COLLEGE OF ENGINEERING AND COMPUTER SCIENCE
FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

Ishwarya Srikanth

for the degree of Doctor of Philosophy (Ph.D.)

"Stochastic Bridge Condition Deterioration Models for Concrete and Timber Bridges"

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Virtual Dissertation

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ABSTRACT OF DISSERTATION
Stochastic Bridge Condition Deterioration Models for Concrete and Timber Bridges

This dissertation presents methodologies to develop bridge condition deterioration models which account for non-stationarity in the deterioration process with applications to Florida concrete and timber bridges. A critical and comprehensive review of bridge deterioration modeling approaches is presented with illustrative examples based on regression, stochastic Markov-chain, mechanistic and Artificial Neural Network (ANN) models. This study also develops a framework for relating the qualitative National Bridge Inventory (NBI) condition ratings with normalized resistance of the concrete bridge component with application to concrete bridge T-beams. A systematic approach for the prioritization of bridges for inspection is developed using the multivariate regression modeling technique, and forecasting models are developed based on multiple relevant variables for both concrete bridge superstructure and substructure components.

This dissertation also develops an approach for risk and reliability assessments of concrete and timber bridges based on non-parametric deterioration modeling techniques such as average time-in condition rating (ATICR) and Kaplan-Meier (K-M) survival (reliability) models, for probabilistic prediction of bridge safety while accounting for the partial information from the incomplete bridge condition observations. This study develops relative deterioration rates based on the ATICR and illustrates the time-dependent probability of deterioration of the concrete and timber bridge components based on K-M estimates. Further, the relationship of explanatory variables to the survival time is discussed and estimates are made for the median survival years for reinforced concrete solid slab decks. This dissertation presents the code developed in *R* for multivariate regression analysis and data-driven reliability analysis. Future research studies in bridge deterioration modeling are also presented.

BIOGRAPHICAL SKETCH
Born in Tiruvannamalai, India
M.S., Ecole Centrale de Nantes, France, 2016
M.S., College of Engineering Guindy, Anna University Chennai, India, 2016
Ph.D., Florida Atlantic University, Boca Raton, Florida, 2021

CONCERNING PERIOD OF PREPARATION &
QUALIFYING EXAMINATION

Time in Preparation: 2017 – 2021

Qualifying Examination Passed: Spring 2018

Papers in the area of bridge deterioration models:

Ishwarya Srikanth, Madasamy Arockiasamy, "Deterioration models for prediction of remaining useful life of timber and concrete bridges: a review." *Journal of Traffic and Transportation Engineering (English Edition), Elsevier.* 2020. Apr 1,7(2):152-73.

Ishwarya Srikanth, Madasamy Arockiasamy, "Remaining Service Life Prediction of Aging Concrete bridges using Multiple Relevant Explanatory Variables". *ASCE Practice Periodical in Structural Design and Construction.* DOI: 10.1061/(ASCE)SC.1943-5576.0000604. 2021

Ishwarya Srikanth, Madasamy Arockiasamy, "Development of Non-Parametric Deterioration Models for Risk and Reliability Assessments of Concrete and Timber Bridges", *ASCE Journal of Performance of Constructed Facilities*. 2021 (Under review)

Papers in the related subject areas:

Ishwarya Srikanth, Madasamy Arockiasamy, Sudhagar Nagarajan," Comparison of Ratings of a 7-Span Open Deck Timber Trestle Railroad Bridge Based on As-Built Provisions and Current AREMA Guidelines", *Transportation Research Board 97th Annual Meeting.* No. 18-06100. 2018.

Ishwarya Srikanth, and Madasamy Arockiasamy, "Integrated Probabilistic-Mechanistic Deterioration Modeling for Preventive Maintenance of Aging Fixed Offshore Jacket-Type Platforms*." In ASME 2021 39th International Conference on Ocean, Offshore and Arctic Engineering. American Society of Mechanical Engineers Digital Collection*, 2020.

Ishwarya Srikanth, Madasamy Arockiasamy, "Stochastic Time-Dependent Deterioration Models for Estimating Residual Service Life of Offshore Jacket-Type Platforms", *In ASME 2021 40th International Conference on Ocean, Offshore and Arctic Engineering. American Society of Mechanical Engineers Digital Collection*, 2021. (Accepted).

Madasamy Arockiasamy, Sudhagar Nagarajan, Hassan Mahfuz, Michael R. Maniaci, Ishwarya Srikanth, Stephen Michael Castillo, Reinaldo Dos Santos, "A Student-Centered Program to Increase STEM Interest through NASA-STEM Content, *In ASEE Annual Conference and Exposition, Conference Proceedings.* 2021.(Accepted)