



SYLLABUS

Course Code	Course Num.	Course Name	Credit Hours	Lec.	Lab.	Tut.	Private study	Pre-requisites	Course Level	Language
PHY	230	Thermal Physics	3	2	0	2	5	PHY 101, MAT 101	3	English

A. Course Description

This course covers the basic principles of thermodynamics including some applications. Fundamental principles are taught in depth, and mathematical tools are presented to equip students for other applications. The laws of thermodynamics are introduced, along with the concepts of temperature, internal energy, heat, entropy and the thermodynamic potentials. Applications of thermodynamic concepts to topics such as heat engines, the expansion of gases and changes of phase are considered.

B. Course Outcomes

At the end of this course the student will be able to:

1. Understand fundamental thermodynamic concepts and describe the laws of thermodynamics.
2. State the basic principles of kinetic theory of gases for ideal and real gases.
3. Apply these principles in conjunction with elementary mathematical techniques to solve simple problems in the basic four thermodynamic laws.
4. Assess whether a solution to a given problem is physically reasonable.

C. References

Required Textbook

Serway R.A. and Jewett J.W., *Physics for Scientists and Engineers with Modern Physics*, 9th Edition, Brooks/Cole, Belmont, CA, USA (2014).

Other references

- Kittel C. and Kroemer H., *Thermal Physics*, W. H. Freeman and Company, New York (1980).
- Schvoder D.V, *An introduction to thermal physics*, Adison Wesley Longman USA (2000).
- Russell L.D, *Classical thermodynamics*, Inter Edition Saunders College Publ., USA (1993).

Course Website: <http://www.imamm.org/>

D. Topics Outline

1. **Temperature:** *Temperature and the zeroth law of thermodynamics, thermometers and temperature scales, the constant volume gas thermometer and the Kelvin scale, thermal expansion of solids and liquids, macroscopic description of an ideal gas* (Contact hours: 12).
2. **Heat and the First Law of Thermodynamics:** *Heat and thermal energy, heat capacity and specific heat, Latent heat, work and heat in thermodynamic processes, the first law of thermodynamics, some applications of the first law of thermodynamics, heat transfer* (Contact hours: 12).
3. **Heat Engines, Entropy and the Second Law of Thermodynamics:** *Heat engines and the second law of thermodynamics, reversible and irreversible process, the Carnot engine, the absolute temperature scale, the gasoline engine, heat pumps and refrigerators, entropy, entropy changes in irreversible processes, entropy on a microscopic scale. Third Law, thermal Radiation* (Contact hours: 12).



4. **The Kinetic Theory of Gases:** Molecular model of an ideal gas, specific heat of an ideal gas, adiabatic process for an ideal gas, the equipartition of energy, the Boltzmann distribution law, distribution of molecular speeds, Mean free path, Van der Waal s equation of state (Contact hours: 12).
5. **Free Energy:** Review of internal energy and enthalpy; Free energy; Helmholtz free energy; Gibbs free energy; miscellaneous relations, the Maxwell relations, and the Gibbs-Helmholtz relations; The Joule and Joule-Thomson coefficients; the thermodynamic functions for an ideal gas; the thermodynamic functions for other substances (Contact hours: 12).

E. Office Hours

Office hours give students the opportunity to ask in-depth questions and to explore points of confusion or interest that cannot be fully addressed in class.

F. Exams & Grading System

The semi-official dates of the exams for this course are:

- **Midterm 1:** 6th or 7th week.
- **Midterm 2:** 11th or 12th week.
- **Quizzes & Homeworks:** During the semester.
- **Final Exam:** 16th week.

Your course grade will be based on your semester work as follows:

Midterm 1: 20 %	Midterm 2: 20 %	Final Exam: 40 %
Quizzes, Homework, Attendance & Participation: 20 %		

The grading distribution:

A ⁺	A	B ⁺	B	C ⁺	C	D ⁺	D	F
[95, 100]	[90, 95)	[85, 90)	[80, 85)	[75, 80)	[70, 75)	[65, 70)	[60, 65)	[0, 60)

G. Student Attendance/Absence

Only three situations will be considered as possible excused absences:

- Occurrence of a birth or death in the immediate family will be excused. (“Immediate family” is defined by the University as spouse, grandparents, parents, brother, or sister).
- Severe illness in which a student is under the care of a doctor and physically unable to attend class will be excused. Students are not excused for a doctor's appointment. Do not make appointments that conflict with rehearsals. Notes from the University Health Center will be accepted.

[Executive Rules for Study Regulations and Exams](#)

goo.gl/ykm7t3

