BACHELOR 'S PROGRAMME
3rd YEAR OF STUDY, 1st SEMESTER

COURSE TITLE	THERMODYNAMICS AND STATISTICAL PHYSICS
COURSE CODE	
COURSE TYPE	full attendance
COURSE LEVEL	1st cycle (bachelor's degree)
YEAR OF STUDY, SEMESTER	3rd year of study, 1st semester
NUMBER OF ECTS CREDITS	5
NUMBER OF HOURS PER WEEK	4 (2 lecture hours + 2 seminar hours)
NAME OF LECTURE HOLDER	Lect. univ. dr. RADU Daniel
NAME OF SEMINAR HOLDER	Lect. univ. dr. RADU Daniel
PREREQUISITES	Advanced level of English

A GENERAL AND COURSE-SPECIFIC COMPETENCES

General competences:

- → Application of the fundamental knowledge of electrodynamics and theory of relativity in solving theoretical and practical problems of Physics;
- → Capability of analysis and synthesis;
- → Self-training capacity for professional development in the chosen specialization.

Course-specific competences:

- → Derivation of working formulas for calculations with physical quantities using appropriate principles and laws of Physics;
- → Description of physical systems, using specific theories and tools (experimental and theoretical models, algorithms, schemes, etc.);
- → Application of the principles and laws of Physics in solving theoretical or practical problems, under qualified assistance conditions;
- → Correct application of methods of analysis and of criteria for choosing the appropriate solutions to achieve the specified performances;
- → Minimal standard
- → Elaboration of a specialty report/project by identifying and using the main Physics laws and principles from a real (problem) context;
- → Make of necessary connections to use physical phenomena, using basic knowledge from close domains (Chemistry, Biology, etc.).

B LEARNING OUTCOMES

Upon successful completion of this discipline, students will be able to:

- expose phenomena and physical processes related to discipline;
- describe phenomena and physical processes related to discipline;
- use the mathematical apparatus specific to axiomatic thermodynamics and statistical physics, respectively, to model processes and / or physical phenomena specific to the discipline as well as border / transdisciplinary;
- analyze phenomena and physical processes related to discipline;
- calculate values of the physical quantities involved in physical phenomena and physical processes related to discipline as well as boundary / interdisciplinary

C LECTURE CONTENT

Fundamentals of thermodynamics. Mechanical work. The amount of heat. Internal energy
Principles of Thermodynamics. Characteristic and potential thermodynamic functions
Systems with variable number of particles. Chemical potential. Gibbs's Phase Rule
Thermodynamic theory of phase transformations
The main subject of statistical physics. Microscopic states and macroscopic states. The basic postulates of statistical physics
Phase space. Mean values. The Liouville Theorem. The density matrix in energy representation. Statistical distribution function in quantum statistics
Entropy and temperature in quantum statistical physics
Gibbs' ensemble theory: the microcanonical and canonical statistical distributions (Gibbs)
Gibbs' ensemble theory: Gibbs' statistical distribution of a system having a variable number of particles
Distributions Maxwell and Boltzmann. Principle of indistinguishability of identical particles in quantum mechanics
Distributions of Fermi-Dirac and Bose-Einstein. Fermi and Bose gases of elementary particles
Degenerated electronic gas and degenerate Bose gas. Thermal radiation
Solid bodies at low and high temperatures. Debye's interpolation formula
Theory of fluctuations and correlations in Statistical Physics

D	RECOMMENDED READING FOR LECTURES
	1. George C. Moisil, Termodinamica, Editura Academiei RSR, Bucuresti (1988); 2. Şerban Ţiţeica, Termodinamica, Editura Academiei RSR, Bucuresti (1982); 3. L.D. Landau, E.M. Lifshitz, Statistical Physics, 3rd Edition, Elsevier, Amsterdam (2013). 4. R. Kubo, M. Toda, N. Saito, Statistical Physics, Springer (1992). 5. D. Trevena, Statistical Mechanics, Oxford, (1993); 6. A.M. Guenanlt, Statistical Physics, London (1988); 7. K. Huang, Statistical Mechanics, J. Wiley (1995); 8. O. Gherman, L. Saliu, Fizica statistica, Bucuresti (1976);
E	SEMINAR / LABORATORY CONTENT
	Pfaff 1-forms. Pfaff equation. Integrant factor. Holonomic and non-holonomic Pfaff 1-forms Principles of Thermodynamics: Applications I Principles of Thermodynamics: Applications II Applications of thermodynamics to study the electrical and magnetic properties of physical systems Student reports I Student reports II Student reports III Student reports IV Fundamentals of Theory of Probability: applications Applications of the theory of statistical ensembles I (microcanonical distribution) Applications of the theory of statistical ensembles II (Gibbs/canonical distribution) Applications of the theory of statistical ensembles III (macrocanonical distribution) Applications of the theory of statistical ensembles IV (macrocanonical distribution) The maximum mechanical work done by a body that is in an external environment. Fluctuations and correlations
F	RECOMMENDED READING FOR SEMINARS
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G	EDUCATION STYLE
LEARNING AND TEACHING METHODS	Lecture, questioning, heuristic conversation, debate, guided discovery, explanation
ASSESSMENT METHODS	• Written exam + oral exam • Quiz and oral presentation of the reports
LANGUAGE OF INSTRUCTION	English