Structural Health Monitoring (SHM)
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Lecture - 17
Part - 1: Short term and long term Structural Health Monitoring (SHM)

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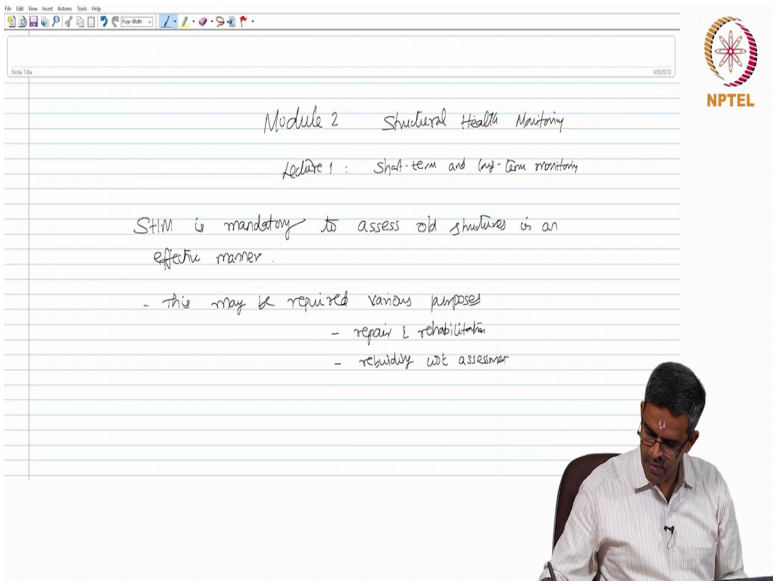

Welcome, to the lectures in module – 2 on the course Structural Health Monitoring. In this lecture, which is lecture – 1 in module – 2, we are going to talk about short term and long term monitoring. We all do agree that structural health monitoring is mandatory to assess old structures in an effective manner. This may be required for various purposes, repair and rehabilitation and sometimes to assess the cost of rebuilding.

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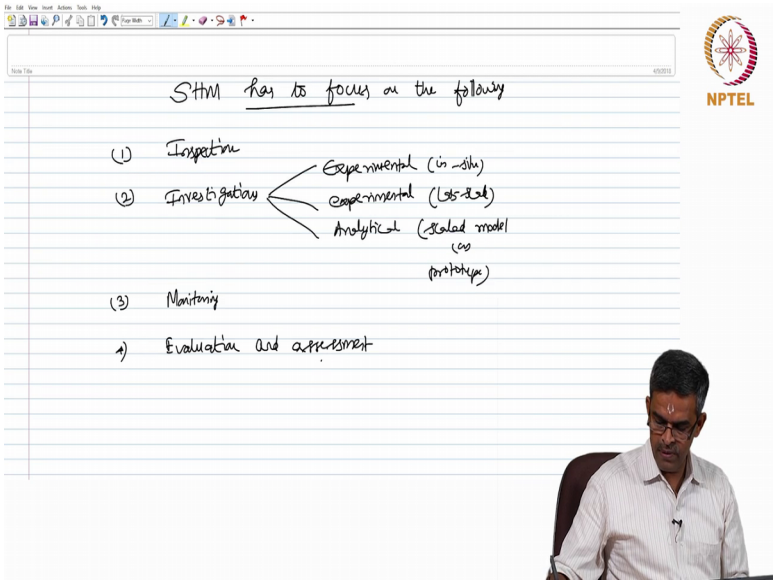

Therefore, friends, structural health monitoring has to focus on the following; 1, as we saw in the last module lectures inspection investigations it may be experimental in-situ. It may be experimental lab scale it may be analytical scaled model or prototype. The third of course, is monitoring after detailed investigation is completed and the last one is evaluation and assessment.

