Lecture homepage is `http://www.physik.uni-bielefeld.de/~yorks/qcd13`

1. Introduction 2

1.1 QCD Appetizer 2
1.2 Reality checks 5
1.3 Color charge in QCD 7
1.4 Elements of gauge theory 9
1.5 Notation and conventions 11

2. Basics 12

2.1 Reminder: QED and gauge invariance 12
2.2 Generalization: Yang-Mills Lagrangian 15
2.3 QCD and its symmetries 18
2.4 Quantization, path integral (remarks only) 21
2.5 QCD Feynman rules 24

3. Fundamentals 29

3.1 One-loop divergences in QCD 30
3.2 More 1-loop divergences in QCD 34
3.3 One-loop counterterms in QCD 37
3.4 QCD β fct, running coupling 40

4. QCD in e^+e^--annihilation 43

4.1 $e^+e^- \to$ hadrons at leading order 43
4.2 The Z-peak in $R(s)$ 46
4.3 QCD corrections to $R(s)$ 48
4.3.1 Real corrections: $\sigma_{e^+e^-\to q\bar{q}g}$ 48
4.3.2 Virtual corrections: $\sigma_{e^+e^-\to q\bar{q}}$ at $O(\alpha_s)$ 52
4.3.3 Results 55
4.3.4 Higher-order corrections to $R(s)$ 57

5. Deep inelastic scattering (DIS) 59

5.1 Structure functions 59
5.2 Parton distribution functions 62
5.3 QCD corrections in DIS 64
5.3.1 DIS at NLO: $eq \to eqg$ 65
5.3.2 DIS at NLO: 1-loop $eq \to eq$ 67
5.3.3 Factorization, evolution 68
5.3.4 DIS at NLO: $eg \to q\bar{q}$ 71

6. "Anomalies" 72

6.1 Vector current conservation 73
6.2 Axial current non-conservation 75

7. Outlook 78