(*faculty stamp*)

COURSE DESCRIPTION

1. Course title: PHYSICS	**2. Course code -**
3. Validity of course description: 2018/2019	
4. Level of studies: BA, **BSc programme** / MA,MSc programme lub 1st cycle / 2nd cycle of higher education	
5. Mode of studies: intramural studies / extramural studies	
6. Field of study:INDUSTRIAL ENGINEERING CHEMISTRY	(RCH4)
7. Profile of studies: general academic	
8. Programme:	
9. Semester: II	
10. Faculty teaching the course: Faculty of Chemistry (RCH4)	
11. Course instructor: dr hab. inż. Przemysław Borys	
12. Course classification: common courses	
13. Course status: compulsory /elective	
14. Language of instruction: English	
15. Pre-requisite qualifications: basic skills in mathematics and physics on a high school level.	
16. Course objectives: to teach the basics of general physics	

17. Description of learning outcomes:

Nr	Learning outcomes description	Method of assessment	Teaching methods	Learning outcomes reference code
1.	Knowledge of the basics of fluid mechanics (sem. 1, 2)	colloquium	Lecture, chalk-board exercises	K_W02++
2.	Knowledge of the quantum mechanics basics (sem. 2)	colloquium	Lecture, chalk-board exercises	K_W02++
3.	Knowledge of the elements of nuclear physics (sem. 2)	colloquium	Lecture, chalk-board exercises	K_W02++
4.	Knowledge of the electromagnetic field theory basics (sem. 2)	colloquium	Lecutre, chalk-board exercises	K_W02++
5.	Knowledge of the special relativity theory (sem. 2)	colloquium	Lecture, chalk-board exercises	K_W02+++
6.	Knowledge of the English terminology (sem. 1, 2)	colloquium	Lecture, chalk-board exercises	K_U03++

18. Teaching modes and hours

Lecture / BA /MA Seminar / Class / Project / Laboratory

30 / 0 / 15 / 0 / 30

19. Syllabus description:

Lecture:

Semmester 2:

UNIT 1,2,3 Quantum Mechanics of Atoms

Discovery and Properties of the Electron. Planck's Quantum Hypothesis. Photon Theory of Light and the Photoelectric Effect. Photon Interactions. Compton Effect and Pair Production. Wave-Particle Duality; the Principle of Complementarity. Wave Nature of Matter. Electron Microscopes. Early Models of the Atom. Atomic Spectra: Key to the Structure of the Atom. The Bohr Model. De Broglie's Hypothesis applied to Atoms. Quantum Mechanics - a New Theory. The Wave function and its Interpretation; the Double-slit Experiment. The Heisenberg Uncertainty Principle.
Philosophic Implications; Probability versus Determinism. Quantum Mechanical View of Atoms. Quantum Mechanics of the Hydrogen Atom; Quantum Numbers. Complex Atoms; the Exclusion Principle. The Periodic Table of Elements. X-ray Spectra and Atomic Number. Fluorescence and Phosphorescence.

UNIT 4, 5 Elements of the Field Theory

Vector differentiation, Scalar Fields; Isotomic Surfaces; Gradient, Vector Fields and Flow Lines, Divergence, Curl, Del Notation, The Laplacian, Vector Identities. Gauss and Stokes theorems.

UNIT 6, 7, 8 Elements of Electromagnetic Field
Insulators and conductors, Coulomb's Law, Electric Fields, Electric Flux, Gauss Law, Potential Difference and Electric Potential, Potential Differences in a Uniform Potential Field, Electric Potential Energy, Obtaining E from the Electric Potential, Electric Potential due to Continuous and Point Charge Distributions, Capacitance, Maxwell equations in differential and integrated forms.

UNIT 9,10 Special Theory of Relativity
The Michelson-Morley experiment, Postulates of special theory of relativity, Simultaneity, Time dilation and Twin Paradox, Length contraction, Four dimensional space-time, Galilean and Lorentz Transformations, Relativistic momentum and mass, The Ultimate Speed, Energy and mass (E=mc2), Doppler Shift for Light.

UNIT 11,12 General Theory of Relativity
Principle of Equivalence. Bending of Light by Gravity. Gravity and Time: Gravitational Red-shift. Gravity and Space: Motion of Mercury. Gravity, Space, and new Geometry. Gravitational Waves. Newtonian and Einsteinian Gravitation.

UNIT 13,14 Elementary Particles
High-energy Particles. Particle Accelerators. Beginnings of Elementary Particle Physics; the Yukawa Particle. Particles and Antiparticles. Particle Interactions and Conservation Laws. Particle Classification. Particle Stability and Resonances. Strange Particles. Quarks. The "Standard Model": Quantum Chromodynamics (QCD) and the Electroweak Theory. Grand Unified Theory.

UNIT 15 Astrophysics and Cosmology
Stars and Galaxies. Stellar Evolution: the Birth and Death of Stars. General Relativity: Gravity and the Curvature of Space. The Expanding Universe. The Big Bang and the Cosmic Microwave Background. The Standard Cosmological Model: the Early History of the Universe. The Future of the Universe?

Chalk board classes: the chalk-board classes serve to illustrate the lecture topics with calculatory problems.

Laboratory classes: DLA, diffusion, Faraday's electromotive force, atracttion of wires with current, optics – diffraction, lenses, friction, Bernoulli equation, viscosity, pendulum, rigid body dynamics, harmonic oscillations

20. Examination: yes

21. Primary sources:

- H.D. Young, R.A. Freedman "University Physics with Modern Physics", Addison-Wesley Publishing Company, 2000
- P.G. Hewitt "Conceptual Physics", Addison Wesley Longman, 1998
- R.A. Serway, J.W. Jewett Jr. "Principles of Physics", Saunders College Publishing, 1998
- R. Resnick, D. Halliday, J. Walker, Fundamentals of Physics, Wiley, 2000.
- D.G. Giancoli, „Physics", 5th ed., Prentice Hall, New Jersey, 1998.
- R. Feynman, "Feynman lectures on physics" - now online http://www.feynmanlectures.caltech.edu/.
- P. Borys, „Physics" - lecture notes - http://mer.chemia.polsl.pl/Dydaktyka

22. Secondary sources:

23. Total workload required to achieve learning outcomes

Lp.	Teaching mode:	Contact hours/ student workload hours
1	Lecture	30/30
2	Classes	15/15
3	Laboratory	30/30
4	Project	-/-
5	BA/MA Seminar	-/-

24. Total hours: 230

25. Number of ECTS credits: 8

26. Number of ECTS credits allocated for contact hours: 4

27. Number of ECTS credits allocated for in-practice hours (laboratory classes, projects): 1

26. Comments: -

Approved:

03.12.2018……
(date, Instructor's signature)

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(date , the Director of the Faculty Unit signature)