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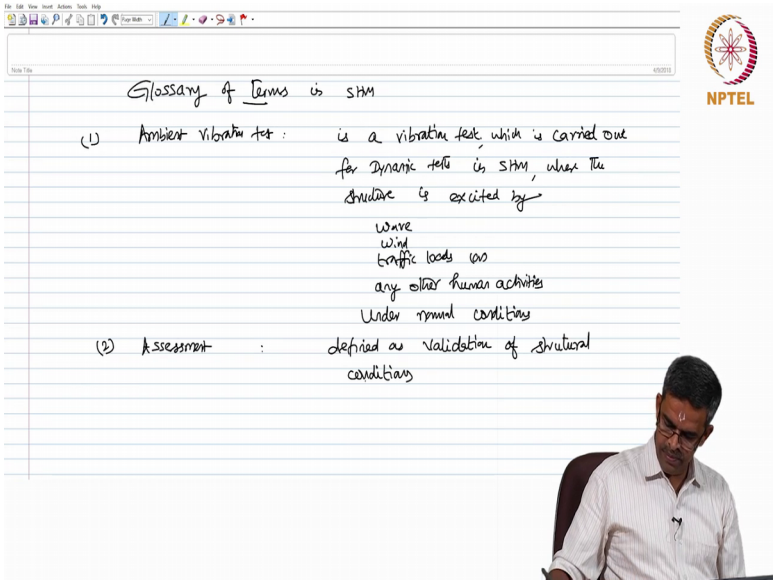

Before we look into the terms of different types of monitoring let us do some glossary of terms which are useful in structural health monitoring. Ambient vibration test which is a

vibration test which is carried out for dynamic tests in structural health monitoring where the structure different kinds of loads like wave load wind load or any other human activities under normal conditions. The second term refers to assessment. Assessment is actually defined as a validation of structural conditions.

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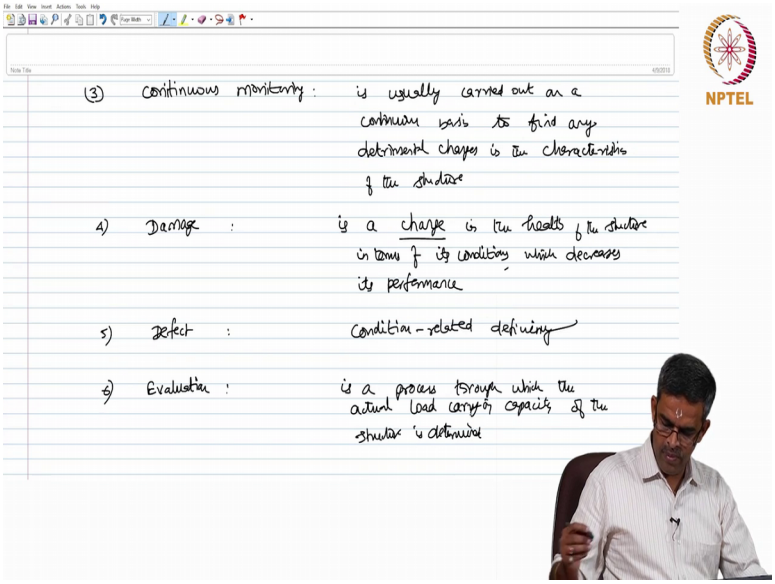

Continuous monitoring is usually carried out on a continuous basis to find any detrimental changes in the characteristics of the structure. What do you understand by damage? Damage actually is a change in the health of the structure in terms of its conditions which decreases its performance. Then what do you understand by defect? Defect actually is a condition related deficiency. What is meant by evaluation? Evaluation is a process through which the actual load carrying capacity of the structure is determined.

