CONTENT of PRACTICAL CLASSES
on «PHYSICS and MATHEMATICS»
FOR ANGLOPHONE STUDENTS OF THE 1 COURSE
over the 1 TERM of 2020/2021 YEAR

MODULE № 1 «Mathematical statistics. Rheology. Electricity».

Class № 1.1
Theme: «Basic concepts of mathematical statistics»

1). Problems of mathematical statistics. General population and sampling. Statistical series.
2). Numerical characteristics of statistical series.
3). Graphical representation of statistical series: polygon of frequencies, histogram.

Class № 1.2
Theme: «Basic concepts of mathematical statistics»

1). Estimation of general population parameters by its sampling.
2). Confidence interval. Confidence (fiducial) probability. Significance level.
3). Methods of statistic hypothesis tests: t- Student's criterion for estimation of the certainty of sampling differences.
4). Control work «Mathematical statistics».

Class № 1.3
Theme: «Viscosity of fluids»

1). Internal friction (viscosity) of liquids. Laminar (steady) flow. Newton's equation. Newtonian and non-Newtonian liquids.
2).Laminar flow of liquids in cylindrical pipes. Poiseuille formula. Hydrodynamical (hydroulic) resistance.
3). Turbulent flow. Reynolds number.
4).Laboratory work №4.

Class № 1.4
Theme: «Mechanical properties of solids»

1). Deformation. Ways of body deformation. Types of body deformation. Hook's law for elastic deformation.
2). Stress-strain diagram. Elastic limit. Ultimate stress.
3). Mechanical properties of some biological tissues. Types of biological tissues deformation. Creep, relaxation.
4). Laboratory work № 5.

Class № 1.5
Theme: «Alternating current. Impedance of electrical circuits»

1). Alternating current. Basic characteristics of an alternating current.
2). Resistance and reactance (capacitive and inductive) of an alternating current circuit.
3). Impedance of the circuit with resistor, capacitor and inductor connected in series.
4). Vector diagrams of voltage of an alternating current circuits.
5). Laboratory work № 8.

Class № 1.6
Theme: «Electrical pulses»

1. Electrical pulse. Parameters of impulse signal: an amplitude, pulse duration, steepness of pulse edge.
2. Pulse current. Parameters of pulse current: period, frequency, off-duty ratio, duty factor.
3. Methods based on using of pulse currents in medicine and veterinary medicine: electrostimulation, electrosleep.
4. Laboratory work № 10.

MODULE № 2 «Optics »

Class № 2.1
Theme: «Wave properties of light»

1. Interference. Coherent waves.
2. The conditions for maximum and minimum of wave intensity. Intensity distribution at interference.
3. Thin-film interference. Blooming.
4. Interferometers and interference microscope, their use in medicine and biology.
5. Diffraction. Huygens'-Fresnel principle.
6. Diffraction grating. Conditions for basic maxima and minima (basic formula for diffraction grating). Diffraction spectrum.
7. Laboratory work № 18.

Class № 2.2
Theme: «Geometrical optics»

1. Rectilinear propagation of light. Speed of light. Index of refraction (refractive index).
2. Law of reflection and refraction. Total internal reflection. Fiber optics and its use in medicine.
3. Laboratory work №19

Class № 2.3
Theme: «Optical microscopy»

1. Lenses. Types of lenses. Construction of image in thin lenses. Formula of thin lense. Power of lens.
2. Aberration of lenses: spherical, chromatic, astigmatism.
3. Simple magnifying lens (loop), ray-tracing in magnifying lens, its magnification. Microscope. Ray-tracing in microscope, magnification formula. Resolution limit and useful magnification of microscope.
4. Special technique of microscopy: ultraviolet microscope, immersion mediums, ultramicroscopy, microprojection and microphotography, size measurement of small objects.
5. Laboratory work № 15.

Literature

1. Maksina A.G., Dainiak B.A. Medical and biological physics. M. 2004.
2. Maksina A.G., Chichuk T.V. Medical and biological physics. Seminars and problems. M. 2003.
3. Smirnova Z.M., Blokhina M.E. Laboratory works in medical and biological physics. M.2003
4. Maksina A.G., Machneva T.V., Smirnova Z.M. Laboratory practice. M. 2011.
5. Halliday D., Resnick R., Walker J. Fundamentals of physics. -6th ed.
6. Davidovits P. Physics in biology and medicine. -3th ed.

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