>- vacuum concrete</li> <li>- asphalt sheeting</li> </ul> <p>3.2 Techniques for Repairs</p> <ul style="list-style-type: none"> <li>-Gunniting, grouting and Shotcrete</li> <li>- Epoxy injection</li> <li>- Jacketing</li> <li>- shoring and underpinning</li> </ul> <p>3.3 Methods of corrosion protection</p> <ul style="list-style-type: none"> <li>- corrosion inhibitors</li> <li>-corrosion resistant steels</li> <li>-coating and cathodic protection</li> </ul>			
<b>UNIT – 4 REPAIR, RETROFITTING AND REHABILITATION</b>	<p>4.1 Repair of</p> <ul style="list-style-type: none"> <li>- stone, brick and block masonry (Cracks, dampness, efflorescence, joint separation, etc.)</li> <li>- Flooring</li> <li>- Roofs (sloping, flat, pitched, etc.)</li> <li>- Concrete members due to <ul style="list-style-type: none"> <li>(i) Steel Corrosion</li> <li>(ii) Lack of Bond</li> <li>(iii) shear, tension, torsion, Compression failure</li> </ul> </li> <li>- Rainwater Leakage in Buildings</li> <li>- Leakage in Basement, toilet area</li> </ul> <p>4.2 Control on Termites (White Ants) in Buildings</p> <p>4.3 Fungus Decay of wood works in Buildings.</p> <p>4.4 Estimation of Repair and Retrofitting.</p>	<p>4a Explain the Repair work of various component in Existing masonry building.</p> <p>4b Explain the Repair work of various Component in existing concrete structure.</p> <p>4c Discuss principles of Retrofitting and Rehabilitation.</p>	15	11
<b>UNIT – 5 DEMOLITION AND DISMANTLING TECHNIQUES</b>	<p>5.1 Define: Demolition</p> <p>5.2 (a) Non Engineering Demolition</p> <ul style="list-style-type: none"> <li>- Manual Demolition</li> </ul> <p>(b) Engineering Demolition</p> <ul style="list-style-type: none"> <li>- Mechanical Method <ul style="list-style-type: none"> <li>(i) Wrecking Ball Method</li> <li>(ii) Pusher Arm technique</li> <li>(iii) Thermic Lance Technique</li> <li>(iv) Non – Explosive Demolition</li> <li>(v) Concrete Sawing Method</li> <li>(vi) Deliberate Collapse Method</li> <li>(vii) Pressure Jetting</li> </ul> </li> <li>- Implosion</li> <li>- Deconstruction Method</li> </ul> <p>5.3 Safety measures during demolition operation.</p>	<p>5a Explain demolition techniques for structures.</p> <p>5b Enlist safety measures to be Followed during demolition.</p> <p>5c Explain care to be taken in dismantling of buildings so that maximum resale value Material is generated.</p>	10	08

	5.4 Dismantling of buildings and reuse of materials/fittings from environmental and financial point of view.			
			Total	60
				45

List of Practical		
No.	Unit	Name of Practical
1	I	Prepare a report on (based on internet search) a. Importance of Maintenance. b. Various routine maintenance works in building
2	II	Prepare a report on (based on internet search) a. Causes of distress in structures b. Points to be taken care of during inspection and evaluation of damaged structure
3	III & IV	Prepare sketches of equipment/tools for repair works. (Based on internet search and site visits)
4	I & II	Study the maintenance of a nearby building/civil structure being carried out (or carried out recently) and prepare a case study on it including financial aspects. (this may includes study of maintenance of cracks)
5	V	Study the Demolition/dismantling work of a nearby building/civil structure being carried out (or carried out recently) and prepare a case study on it (including financial aspects and resale value of Materials obtained in dismantling).
6	IV	Study the guide lines of the Municipal Corporation or R& B department, BIS standards etc regarding declaring buildings/structures unsafe for living/use and based on this identify buildings/structures if any in your locality and prepare a case study on it. OR Study the preservation work of a historical building being carried out by Archaeological department in nearby location and prepare a report on it.
7	ALL	Seminar (Present case studies and reports prepared in above practical's in seminar type situation)

List of Text Books			
No	Title of Books	Authors	Publication
1	Maintenance & Repair Of Civil Structures	B .L.Gupta	Standard Publications
2	Concrete Technology Theory and Practice	M.S.Shetty	S.Chand and Compony, New Delhi

List of Reference Books			
No	Title of Reference Books	Authors	Publication
1	Maintenance, Repair & Rehabilitation and Minor Works of Buildings	P. C. Varghese	PHI
2	Handbook on Repairs and Rehabilitation of Structures		CPWD, Delhi

Link of Learning Web Resource	
1	<a href="http://cpwd.gov.in/Units/handbook.pdf">cpwd.gov.in/Units/handbook.pdf</a>
2	<a href="http://www.civilengineeringnews.tk/2014/07/methods-of-demolition-ofbuilding.html">http://www.civilengineeringnews.tk/2014/07/methods-of-demolition-ofbuilding.html</a>
3	<a href="http://www.bis.org.in/sf/nbc.htm">www.bis.org.in/sf/nbc.htm</a>
4	<a href="http://thecontractor.org">thecontractor.org</a>