Nazwa przedmiotu: **Elements of Modern Physics**	
Typ przedmiotu: obowiązkowy	*Język przedmiotu: angielski*
Prowadzący: **prof. dr hab. Piotr Magierski**	
Nominalny semestr: 8	*Metody nauczania:* 2 / 1 / - (Wyk/Ćwicz/Lab)
Kod:	*Liczba punktów ECTS: 4*
Poziom przedmiotu: podstawowy	
Przedmioty poprzedzające:	

Prerequisite:
Knowledge of basic physics, mathematical analysis, variational methods and special functions is recomended but not required.

Assessment and Grades:
Will be based on a project prepared by a student.

Course Objectives:
This course is meant to provide a review of selected topics in modern physics. A student will acquire a qualitative understanding of various phenomena within the framework of quantum mechanics which provide the suitable language to describe microscopic processes. Various challenges and problems, both conceptual and computational, will be discussed during the course.

Content:

1. Fundamentals of classical mechanics and electrodynamics. Concept of conservation laws.

2. Special theory of relativity. Motivation. Formulation and consequences.

3. Paradoxes of classical physics, quantum mechanics, concept of wave function.

4. Structure of quantum mechanics: observables, expectation values, Heisenberg uncertainty principle. Act of measurement in quantum mechanics. Quantum entaglement.

5. Application of quantum mechanics to simple problems. Hydrogen atom.

6. Atomic and molecular physics. Interaction of light with atoms.

7. Quantum theory of light. Concept of photons.

8. Concept of spin. Fermions and Bosons. Pauli principle.

9. Solid state. Band structure. Electric conductivity and superconductivity. Semiconductors.

10. Nuclear physics. Properties of atomic nuclei. Nuclear reactions.

11. Elementary particles and their interactions. Standard model.

Suggested readings:
1. *R.P. Feynman, R.B. Leighton, M. Sands, The Feynman Lectures on Physics.vol. 1-3*
2. *R.M. Eisberg, Fundamentals of Modern Physics*
3. *C. Cohen-Tannoudji, B. Diu, F. Laloe, Quantum Mechanics, vol.1-2*
4. *C. Kittel, Introduction to Solid State Physics, Wiley 1996*

Additional remarks: