Physics 598
Fall Semester 2022, Academic Year 2022/2023
List of Suggested Term Papers

Professor Eduardo Fradkin

October 24, 2022

1. Non-linear Sigma models and quantum spin chains.
   References: F. D. M. Haldane, Phys. Lett. A **93**, 464 (1983); Phys. Rev. Lett. **50**, 1153 (1983).

2. Frustrated Quantum Magnets
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3. Quantum Dimer Models
   References: S. A. Kivelson, D. S. Rokhsar, and J. P. Sethna, Phys. Rev. B 35, 8865 (1987)
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   E. Fradkin, Field Theories of Condensed Matter Systems, Second Edition (Cambridge University Press, 2013), Chapter 9
   X. G. Wen, Phys. Rev. B 44, 2664 (1991)
   C. Mudry and E. Fradkin, Phys. Rev. B 49, 5200 (1994)
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4. Localization theory and the IQHE.
   References: E.Abrahams, P.W.Anderson , D. C. Licciardello and T. V.

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Chapter 5 of the book by S.Girvin and R.Prange, *The Quantum Hall Effect*.

5. Quantum Hall Effect on a Lattice, Berry Phase, and Topological Invariants
References: D. J. Thouless, M. Kohmoto, P. M. Nightingale and M. den Nijs, Phys. Rev. Lett. 46, 405 (1982)
M. Kohmoto, Ann. Phys. 160, 343 (1985)
Q. Niu, D. J. Thouless, and Y. S. Wu, Phys. Rev. B 31, 3372 (1985).

6. Laughlin's theory of the FQHE.
References: R. Laughlin, Phys. Rev. Lett. 50, 1395 (1983)
R. Laughlin in Chapter 7 of the book by S.Girvin and R.Prange, *The Quantum Hall Effect*.

7. Hierarchies of Fractional Quantum Hall States
References: F.D.M.Haldane, Phys. Rev. Lett. 51, 605 (1983)
B.I.Halperin, Phys. Rev. Lett. 52, 1583 (1984)
F.D.M.Haldane, Chapter 8 of the book by S.Girvin and R.Prange, *The Quantum Hall Effect*
J. K. Jain, Phys. Rev. B 40, 8079 (1989); Adv. Phys. 41, 105 (1992)

8. Landau-Ginzburg Theory of The FQHE
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9. Fermion Chern-Simons Theory of the FQHE
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