

# Plan for 8.821, String Theory

as of 09.20.07. with relevant reading material.

1. overview. (Joe 1.1, 3.1, try GSW ch 1, Uranga's overview lectures)
2. classical bosonic strings (mostly GSW 2.1, Joe 1.2)
3. why and how do we impose virasoro constraints? (some of GSW 2.2)  
solve them using lightcone gauge quantization.  
find the spectrum of the open string. (Joe 1.3-4, GSW 2.3)  
use zeta-function regularization to find the critical dimension at which the light cone quantization gives a lorentz-invariant spectrum
4. closed-string spectrum in LCG  
high-energy density of states (GSW p. 117 et seq., )  
there is more to life than 26-d flat space: torus compactification (the non-CFT parts of Joe 8.1-8.3, Uranga's lecture 3)  
the spectrum of the bosonic string on a circle  
enhanced gauge symmetry at  $R = \sqrt{\alpha'}$   
T-duality
5. (GSW 3.1, 3.4, Joe ch 3.2, 3.3, 3.7)  
how do the spacetime EoM arise from 2d perspective and why?  
strings in background fields (effect of dilaton, strings are charged under  $B_{\mu\nu}$ , beta functions)  
gauge fixing of polyakov path integral (to discover another example of a 2d CFT)
6. systematic discussion of euclidean 2d CFT, part 1 (peskin's lectures linked on webpage §2, 3.1, 4.3, Joe ch. 2)
7. CFT 2 [JP ch2] in what sense is  $c \neq 26$  a conformal anomaly?
8. measure for moduli [JP ch 5], tree level amplitudes [JP ch 6]
9. one loop amplitudes, modular invariance [JP ch 7]
10. D-branes, worldvolume gauge theory [JP ch 8]
11. superstring worldsheet technology [JP ch 10]
12. superstring spectrum, including heterotic strings. [end of ch 10]
13. string duality (Batman lecture) [JP ch 12]
14. open-closed duality
15. black hole microstates.
16. AdS/CFT 1
17. CY compactification
18. heterotic on CY, some phenomenology

19. orbifolds
20. supersymmetric sigma models
21. GLSM
22. seiberg-witten
23. the conifold
24. AdS/CFT 2, warping
25. flux vacua, throats, the potential for moduli, supercritical strings.