

GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL (STRUCTURAL ENGINEERING) (20)

DESIGN OF BRIDGES

SUBJECT CODE: 2742002

M.E. 4th SEMESTER

Type of course: Elective

Prerequisite: Design of Structures

Rationale: Bridge is an important infrastructure facility required for the passage of railways, road ways, footpaths and even for carriage of fluids. Further, the constant increase in traffic loads associated with the economic growth in modern societies imparts large demands to build such structures. Therefore, the study of analysis and design of bridges is essential for the structural engineering students.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P		Theory Marks		Practical Marks				
			ESE (E)	PA (M)	ESE (V)		PA (I)			
					ESE	OEP	PA	RP		
3	0	2#	4	70	30	20	10	10	10	150

Content:

Sr. No.	Course Content	Total Hrs	% Weightage
1	Classification, investigations and planning, choice of type of bridges	2	5
2	I.R.C. and other international specifications on live loads for road bridges, Various forces acting on bridges, Load distribution theories: Courbon's Method, Hendry Jaeger Method, Grillage analogy, Pigeaud's curves	7	15
3	Superstructure: General design considerations, analysis and design of reinforced concrete slab culverts, tee beam and slab bridges, Design principles of prestressed bridges, continuous bridges, box girder bridges, balanced cantilever bridges.	15	35
4	Substructure : Various parts of substructures, Various types of substructures, Loads acting on substructures, Design of pier and pier cap, Design of different types of foundation – Open, pile & well foundation, its construction aspects & related issues	14	35
5	New era methodology/technology for design and construction of bridges, Seismic resistant design provisions, load test on bridges.	4	10

Reference Books:

1. "Bridge Deck Behaviour" By E. C. Hambly, CRC Press, 2nd edition
2. "Grillage Analogy in Bridge Deck Analysis " by C. S. Surana, Alpha Science International Ltd.
3. Raina V.K. "Concrete Bridge Practice" , Tata McGraw Hill Publishing Company, New Delhi, 1991.
4. Krishnaraju, N., "Design of Bridges" Oxford and IBH Publishing Co., Bombay, Calcutta, New Delhi, 1988
5. Bakht, B. and Jaegar, L.G., "Bridge Analysis simplified", McGraw Hill, 1985.

6. Ponnuswamy, S., "Bridge Engineering", Tata McGraw Hill, 1989
7. Derrick Beckett, "An introduction to Structural Design of Concrete Bridges", Surrey University Press, Henley Thomes, Oxford Shire, 1973.
8. Taylor, F.W., Thomson, S.E., and Smulski E., "Reinforced Concrete Bridges", John Wiley and Sons, New York, 1955.
9. Edwin H.Gaylord Jr., Charles N.Gaylord, James, E.,Stallmeyer "Design of Steel
10. Structures" McGrew Hill International Editions, 1992.
11. IRC: 5, 6, 78, 112-2011

Course Outcome:

After learning the course the students should be able to:

1. Analyse and design of reinforced concrete slab culverts, tee beam and slab bridges as per IRC specifications,
2. Understand design principles of pre-stressed bridges, continuous bridges, box girder bridges, balanced cantilever bridges,
3. Design pier and pier cap, piles and wells.

List of Experiments/Tutorials:

Analysis and design of bridge with full analytical treatment, design procedure, references and all necessary drawings in the form of neat dimensioned sketches.

Design based Problems (DP)/Open Ended Problem:

Case study of RC bridge, pre-stressed bridges, continuous bridges, box girder bridges, balanced cantilever bridges

List of Open Source Software/learning website:

<http://nptel.ac.in/>

Review Presentation (RP): The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.