STRUCTURAL RELIABILITY (corso di Laurea STReGA, in Lingua Inglese)
2017-2018, II Semestre
Docente: Prof. Fatemeh Jalayer
Cultore: Dr. Hossein Ebrahimian

Date	Lecture
09/03/2018	Introduction
13/03/2018	Preliminary concepts in Probability
14/03/2018	Discrete Probability distributions (PMF, CDF) Uniform, Bernoulli, Binomial Distributions
16/03/2018	Continuous Probability distributions (CDF and PDF), Uniform Distribution
20/03/2018	Exercise session
21/03/2018	Statistics of Probability Distributions (expected value, variance, covariance, correlation)
23/03/2018	Poisson Distribution (Poisson and Exponential)
27/03/2018	Exercise session
28/03/2018	Poisson Distribution (Gamma and Filtered Poisson)
04/04/2018	Normal Distribution (PDF, CDF, statistics, confidence intervals), Lognormal Distribution (median and coefficient of variation)
06/04/2018	sample mean, standard deviation and covariance, linear regression probabilistic model, logaritmic linear regression
10/04/2018	Exercise Session
11/04/2018	Introduction to PSHA, seismogenic sources, source to site distance definitions, moment balancing on a fault, truncated exponen
13/04/2018	PSHA, YC recurrence model, characteristic recurrence model, PSHA formulation for point source, PHSA formulation for linear so
17/04/2018	Exrecise session: Source Charachterization
18/04/2018	PSHA, Areal source (point source model), Attenuation Relations (GMPE), linear source (finite rupture length)
20/04/2018	PSHA, hazard curve, uniform hazard spectrum, seismic hazard deaggregation, epsilon and spectral shape, conditional spectrum
24/04/2018	Exercise: Use MATLAB to perform PSHA of a real Areal Source
25/04/2018**	Probabilistic seismic demand analysis II
27/04/2018	Exercise: Calculation of UHS for the site using MATLAB and PSHA Disaggregation of that Site
1/05/2018**	Exercise session
02/05/2018	Calculation of demand hazard, derivation of the closed-form for demand hazard, calculation of risk and the derivation of its clo
04/05/2018	postponed
08/05/2018	Calculation of risk integral, the IM-based version, the IM-based closed-form risk expression, consideratio of epistemci uncertaint
09/05/2018	Safety-checking based on DCFD format, IM-based, Demand-based, with and without epistemci uncertainties, The cloud Method
11/05/2018	Fragility assessment for Cloud Method, Fragility Curves, The Incremental Dynamic Analysis (The Method, Safety-checking and Fra
15/05/2018	Exercise session: Safety checking based on DCFD format, Uncertainty propagation, Calculation of Fragility curve
16/05/2018	The Multiple-stripe analysis (MSA), differences with IDA, safety-chekicng and fragility assessment with MSA, a breif overview of t
18/05/2018	The reliability methods, component reliability, second moment methods, safety margin and safety ratio formulations, systems in
22/05/2018	Exercise session: solution to PSHA, Seismic Fragility and Risk Assessment, Notes on DCFD
23/05/2018	Mean Value First order second moment (MVFOSM) reliability method and FOSM
25/05/2018	First order second moment (FOSM) reliability method, Importance Measure, FORM, Nataf Distribution
29/05/2018	Exercise session: solutions closed-from, risk integral and cloud regression
30/05/2018	Monte Carlo Simulation
01/06/2018	Importance Sampling
05/06/2018	Exercise session: solutions on Fragility, risk and safety checking using IDA, and CLOUD
06/06/2018	Reliability analysis of elastic perfectly plastic SDOF system, MVFOSM, FOSM, Generalized Second Moment and Monte Carlo Sim
08/06/2018	Exercise session:solutions on Fragility, risk and safety checking using IDA, and CLOUD / Example on Monte Carlo Simulation

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40% Exercise, 60% Final Exam (written and oral)

Text Books:

1. Course notes
2. R. E. Melchers. Structural reliability analysis and prediction, 2nd Ed., 2002, John Wiley.
3. O. Ditlevsen, H. O. Madsen. Structural Reliability Methods, Internet Edition, 2007, John Wiley & Sons
4. J. Benjamin, C.A. Cornell, Probability, Statistics, and Decision for Civil Engineers, Dover Books on Engineering, 2014
5. Jalayer F, Cornell CA. A technical framework for probability-based demand and capacity factor design
6. (DCFD) seismic formats. Pacific Earthquake Engineering Center (PEER) 2003/08.
7. FEMA-SAC Joint Venture. Recommended seismic design criteria for new steel moment-frame buildings.
8. Federal Emergency Management Agency, 2000. FEMA-547, Federal Emergency Management Agency, 2006.
9. FEMA 445-ATC-58: Next-Generation Performance-based Earthquake Engineering Design Criteria for Buildings: Program Plan for New and Existing Buildings, 2006.