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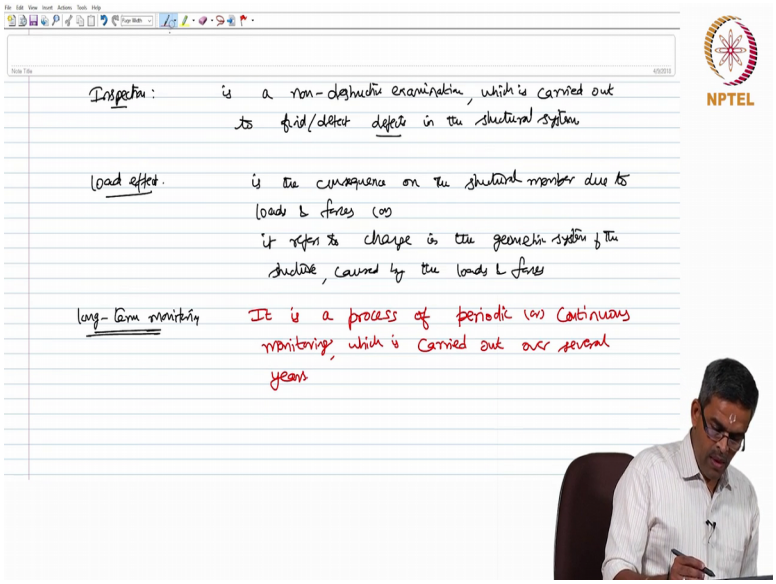

Inspection is a non-destructive examination which is carried out to find or detect defects in the structural system. Load effect, it is the consequence on the structural member due to loads and forces or it refers to change in the geometric system of the structure caused by the loads and forces; what is long term monitoring it is a process of periodic or continuous monitoring which is carried out over several years.

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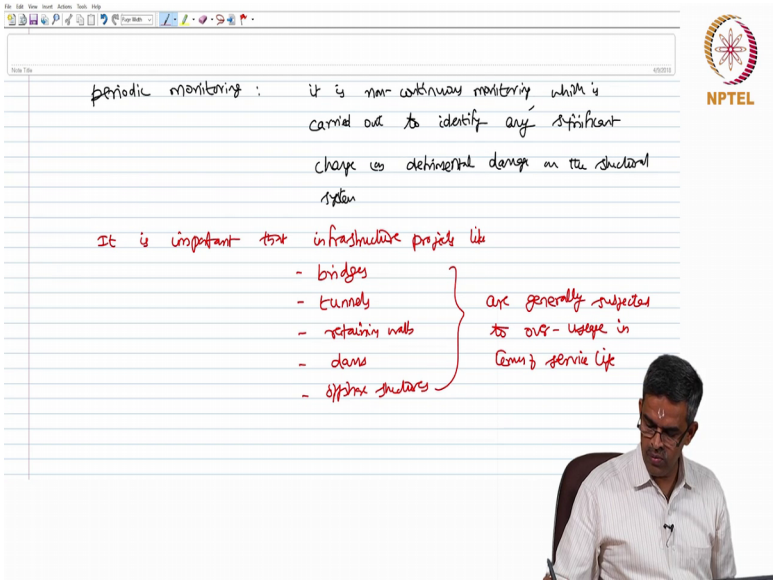

Periodic monitoring, it is a non continuous monitoring which is done to identifying any significant change or detrimental damage on the structural system. That infrastructure

projects like bridges, tunnels, retaining walls, dams, offshore structures or generally subjected to over usage in terms of its service life.

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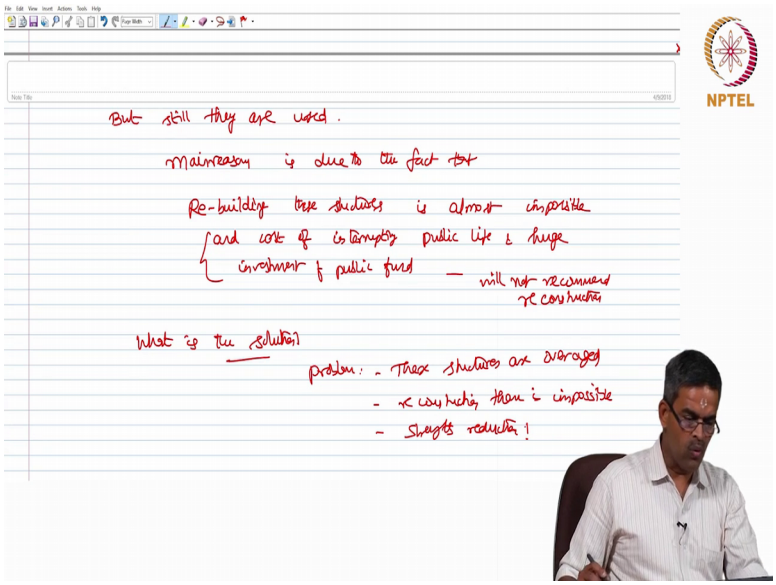

But, still they are used. Main reason is due to a fact that re-building these structures is almost impossible and the cost of interrupting public life and huge investment of public fund will not essentially recommend this. Then what is the solution? The problem is these structures are over aged reconstructing them is impossible, there is a significant strength reduction. So, what do we do?

