

*Only the german version of the module description as part of the study regulations is legally binding.*

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Module name                     | <b>Advanced Problem Solving and Search</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Module number                   | INF-25-Ma-FTK-APSS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Responsible lecturer            | Dr. Sarah Alice Gaggl<br>sarah.gaggl@tu-dresden.de                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Qualification objectives        | Students are familiar with scientific methods for dealing with difficult combinatorial and search problems that are relevant for applications in computer science. They understand their formal modeling and know methods for solving them. They are able to formally examine the computational properties of these problems and the associated algorithms.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Content                         | Contents of the module are uninformed and informed search, local search, stochastic hill climbing, simulated annealing, tabu search, constraint satisfaction problems, evolutionary and genetic algorithms, answer set programming as well as structural decomposition techniques such as tree and hypertree decompositions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Teaching and learning methods   | The module comprises lectures of 2 SWS, exercises of 2 SWS and self-study. The language of instruction for the lectures and exercises is English.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Prerequisites for participation | In the Diploma Program in Computer Science, the modules INF-25-Ba-AuD Algorithms and Data Structures, INF-25-Ba-AuB Automata and Computability Theory, INF-25-Ba-LuK Logic and Complexity, INF-25-Ba-Ma1 Linear Algebra and Analysis, INF-25-Ba-Ma2 Discrete Structures, INF-25-Ba-Ma3 Algebra, INF-25-Ba-Ma4 Probability Theory and Statistics, INF-25-Ba-DMF Data Management Foundations, INF-25-Ba-SWT Software Technology and INF-25-Ba-KI Artificial Intelligence. The Master's degree course in Computer Science requires knowledge of the fundamentals of algorithm design, formal languages, theoretical computer science and propositional and predicate logic as well as knowledge of mathematics at Bachelor's level.                                                                                                                                                                                                                                                                                                                                                      |
| Applicability                   | The module is a compulsory elective module in the Diploma degree course in Computer Science in the main course of study in the subject area of Theoretical Computer Science and Symbolic Artificial Intelligence, which must be selected in accordance with Annex 2 to the examination regulations. In the Master's degree program in Computer Science, the module is a compulsory elective module in the open track in the subject area of Theoretical Computer Science and Symbolic Artificial Intelligence and the supplement, which must be selected in accordance with Annex 2 to the examination regulations. The module can only be chosen once in the Master's degree program in Computer Science. The module cannot be selected in the Master's degree program in Computer Science if this module or a module with essentially the same content from a degree program with which the admission requirements according to Section 3 of the study regulations have already been completed. The module creates the prerequisites for the modules listed under prerequisites for |

|                                        |                                                                                                                                                                                 |
|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                        | participation.                                                                                                                                                                  |
| Requirements for earning credit points | Credit points are earned if the module examination is passed. The module examination consists of a written examination lasting 90 minutes. The examination language is English. |
| Credit points and grades               | 6 credit points can be earned through the module. The module grade corresponds to the grade of the examination.                                                                 |
| Module frequency                       | The module is offered every winter semester.                                                                                                                                    |
| Workload                               | The total workload is 180 hours.                                                                                                                                                |
| Module duration                        | The module comprises one semester.                                                                                                                                              |