# COURSE DETAIL

| COMPUTATIONAL METHODS OF THE NATURAL SCIENCES |
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| **Country**<br>Germany |
| **Host Institution**<br>Free University of Berlin |
| **Program(s)**<br>Free University Berlin |
| **UCEAP Course Level**<br>Upper Division |
| **UCEAP Subject Area(s)**<br>Physics |
| **UCEAP Course Number**<br>113 |
| **UCEAP Course Suffix** |
| **UCEAP Official Title**<br>COMPUTATIONAL METHODS OF THE NATURAL SCIENCES |
| **UCEAP Transcript Title**<br>COMPUTATNL METHODS |
| **UCEAP Quarter Units**<br>8.50 |
| **UCEAP Semester Units**<br>5.70 |

**Course Description**

This course covers the following subjects: representations of numbers and arithmetic error (floating point math), functions and roots, linear and non-linear systems of equations, interpolation and approximative representations of functions, numerical differentiation and integration, ordinary and partial differential equations, eigenvalue problems (wave equations), molecular dynamics simulations (planet systems, Lennard-Jones liquids, molecular chaos), stochastics, Monte-Carlo integration, Monte-Carlo metropolis simulation (lattice spin model), optimization of non-linear problems, steepest descent,  conjugate gradient, simulated annealing (traveling salesman problem), Fourier transforms, spectral analysis (analysis of acoustic signals, audio synthesis), networks, infection models, random walks, reaction-diffusion systems, predator-prey population dynamics, cellular automata (Game of Life), and artificial neural networks.

**Language(s) of Instruction**
German

**Host Institution Course Number**
20101201 ,20101202

**Host Institution Course Title**
COMPUTERGESTÜTZTE METHODEN DER EXAKTEN NATURWISSENSCHAFTEN

**Host Institution Course Details**
https://www.fu-berlin.de/vv/en/lv/1015222?m=1502467&pc=909347&sm=934771&id=1015...

**Host Institution Campus**

**Host Institution Faculty**

**Host Institution Degree**

**Host Institution Department**

Physik

**Course Last Reviewed**
2025-2026

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