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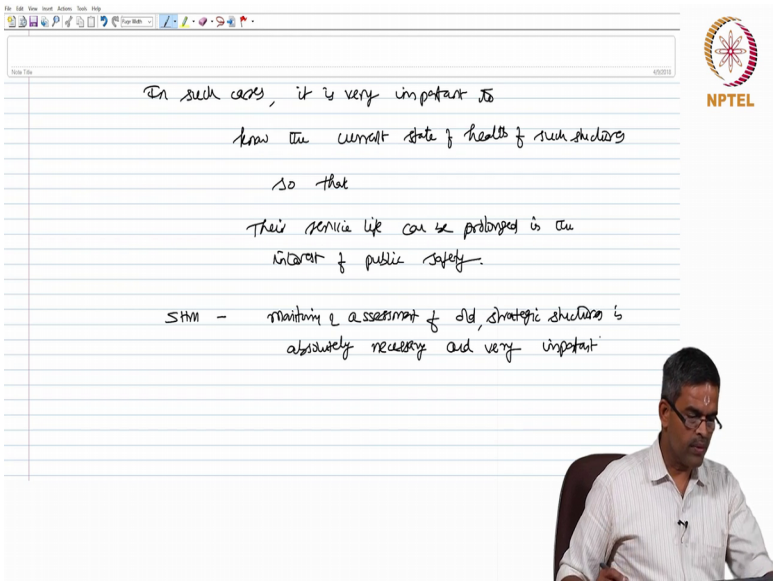

In such cases, it is very important to know the current state of health of such structures so that the service life can be prolonged in the interest of public safety.

So, by this logic structural health monitoring which deals with monitoring and assessment of old strategic structures is absolutely necessary and very important.

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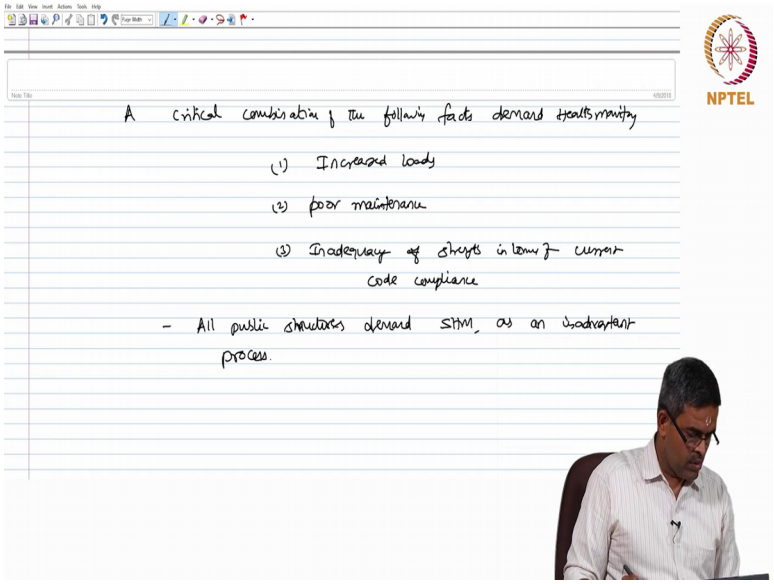

Further, one can also notice that a critical combination of the following facts demand health monitoring; 1 – increased loads, 2 – poor maintenance and 3 – inadequacy of strength in terms of current code compliance. Therefore, all public structures demand structural health monitoring as an inadvertent process.

