BRIDGE ENGINEERING

PROF. PIYALI SENGUPTA
Department of Civil Engineering
IIT-ISM

PRE-REQUISITES : Structural Analysis, Solid Mechanics, Design of Concrete Structure, Design of Steel Structure

INTENDED AUDIENCE : UG, PG and PhD Students; Working Professionals

INDUSTRY SUPPORT : Construction Industry, Design and Consultancy Firms

COURSE OUTLINE :

Bridges constitute a significant portion of the national economy of a country and serve as a foundation for infrastructure development. With several new bridges required to be constructed and numerous existing bridges required to be repaired and retrofitted across the world, it is essential to study a course on “Bridge Engineering”. This course on “Bridge Engineering” aims at knowledge development of principles of engineering mechanics, load transfer mechanisms, analysis methodologies, design principles, damage mechanics, failure mechanisms, construction, inspection, maintenance, repair and retrofit strategies in the realm of bridge engineering. Additionally, advanced topics in the domain of bridge engineering, like, fatigue and fracture in bridges, use of shape memory alloys (SMA) and special concrete for repair of bridges, 3D printing of bridges, high speed railway bridges, will also be introduced in this course. After successful completion of this course, the students will be able to equip themselves with fundamental concepts, acquire an in-depth knowledge on analysis and design of a wide variety of bridges, understand field-based construction, inspection, maintenance, repair and rehabilitation techniques of bridges and comprehend the emerging global trends in the domain of bridge engineering.

ABOUT INSTRUCTOR :

Prof. Piyali Sengupta (M. ASCE, M. ACI, A.M. EERI, M. IABSE, M. IEI) is presently serving as Assistant Professor in Department of Civil Engineering of Indian Institute of Technology (ISM) Dhanbad since 2017. She received her PhD from Structures and Mechanics Division of School of Civil and Environmental Engineering, Nanyang Technological University (NTU), Singapore in 2014. She obtained her B.E. in Civil Engineering with First Class (Honours) from Indian Institute of Engineering Science and Technology (IIEST), Shibpur in 2007. Before joining IIT (ISM) Dhanbad, she served as post-doctoral research fellow in National University of Singapore (NUS) for three years. She also acquired two years of industry experience while being associated with M. N. Dastur & Co (Pvt.) Limited, Kolkata, India and EMAS-AMC PTE LTD, Singapore. Her primary research interest comprises vulnerability assessment of bridges and tall and special buildings under extreme loading. She is recipient of Early Career Research Award by Science and Engineering Research Board of Department of Science and Technology (DST) in 2019 for her research project on “Multi-Hazard Performance Assessment of Highway Bridges under Seismic and Blast Loading”. She has authored several research publications in SCI-indexed journals and reputed conferences. She also served as the secretary of American Society of Civil Engineers (ASCE), India Section, Eastern Region during 2019-2021.

COURSE PLAN :
Week 1: Introduction
Week 2: Reinforced Concrete Slab Bridge Decks
Week 3: Box Culverts and Pipe Culverts
Week 4: Steel Truss Bridges
Week 5: Plate Girder Bridges
Week 6: Arch Bridges, Suspension Bridges, Cable-Stayed Bridges, Balanced Cantilever Bridges
Week 7: Prestressed Concrete Bridges and Composite Bridges
Week 8: Rigid Frame Bridges and Continuous Girder Bridges
Week 9: Piers, Abutments and Foundations
Week 10: Bridge Bearings, Joints and Appurtenances
Week 11: Construction, Maintenance and Rehabilitation of Bridges
Week 12: Advanced Topics in Bridge Engineering