Modern Physics GEFIT005M-a
Curriculum and Requirements
2018/2019. I. semester

Curriculum:

37. week The absolute frame of reference, the Michelson-experiment. The special theory of relativity. The Lorentz-transformation. Basic concepts of relativistic dynamics.
38. week The variation of mass with velocity. Mass energy equivalence. Cockroft-Walton experiment. Experimental basis of quantum physics. Blackbody radiation, the molar heat capacity of solids at low temperature.
39. week Photoelectric effect, the birth of the photon concept. Compton scattering.
40. week Line spectra of atoms. Bohr's postulates. Franck and Hertz experiment.
41. week The Bohr model of hydrogen. The explanation of line series.
42. week Wave particle duality of particles, de-Broglie hypothesis. Concept of wave packet.
43. week Holiday.
44. week Experimental verification of wave particle duality. Two-slit interference of electrons.
45. week The Heisenberg uncertainty principle and the consequences. The Schrödinger equation of quantum mechanics. The meaning of the wave function. Quantum mechanical description of the motion of a free particle.
46. week Travelling through a potential step. Tunnelling through a rectangular potential barrier. Application of tunnel effect.
47. week The quantum mechanical model of the Hydrogen atom. The electron spin.
48. week The X-ray spectra. The continuous X-ray spectrum, the characteristic X-ray spectrum. Quantum optics, physical basic of laser operation. Stimulated emission, population inversion. Different lasers.
49. week Nuclear physics. Discovering the nucleus, Rutherford experiment. Nuclear interaction. Radioactivity α-, β-, χ-, radiation. The laws of radioactive decay. Radioactive decay series. Detection and measurement of radioactive radiation. Biological effects of radiation.
50. week Mass defect and nuclear binding energy. Nuclear fission. Chain reaction. The nuclear reactor. Nuclear fusion.

The requirements for signature and final examination:
The students write one getting signature tests during the semester. The test contains definitions, rules, formulas and problems from different subjects of modern physics. The qualification of the test is ”pass” or ”fail”. In case of ”fail” the test can be repeated on the last week of the semester.

Requirements for getting signature:
1. students have to attend more than half of the lectures,
2. students have to pass on the getting signature tests, or on the repeated test.

If somebody does not get signature at the end of semester, because does not fulfil the first condition above, but the Dean of Faculty gives him or her one more chance to get it, the student has to report from the whole subject at the lecturer.
If somebody does not get signature at the end of semester, because does not fulfil the second condition above, he or she can write a getting signature test, during the examination period, until a given date decided by the Dean of Faculty.

Conditions of final examination:
On the exam there is a minimum test with physical formulas. The total scores are 20. At least 11 scores needed to pass. After that there is a written exam. The students get two themes from the whole subject of the semester. The total score is 100, and minimum 50 scores are needed for successful exam.

Books, recommended literature:
[1] Halliday and Resnic: Fundamentals of Physics, John Wiley & Sons, 1981.
[2] Alonso and Finn: Fundamental University Physics I, II, Addison-Wesley Pub., 1980.
[3] Sears, Zemansky & Young: University Physics, Addison-Wesley Pub., 1987.
[4] Savelyev: Physics I, II, Mir Publishers, 1980

Miskolc, 1 September 2018.

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