

| TENTATIVE SCHEDULE FOR PHYSICS 402, FALL 2022 |       |  |  |        |      |                   |
|---|-------|--|--|--------|------|-------------------|
| Date  | Mtg.# | Reading Assignment                                   | Topic  | HW Due | QUIZ | EXAMS             |
| <b>Week 1</b>                                 |       | <b>Griffiths / Krane / Liboff / Sakurai --&gt;</b>   | <b>(Krane, Liboff - lower level treatment; Sakurai - higher level treatment)</b>                   |        |      |                   |
| 8/29  | 1     | Chap 1-3 / Chap 1, 4, 5, 7 / Chap 1-8 / Chap 1-3     | Review of QM, QM in 3D   |        |      |                   |
| 8/31  | 2     | 4.1,4.2,4.3 / Chap 7 / Chap 9,10 / A.5, A.6, 3.5-3.7 | Hydrogen Atom Review, Angular Momentum Review, Ladder Operators                                    | #0     |      |                   |
| <b>Week 2</b>                                 |       |  |  |        |      |                   |
| 9/5   |       | <b>LABOR DAY</b>                                     |  |        |      |                   |
| 9/7   | 3     | 4.4 / 6.4, 7.6 / 11.6-11.8 / 1.1, 3.2                | Spin of the Electron, Pauli Spin Matrices, Stern-Gehrlach, Perturbation Theory                     | #1     | #1   |                   |
| <b>Week 3</b>                                 |       |  |  |        |      |                   |
| 9/12  | 4     | 7.1 / * / 13.1 / 5.1                                 | Time-Independent Perturbation Theory   |        |      |                   |
| 9/14  | 5     | 7.1 / 7.9 / 13.1 / 5.3                               | 2nd-Order Perturbation Theory and Fine Structure of Hydrogen, Relativistic Correction              | #2     | #2   |                   |
| <b>Week 4</b>                                 |       |  |  |        |      |                   |
| 9/19  | 6     | 7.3 / 7.8 / 12.1-12.2 / 5.3                          | Spin-Orbit Interaction in Hydrogen, <b>J=L+S</b>   |        |      |                   |
| 9/21  | 7     | 7.3 / 7.7, 8.6 / 9.4 / 3.7                           | Addition of Angular Momenta and $J^2$ eigenfunctions, Clebsch-Gordan Coeffs.                       | #3     | #3   |                   |
| <b>Week 5</b>                                 |       |  |  |        |      |                   |
| 9/26  | 8     | 7.5 / 8.2 / * / *                                    | Hyperfine interaction and the 21 cm line   |        |      |                   |
| 9/28  | 9     | 7.2 / * / 13.2-13.3 / 5.2                            | Degenerate Perturbation Theory, Stark Effect   | #4     | #4   |                   |
| <b>Week 6</b>                                 |       |  |  |        |      |                   |
| 10/3  | 10    | 7.4 / 7.8 / * / 5.3                                  | Zeeman Effect  |        |      |                   |
| 10/5  | 11    | 5.1-5.2 / 8.3, 8.4 / 12.3, 12.5-12.6 / 6.1-6.4       | He atom, Exchange, Bosons, Fermions, and Pauli exclusion, Identical Particle Wavefunctions         | #5     | #5   |                   |
| <b>Week 7</b>                                 |       |  |  |        |      |                   |
| 10/10   | 12    | 5.2 / * / 12.5-12.6 / 6.4                            | He atom Ground State Wavefunction  |        |      |                   |
| 10/12   | 13    | 5.2 / 8.1-8.5 / 12.4 / *                             | Excited States of He, Periodic Table, H <sub>2</sub> Molecule, Bonding                             | #6     | #6   |                   |
| <b>Week 8</b>                                 |       |  |  |        |      |                   |
| 10/17   | 14    | 11.1 / * / 13.5 / 5.6                                | Time Dependent Perturbation Theory, Two Level Systems  |        |      |                   |
| 10/19   | 15    | 11.2 / * / 13.6 / 5.7                                | Sinusoidal Perturbation, Atomic Transitions, Rabi oscillations, Selection Rules, Review for Exam 1 | #7     | #7   |                   |
| <b>Week 9</b>                                 |       |  |  |        |      |                   |
| 10/24   | 16    | 11.3-11.4 / 7.7 / 13.7, 13.9 / 5.6                   | Selection Rules, Spontaneous Emission, LASERs, Fermi Golden Rule                                   |        |      |                   |
| 10/26   | 17    |  | <b>Chapters 5, 7 (roughly)</b>   |        |      | <b>EXAM #1</b>    |
| <b>Week 10</b>                                |       |  |  |        |      |                   |
| 10/31   | 18    | 9.1-9.2 / * / 7.10 / 2.4                             | WKB Approximation  |        |      |                   |
| 11/2  | 19    | 9.3-9.4 / 5.6, 12.7 / 7.10 / 2.4-2.5                 | WKB Approximation, Fowler-Nordheim Tunneling, STM  | #8     | #8   |                   |
| <b>Week 11</b>                                |       |  |  |        |      |                   |
| 11/7  | 20    | 8.1-8.4 / * / * / 5.4                                | Variational Principle  |        |      |                   |
| 11/9  | 21    | 10.1-10.2 / 6.3 / 7.6-7.8, 14.1 / 7.1                | Classical Scattering, Quantum Scattering   | #9     | #9   |                   |
| <b>Week 12</b>                                |       |  |  |        |      |                   |
| 11/14   | 22    | 10.3-10.4 / * / 14.2-14.3 / 7.2-7.7                  | Scattering in Perturbation Theory, Semiclassical Treatment, Review for Exam 2                      |        |      |                   |
| 11/16   | 23    |  | <b>Chapters 8-11 (roughly)</b>   |        |      | <b>EXAM #2</b>    |
| <b>Week 13</b>                                |       |  |  |        |      |                   |
| 11/21   | 24    | 10.4 / * / 14.4-14.5 / 7.8                           | Quantum Scattering, Born series  |        |      |                   |
| 11/23   |       | <b>THANKSGIVING BREAK</b>                            |  |        |      |                   |
| <b>Week 14</b>                                |       |  |  |        |      |                   |
| 11/28   | 25    | 5.3 / 10.7 / 8.4 / *                                 | Electrons in a Metal, Fermi energy   |        |      |                   |
| 11/30   | 26    | * / 11.5 / 12.8 / *                                  | Cooper Pairing of Electrons and Superconductivity  | #10    | #10  |                   |
| <b>Week 15</b>                                |       |  |  |        |      |                   |
| 12/5  | 27    | 5.3, 6.1, 6.2 / 11.3-11.4 / 8.2, 8.3, 13.4 / *       | Band Structure in Solids, Bloch's Theorem  |        |      |                   |
| 12/7  | 28    | 5.4 / 10.5, 10.6 / * / *                             | Superfluidity in He-4  | #11    | #11  |                   |
| <b>Week 16</b>                                |       |  |  |        |      |                   |
| 12/12   | 29    | 6.8 / * / * / *                                      | Time Translation, Review for Final Exam  |        |      |                   |
| 12/20   | 30    |  | <b>FINAL EXAM [8 AM to 10 AM]</b>  |        |      | <b>FINAL EXAM</b> |

\* means no reading assignment from this text. Look elsewhere!