COURSE CONTENT

NON-DESTRUCTIVE TESTING AND STRUCTURAL EVALUATION								
I Semester: ST								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
BSTD06	**Elective**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		3	0	0	3	40	60	100
Contact Classes: 48	**Total Tutorials: Nil**	**Total Practical Classes: Nil**				**Total Classes: 48**		
Prerequisite: Concrete Technology								

I. COURSE OVERVIEW:

Non-destructive Testing (NDT) plays an extremely important role in quality control, flaw detection and structural health monitoring covering a wide range of industries. There are varieties of NDT techniques in use. This course will first cover the fundamental science behind the commonly used NDT methods to build a basic understanding of the underlying principles. It will then go on to cover the process details of each of these NDT methods. This course is devised to introduce the student to forms of discontinuities in the manufacturing and service life of a part. Students are provided with an understanding of how and why a specific Non-destructive Testing method is chosen and acquainted with visual inspection techniques and their correct use.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The importance of Non-destructive Testing (NDT) for evaluating Structural performance.
II. The application of modern techniques in existing structures for strengthening and demolition in real time situations.
III. The procedures for corrosion activity and permeability detection in concrete

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1 Apply the various NDT techniques to identify the defects.

CO 2 Select the suitable NDT techniques for various defects

CO 3 Identifying the nature and quantifying the defects

CO 4 Understand the instruments and interpretation on techniques

CO 5 Familiarize with basic principles of electromagnetic NDT methods.

CO 6 Understand the special radiographic techniques and the various advantages and limitations of the processes.

IV. COURSE CONTENT:

MODULE - I: INTRODUCTION TO NON-DESTRUCTIVE TESTING (NDT) (10)

Basics of manufacturing processes and defects in concrete structures, testing of concrete: Quality control tests, partial destructive tests. Need of non-destructive testing, basic methods of NDT, scope and

application. Visual Inspection: Tools and Equipment's required, procedure, reporting, applications and Limitations.

MODULE - II: SURFACE HARDNESS TESTING AND REINFORCEMENT DETECTION (10)
Schmidt rebound hammer test: Equipment required, general procedure, applications, scope and limitations. Penetration resistance or winds or robe test: equipment, procedure, applications, scope and limitations. Electromagnetic testing for reinforcement detection: Equipment, procedure, applications, scope and limitations

MODULE - III: CORROSION ACTIVITY AND PERMEABILITY TESTS (10)
Half-cell electrical potential method: Equipment, procedure, applications, scope and limitations; Resistivity measurement: Equipment, procedure, applications, scope and limitations.

Carbonation depth measurement: Equipment, procedure, applications, scope and limitations; Permeability test: Equipment, procedure, applications, scope and limitations.

MODULE - IV: ULTRASONIC TESTING (09)
Pulse velocity test: Equipment, procedure, applications, scope and limitations, Ultrasound pulse echo: Equipment, procedure, applications, scope and limitations, Impact echo test: Equipment, procedure, applications, scope and limitations, Relative amplitude method: Equipment, procedure, applications, scope and limitations

MODULE - V: VOIDS, DEFECTS AND MOISTURE DETECTION (09)
Radiographic testing: Equipment, procedure, applications, scope and limitations, Ground penetrating radar: Equipment, procedure, applications, scope and limitations, Infrared thermography: Equipment, procedure, applications, scope and limitations.

V. TEXT BOOKS:

1. J Prasad, C. G. K. Nair, "Non-destructive testing and evaluation of material," Mcgraw Hill Education India Pvt.Ltd, 2011.
2. D. E. Bray and R. K. Stanley, "Nondestructive evaluation: A tool for design, manufacturing and service," CRC Press, 1996.

VI. REFERENCE BOOKS:

1. Balayssac, Jean-Paul, and Vincent Garnier, eds. Non-destructive testing and evaluation of civil engineering structures. Elsevier, 2017.

VII. ELECTRONICS RESOURCES:

1. www-pub.iaea.org/mtcd/publications/pdf/tcs-17_web.pdf
2. http://store.elsevier.com/Non-Destructive-Evaluation-of-Reinforced-Concrete-Structures/isbn-9781845699505/
3. http://www-pub.iaea.org/mtcd/publications/pdf/tcs-17_web.pdf

VIII. MATERIALS ONLINE:

1. Course Template
2. Tutorial Question Bank
3. Assignments
4. Model Question Paper – I
5. Model Question Paper - II
6. Lecture Notes
7. Power point presentation