

**BOĞAZİÇİ UNIVERSITY - PHYSICS DEPT.**  
**PHYS 221 Thermal Properties of Matter (3 Credits)**  
**SUMMER 2026 SEMESTER SYLLABUS**  
**(JUNE 24 - AUGUST 12)**

**Prerequisites:** PHYS 102 (PHYS II) or PHYS 121 or PHYS 130.

**Instructor :** Serdar Nergiz e-mail: nergiz@bogazici.edu.tr OFFICE : KB331-L

**Textbook :** F. Reif - Statistical Physics (Berkeley Physics Series Volume 5.)

**Schedule :** 6 Lecture hours per week. TT34-WW34-ThTh34

| Lecture Hours |       | Monday       | Tuesday      | Wednesday   | Thursday    | Friday |
|---------------|-------|--------------|--------------|-------------|-------------|--------|
| 9:00          | 9:50  | 221 Reserved | 221 Reserved |             |             |        |
| 10:00         | 10:50 | 221 Reserved | 221 Reserved |             |             |        |
| 11:00         | 11:50 |              | 221 Lecture  | 221 Lecture | 221 Lecture |        |
| 12:00         | 12:50 |              | 221 Lecture  | 221 Lecture | 221 Lecture |        |
| 13:00         | 13:50 |              |              |             |             |        |
| 14:00         | 14:50 |              |              |             |             |        |
| 15:00         | 15:50 |              |              |             |             |        |
| 16:00         | 16:50 |              |              |             |             |        |

**Contents :**

Elements of probability theory, Poisson and Gaussian probability distributions. Random walk. Thermal motion, molecular distribution of energy in crystals and gases, definition of temperature and the Boltzmann factor, statistical description of thermal equilibrium and entropy. Canonical ensemble, partition function, phase space. Maxwell velocity distribution, equipartition theorem, specific heat. Entropy and heat: second law of thermodynamics. Entropy of mixing. Open systems and free energy minimum principles. Ideal gases with internal degrees of freedom. Third law of thermodynamics.

**Attendance:** Students are expected to come to class regularly and on time. Since additional material may be covered in the classes, the class attendance is very important. Students should be prepared to discuss the textbook material and to have worked on the suggested problems.

**Exams :** There will be a midterm exam and a final exam. Both exams are closed book, calculators are not allowed.

**Make-Up Exams :** There will **not** be any make-up exams (both for midterm and final) during the summer term, due to time constraints. Thus, we strongly recommend you to be present for the exams, unless it is absolutely impossible.

**Grading** will be based on the sum of **class attendance** (10%), a **midterm exam** (40%) and **final exam** (50%). Letter grades will be assigned after the final exam according to the distribution of the total grade points.