Georg-August-Universität Göttingen **Module M.Inf.1115: Advanced Topics on Algorithms**	5 C 4 WLH

Learning outcome, core skills: We expect that the students will become familiar with efficient sorting and searching methods, advanced data structures, dynamic data structures, as well as other efficient algorithmic methods, they will be able to estimate the complexity of those algorithms, and they will be able to apply those algorithms to particular programming problems (from practical or theoretical settings).	**Workload:** Attendance time: 56 h Self-study time: 94 h

Course: M.Inf.1115.Lec **Advanced Topics on Algorithms** (Lecture, Exercise) *Contents*: In this course we present a series of selected results on data structures and efficient algorithms, and discuss a series of areas in which they can be applied successfully. The emphasis of the course is on the theory, we also approach the problem of a practical implementation of the presented algorithms. The main topics our course will cover are: efficient sorting and searching (non-comparison based methods, van Emde Boas trees, Radix Sort), advanced tree-structures (Fibonacci heaps, B-Trees, structures for working with disjoint sets), dynamic data structures (range minimum queries, lowest common ancestor, applications to string algorithms: suffix arrays, suffix trees), Hashing and Dictionaries, Young tableaux, geometric algorithms (convex hull), number theoretic algorithms. The presentation of each theoretical topic from the above will be accompanied by a brief discussion on its possible applications. Literature • T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein: Introduction to Algorithms (3rd Edition), MIT Press, 2009. • E. Demaine: Advanced Data Structures, MIT Course nr. 6.851, 2012. • Pawel Gawrychowski and Mayank Goswami and Patrick Nicholson: Efficient Data Structures, MPI Course, Summer 2014.	4 WLH
Examination: Oral examination (approx. 20 minutes) M.Inf.1115.Mp: Advanced Topics on Algorithms **Examination requirements:** efficient sorting and searching (non-comparison based methods, van Emde Boas trees, Radix Sort), advanced tree-structures (Fibonacci heaps, B-Trees, structures for working with disjoint sets), dynamic data structures (range minimum queries, lowest common ancestor, applications to string algorithms: suffix arrays, suffix trees), Hashing and Dictionaries, Young tableaux, geometric algorithms (convex hull), number theoretic algorithms	5 C

Admission requirements: none	**Recommended previous knowledge:** none
Language: English	**Person responsible for module:** Prof. Dr. Florin Manea

Course frequency: irregular	**Duration:** 1 semester[s]
Number of repeat examinations permitted: twice	**Recommended semester:**
Maximum number of students: 50	