

<b>Modern Programming Concepts in Engineering</b>					
<b>Module-No./Abbreviation</b>	<b>Credits</b>	<b>Workload</b>	<b>Term</b>	<b>Frequency</b>	<b>Duration</b>
CE-P04/MPCE	6 CP	180 h	1 <sup>st</sup> Sem.	Winter term	1 Semester
<b>Course</b> Modern Programming Concepts in Engineering			<b>Contact hours</b> 4 SWS (60 h)	<b>Self-Study</b> 120 h	<b>Group Size:</b> No Restrictions
<b>Prerequisites</b> No prior knowledge or preliminary modules.					
<b>Learning goals / Competences:</b> In this course, students acquire fundamental skills for the development of software solutions for engineering problems. This comprises the capability to analyze a problem with respect to its structure such that adequate object-oriented software concepts, data structures and algorithms can be applied and implemented. In this course Java is used as a programming language. The conveyed solution techniques can be easily transferred to other programming languages. After successfully completing the module, the students <ul style="list-style-type: none"> <li>• will have acquired fundamental skills for the development of software solutions employed in engineering problems,</li> <li>• are capable of analyzing a problem with respect to its structure such that adequate object-oriented software concepts, data structures and algorithms can be applied and implemented,</li> <li>• are able to code typical engineering programs in the Java programming language,</li> <li>• can quickly and efficiently learn further programming languages needed in engineering based on the fundamental concepts presented in the course.</li> </ul>					
<b>Content</b> Lectures and exercises cover the following topics: <ul style="list-style-type: none"> <li>• Principles of object-oriented modeling <ul style="list-style-type: none"> <li>○ Encapsulation</li> <li>○ Polymorphism</li> <li>○ Inheritance</li> </ul> </li> <li>• Unified Modeling Language (UML)</li> <li>• Basic programming constructs</li> <li>• Fundamental data structures</li> <li>• Implementation of efficient algorithms <ul style="list-style-type: none"> <li>○ Vector and matrix operations</li> <li>○ Solving systems of linear equations</li> <li>○ Grid generation techniques</li> </ul> </li> <li>• Using software libraries <ul style="list-style-type: none"> <li>○ View3d as visualization toolkit</li> <li>○ Packages for graphical user interfaces</li> </ul> </li> </ul> During the exercises, students practice object-oriented programming techniques in the computer lab on the basis of fundamental engineering problems.					
<b>Teaching methods / Language</b> Lecture (2h / week), Exercises (2h / week) / English					
<b>Mode of assessment</b> Written examination (120 min, 100%)					
<b>Requirement for the award of credit points</b> Passed final module examination					
<b>Module applicability</b> MSc. Computational Engineering					

<b>Weight of the mark for the final score</b> 4 %
<b>Module coordinator and lecturer(s)</b> Prof. Dr.-Ing. M. König, Assistants
<b>Further information</b>