

| Module Nr. | Credits | Workload | Semester | Frequency | Duration |
|--|---------|----------|---------------------|-------------------|-------------------|
| SE-CO-8 | 6 CP | 180 h | 2 | Yearly (SS) | 1 Semester |
| Courses | | | Contact time | Self-study | Group size |
| Numerical Methods and Stochastics | | | 4 h/week | 120 h | --- |
| Numerical Methods in Stochastics | | | | | |
| Learning outcomes | | | | | |
| After successfully completing the module the students, the students should become familiar with modern numerical and stochastic methods. | | | | | |
| Content | | | | | |
| Numerical Methods: | | | | | |
| <ul style="list-style-type: none"> • Boundary value problems for ordinary differential equations (shooting, difference and finite element methods) • Finite element methods (brief retrospection as a basis for further material) • Efficient solvers (preconditioned conjugate gradient and multigrid algorithms) • Finite volume methods (systems in divergence form, discretization, relation to finite element methods) • Nonlinear optimization (gradient-type methods, derivative free, methods, simulated annealing) | | | | | |
| Stochastics: | | | | | |
| <ul style="list-style-type: none"> • Fundamental concepts of probability and statistics: (multivariate) densities, extreme value distributions, descriptive statistics, parameter estimation and testing, confidence intervals, goodness of fit tests • Time series analysis: trend and seasonality, ARMA models, spectral density, parameter estimation, prediction • Multivariate statistics: correlation, principal component, analysis, factor analysis • Linear models: multiple linear regression, F-test for linear, hypotheses, Analysis of Variance | | | | | |
| Teaching Methods / Language | | | | | |
| Lectures (3h / week), Exercises (1h / week) / English | | | | | |
| Modes of assessment | | | | | |
| Written examination (180 min) | | | | | |
| Requirements for the award of credit points | | | | | |
| Passing the written examination | | | | | |
| Module applicability (in other study programs) | | | | | |
| Master Computational Engineering | | | | | |
| Weight of the mark for the final score | | | | | |
| 5 % | | | | | |

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| Module coordinator and lecturer(s) Prof. Dr. H. Dehling (coordinator), Assistants |
| Other information Basic knowledge of: partial differential equations, numerical methods and stochastics |