Introduction to String Theory
Syllabus of the course 40517, SS 2016

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Topics

1. Introduction and overview of the course. Historical introduction (GSW 1; POL 1.1);
2. Classical bosonic string: relativistic particle, Nambu-Goto action, Polyakov action, oscillator expansions (GSW 2.1; POL 1.1; LT 2; TONG 1; ZWIE 6.3; ARU 3.2.3);
3. Quantized bosonic string: sketch of old covariant quantization, Lightcone Quantization (TONG 2; LT 3.1-3.3; ARU 4.2.1);
4. Introduction to Conformal Field Theory: basically TONG 4 (also POL 2; DIX III.A-D,F,H; related parts in DIFR);
5. Polyakov path integral and ghosts, states and vertex operators (TONG 5, ARU page. 66-68; DIX IV.A,IV.C);
6. String interactions: Tree-level scattering amplitudes for open and closed strings, high-energy scattering, one-loop amplitudes, string 1-loop partition function (TONG 6; POL 3, 7; LT 6, BBS 3.5, NAKA 2.1.2);
7. Strings in background fields (TONG 7; POL 3.7; GSW 3.4);

Acronyms List

GSW: M. B. Green, J. H. Schwarz, E. Witten, "Superstring Theory, Volume 1: Introduction", Cambridge Monographs on Mathematical Physics;

POL: J. Polchinski, "String Theory, Volume 1: Introduction", Cambridge Monographs on Mathematical Physics;

LT: D. Lüst, S. Theisen, "Lectures on String Theory", Springer Verlag;

TONG: D. Tong, String Theory, University of Cambridge Part III Mathematical Tripos, http://arxiv.org/pdf/0908.0333.pdf;

ZWIE: B. Zwiebach, "A first course in String Theory", Cambridge University Press;

BBS: K. Becker, M. Becker, J. H. Schwarz, "String Theory and M-theory:
a modern introduction", Cambridge University Press;

ARU: G. Arutyunov, "Lectures on String Theory",
http://www.staff.science.uu.nl/ aruty101/lecture1.pdf ;

DIX: L .J. Dixon, "Introduction to conformal field theory and string theory",
http://www.slac.stanford.edu/cgi-wrap/getdoc/slac-pub-5149.pdf ;

DIFR: P. Di Francesco, P. Mathieu, D. Sénéchal, "Conformal Field Theory", Springer Verlag;

NAKA: M. Nakahara, "Geometry, Topology and Physics", Institute of Physics Publishing;

SZA: R. Szabo, "BUSSTEPP Lectures on String Theory: An Introduction
to String Theory and D-Brane Dynamics",
http://arxiv.org/pdf/hep-th/0207142v1.pdf.

Description of the final exam

All students of the SS 2016 which already had a course in quantum field theory and handed in a minimum of *half of the Problem Sets* given during the course are admitted to the final exam.

The exam will consist of:
– 20 minutes blackboard presentation of one argument chosen by the candidate, with related problem solution chosen from the ones in the Problem Sets given during the course;
– 20 minutes oral examination on the topics presented during the course.