B. Tech. Civil Engineering				
Course code: Course Title	**Course Structure. Credit=4**			**Pre-Requisite**
CE 409: Design of Bridges	**L**	**T**	**P**	**CE203: Design of Structures-I**
	3	**1**	**0**	

Course Objective: To equip students with skills to design and manage the bridge stocks.

S. No	Course Outcomes (CO)
CO1	Introduction to the bridge system and components; the collection of data for the design.
CO2	Exposure to loading and other parameters required for the design of bridge structures**.**
CO3	Proficiency in the design of superstructures using various approaches.
CO4	Proficiency in the design of substructures using various approaches.
CO5	Proficiency in the design of various appurtenances, bearings, expansion joints, etc.
CO6	Development of systems to maintain and manage the bridges with exposure to state-of-the-art knowledge in the domain of Bridge Management Systems.

S. No	Contents	Contact hours
UNIT 1	Introduction, components of bridges, classification of bridges, related structures, classical examples of various types of bridges. Selection of site and initial decision process, survey and alignment, geotechnical investigations, collection of bridge design data, hydrological calculations, waterway calculations, scour, depth of foundation, freeboard considerations, vertical clearance.	8
UNIT 2	Standard loadings for bridge design as per different codes of practice, IRC, BS and AASHTO codes, various types of loads considered for design of bridges, impact factor, centrifugal force, wind and seismic considerations, width and roadway considerations, influence lines, load combinations, limit and working stress design considerations, pre-design considerations, roadway vs. railway bridges.	8
UNIT 3	Superstructure of bridge: selection of main bridge parameters, design methodologies, choice of superstructure type, load distribution in various types of superstructures, RCC and PSC superstructures, longitudinal analysis of bridges, transverse analysis of bridge, temperature analysis, effect of differential movements of supports, reinforced earth structures, box girder bridges.	8

UNIT 4	Substructure of bridge: pier, abutment, wing walls, importance of substructure soil interaction, open foundation, pile foundation, well foundation, simply supported and continuous bridges.	8
UNIT 5	Appurtenances, Bearings and deck joints: types of bearings, expansion joints, design of bearings and joints, parapets and railings for highway bridges, definitions, classifications of bridge parapets, related details.	6
UNIT 6	Bridge inspection, maintenance and management strategies, lessons learned from failure of bridges, life extension and lifecycle analysis with case studies.	4
	TOTAL	**42**

REFERENCES

S. No.	**Name of Books/Authors/Publishers**	**Year of Publication / Reprint**
1	M.J. Ryall, Parke G.A.R. and Harding J.E.,' The manual of bridge engineering', Thomas Telford Publishers ASIN 8000Q91ZDY.	1997
2	Raina V.K., 'Concrete bridge practice – analysis, design and economics, Tata McGraw-Hill Publishing Company Ltd. (ISBN 8184043783).	2002
3	Ponnuswamy S., 'Bridge engineering', Tata McGraw-Hill Publishing Company Ltd. ISBN: 9780070656956.	2000
4	Essentials of Bridge Engineering, 6th Edition, by D.J. Victor. CBS Publishers.	2018
5	IRC:5. Standard Specifications and Code of Practice for Road Bridges. Section I- General Features of Design.	2015
6	IRC:6 Standard Specifications and Code of Practice for Road Bridges Section II. Loads and Load Combinations.	2017
7	IRC: 112 Code of Practice for Concrete Road Bridges.	2011