**University of Management and Technology**

**School of Science and Technology**

***Department of Physics***

**Course Code:** **PH 6011**

 **Course Title: Advanced Statistical Physics**

 **Program: MS (Phy)**

**Course Outline**

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| **Schedule**  | Wednesday and Sunday  | **Pre-requisite** | Thermal Physics |
| **Course Coordinator** | Dr. Tanvir Hussain | **Contact** | tanvir.hussain@umt.edu.pk |
| **Text** **Book** | \* Statistical Physics by Franz Mandl Second Edition\*\* The Introduction of Thermal Physics by Daniel V. Schroeder |
| **Reference Book:** | W. Brewer, F. Schwabl, “Statistical Mechanics”, Springer, 2nd ed. 2006. . |
| **Assignments**  | Problems will be assigned at regular intervals as an assignment. | **Quizzes**  | All quizzes will be announced well before time. No make-ups will be offered for missed quizzes. |
| **Mid Term****Examination** | A 120-minutes exam will cover all the material covered during the first 7-8 lectures.Combined Mid Term exam for all multiple sections. | **Final** **Examination** | A 180-minutes exam will cover all the material covered during the semester. Combined Final exam for all multiple sections |
| **Attendance** **Policy** | Students missing more than 25% of the lectures will receive an “SA” grade in the course and will not be allowed to take Final exam.  |
| **Grading** **Policy** | Assignment+ Quizzes(Minimum number of assessments will be 8): 30% Mid Term Examination: 30%Final Examination: 40% |

**Department of Physics**

**Statistical Physics (PH 310)**

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| **Week** | **Lecture****#** | **TOPICS** |
| 1 | 1 | The first Law of thermodynamics  |
| 2 | 1 | Second Law of thermodynamicsDirection of the natural processThe statistical Weight of a Microstate |
| 3 | 1 | The equilibrium of an isolated systemThe Schottky DefectsEquilibrium of a system in heat Bath |
| 4 | 1 | ParamagnetismA magnetic Solid in Heat BathAn Isolated Paramagnetic SolidNegative Temperature |
| 5 | 1 | The Second Law of Thermodynamics II The Clausius Inequality  |
| 6 | 1 | The Helmholtz Free EnergyThird Law of thermodynamics  |
| 7 | 1 | The Heat capacity of SolidsEinstein’s SolidsDebye’s Theory |
| 8 | 1 | The perfect Classical GasThe partition Function |
| 9 | 1 | The Maxwell Velocity DistributionThe heat Capacity |
| 10 | 1 | Phase EquilibriaThe Clausius - Clapeyron Equation  |
| 11 | 1 | The perfect Quantal GasGrand partition function |
| 12 | 1 | Quantum Statistics: The partition function for photons Quantum Statistics: Plank’s Law: Derivation |
| 13 | 1 | The thermodynamics of black body radiationSystem with variable particle numbers |
| 14 | 1 | Quantum Statistics : Fermi Dirac distribution Quantum Statistics : Fermi Dirac distribution |
| 15 | 1 | Quantum Statistics : The free electron Model of metalsQuantum Statistics : Bose –Einstein condensation |