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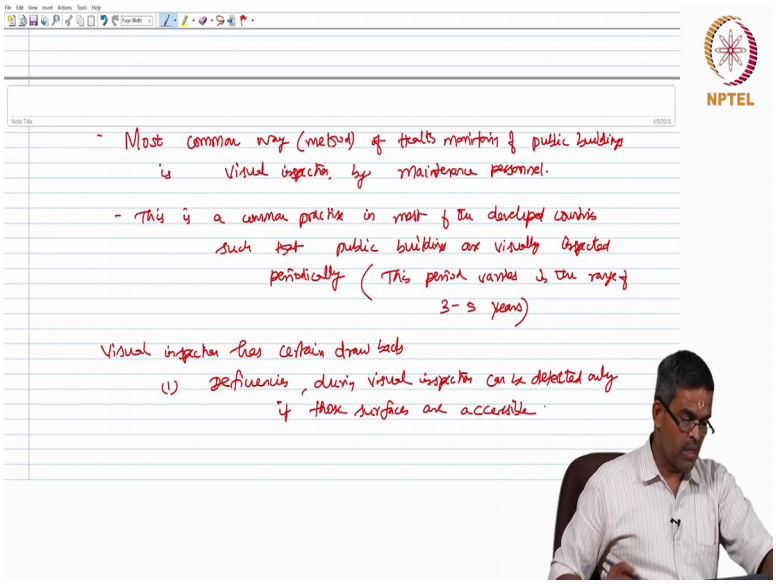

Way or method of health monitoring of public buildings is visual inspection, by the maintenance personnel. This is a common practice in most of the developed countries such that public buildings or visually inspected periodically. Of course, this period varies in the range of 3 to 5 years.

Friends, visual inspection has certain drawbacks. The foremost drawback is that structural deficiencies during visual inspection can be detected only if those surfaces are accessible, that is one of the major drawbacks.

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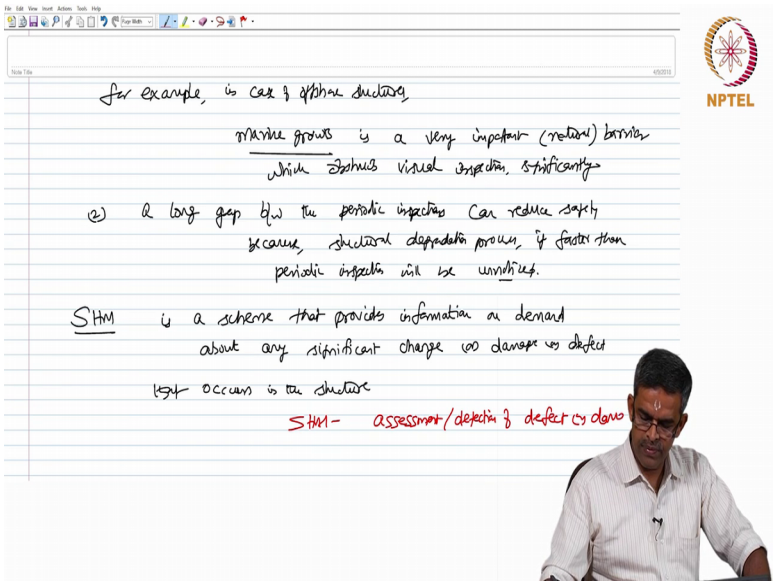

In case of offshore structures, marine growth is a very important I should say natural barrier which obstructs visual inspection significantly. In fact, the legs will be covered with marine growth and therefore, you will exactly do not know; what is the status of condition of these members under the formation of marine deposits along these legs or the platforms. So, visual inspection is one of the major demerits. It is applicable only when the deficiencies are accessible. The second issue is a long gap between the periodic inspections can reduce safety because, structural degradation process, if faster than periodic inspection will be unnoticed.

Therefore, friends as we all agree structural health monitoring a scheme that provides information on demand about any significant change or damage or defect occurs that occurs in the structure. So, essentially SHM is assessment or at least detection of defect or damage. So, SHM methods should focus on this objective.