B. Tech. Civil Engineering				
Course code: Course Title	**Course Structure**			**Pre-Requisite**
CE408: Retrofitting of Structures	**L**	**T**	**P**	
	3	**1**	**0**	
Course Objective: This subject imparts a broad knowledge in the area of repair and rehabilitation of Structures.				

S. No	**Course Outcomes (CO)**
CO1	Evaluate/ assess the existing buildings through field investigations and RVS, and conduct a Preliminary forensic assessment of existing or damaged structures through NDT.
CO2	Understand the different techniques for structural retrofitting at the local and global level.
CO3	Analyse the deficiency in the existing building and recommend the type of strengthening techniques for RCC structures.
CO4	Able to understand the process of adding new components in structures for retrofitting.
CO5	Analyse the energy dissipation involved in the retrofitting of structures.
S. No	**Contents**
UNIT 1	Introduction: Terminology; Basic principles of seismic evaluation and retrofitting. Qualitative Methods of Seismic Evaluation: Rapid visual screening procedure (RVSP) and simplified evaluation of buildings; Visual inspection method and non-destructive testing (NDT) method.
UNIT 2	Quantitative Methods of Seismic Evaluation: Performance based method using nonlinear static push-over analysis (NSP) and non-linear dynamic method of analysis (NDP); Estimation of seismic capacity (strength and ductility).
UNIT 3	Local and Global Methods of Seismic Retrofitting of RC Buildings: System completion; Strengthening of existing components; RC, Steel and FRP Jacketing;
UNIT 4	Addition of new components – frames, shear walls and braced frames; Design of connections for retrofitting of structures.
UNIT 5	Introduction to supplemental energy dissipation and base isolation.

REFERENCES

S. No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	Agarwal, Pankaj, Shrikhande, Manish. (2006), "Earthquake Resistant Design of Structures"- Prentice–Hall India.	2006
2	Duggal, S.K. (2007)., "Earthquake Resistant Design of Structures"- Oxford University Press.	2007

3	Priestley, M. N., Seible, F., & Calvi, G. M. (1996). Seismic design and retrofit of bridges"- John Wiley & Sons.	1996
4	Seismic Evaluation and retrofit of concrete building" – Vol. I & II"- Applied Technology Council, California, ATC 40. (1996)	1996
5	Rapid Visual Screening of Buildings for Potential Seismic Hazards, Federal Emergency Management Agency, Building Seismic Safety Council, Washington, D.C., FEMA 154/155. (2002)	2002
6	FEMA-356. "Commentary for the Seismic Rehabilitation of Buildings," Federal Emergency Management Agency, Washington, DC. (2000)	2000
7	FEMA, P-695. "Quantification of Building Seismic Performance Factors"- Federal Emergency Management Agency. (2009)	2009
8	FEMA-440, A., "Improvement of nonlinear static seismic analysis procedures"- . FEMA-440, Redwood City. (2005)	2005
9	A Primer on Rapid Visual Screening (RVS) Consolidating Earthquake Safety Assessment Efforts in India by National Disaster Management Authority (2020)	2020