

<b>Program of Studies:</b>	<b>Master Program Bioinformatics</b>
<b>Name of the module:</b>	<b>Introduction to Computational Logic</b>
<b>Abbreviation:</b>	<b>I-M-8</b>
<b>Subtitle:</b>	Core lecture
<b>Modules:</b>	Lecture 4 h (weekly) Tutorial 2 h (weekly)
<b>Semester:</b>	1 <sup>st</sup> -3 <sup>rd</sup> Semester / At least once every two years
<b>Responsible lecturer:</b>	Prof. Dr. Gert Smolka
<b>Lecturer:</b>	Prof. Dr. Gert Smolka
<b>Language:</b>	English
<b>Level of the unit/ Mandatory or not :</b>	Graduate course / mandatory elective
<b>Course type/weekly hours:</b>	Lecture 4 h (weekly) Tutorial 2 h (weekly) Tutorials in groups of up to 20 students
<b>Total workload:</b>	270 h = 90 h of classes and 180 h private study
<b>Credits:</b>	9
<b>Entrance requirements:</b>	For graduate students: none
<b>Aims/Competences to be developed:</b>	<ul style="list-style-type: none"> <li>- structure of logic languages based on type theory</li> <li>- distinction notation / syntax / semantics</li> <li>- structure and formal representation of mathematical statements</li> <li>- structure and formal representation of proofs (equational and natural deduction)</li> <li>- solving Boolean equations</li> <li>- proving formulas with quantifiers</li> <li>- implementing syntax and deduction</li> </ul>

<b>Content:</b>	<p><i>Type Theory</i></p> <ul style="list-style-type: none"> <li>• functional representation of mathematical statements</li> <li>• simply typed lambda calculus, De Bruijn representation and substitution, normalization, elimination of lambdas</li> <li>• Interpretations and semantic consequence</li> <li>• Equational deduction, soundness and completeness</li> <li>• Propositional Logic</li> <li>• Boolean Axioms, completeness for 2-valued interpretation</li> <li>• resolution of Boolean equations, canonical forms based on decision trees and resolution</li> </ul> <p><i>Predicate Logic (higher-order)</i></p> <ul style="list-style-type: none"> <li>• quantifier axioms</li> <li>• natural deduction</li> <li>• prenex and Skolem forms</li> </ul>
<b>Assessment/Exams:</b>	<ul style="list-style-type: none"> <li>- Regular attendance of classes and tutorials</li> <li>- Passing the midterm and the final exam</li> </ul>
<b>Literature:</b>	Will be announced on the course website