

# Introduction to conformal field theory, fall 2011

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### Lecturer

[Jouko Mickelsson](#)

### Scope

10 cu.

### Type

Advanced studies

### Prerequisites:

Certain mathematical maturity in abstract algebra and Hilbert space theory, which can be obtained from the algebra/functional analysis courses at the mathematics department or through self studies. On the physics side, in order to understand the motivation for the aims of CFT, it is recommended to have as prerequisites the basics in relativity theory and in quantum mechanics (from the standard theoretical physics courses).

### Contents:

Conformal field theory (CFT) in a two dimensional space-time is important for at least two reasons: First, CFT models can be mathematically rigorously constructed in contrast to nontrivial quantum field theory models in four dimensions, and they are also a rich source for interesting problems in pure mathematics. Secondly, some of the CFT models can be actually applied to interesting physical problems in surface physics, with links to quantum statistical mechanics.

The present course is more mathematics oriented and is therefore recommended for advanced undergraduate and PhD mathematics students as well as for advanced theoretical physics students.

Some topics to be covered: Conformal transformations in two and higher dimensions. The energy momentum tensor in 2D CFT and the Virasoro algebra. Representations of the Virasoro algebra. Wess-Zumino-Witten model; geometrical and algebraic aspects. Affine Lie algebras and their representations. CFT from vertex operator algebras.

### Lectures

Weeks 36-42 and 44-50, Monday 10-12 in room C123, Tuesday 10-12 in room B322. Two hours of exercise classes per week.

### Exams: Written examination January 26, 2012, 4-8 pm

### Bibliography

Martin Schottenloher: A Mathematical Introduction to Conformal Field Theory. Lecture Notes in Physics 759. Springer Verlag, second edition(2008).

[Lecture notes pp. 1-32](#)

[Lecture notes pp. 33-45](#)

[Lecture notes pp. 45-58](#)

### Registration

Did you forget to register? [What to do.](#)

### Exercise groups

Group	Day	Time	Place	Instructor
1.	Wed	10-12	B322	Kalle Kytölä

[Exercise set 1, Sept. 14](#)

[Exercise set 2, Sept. 21](#)

**Exercise set 3, Sept. 28**

**Exercise set 4, Oct. 12**

**Exercise set 5, Oct. 19**

**Exercise set 6, Nov. 2**

**Exercise set 7, Nov. 9**

**Exercise set 8, Nov. 16**

**Exercise set 9, Nov. 23**

**Exercise set 10, Nov. 30**

**Exercise set 11, Dec. 7**