

## Biophysics

Study Programme: MIMV Curricular Year: 1<sup>st</sup> Semester: 1<sup>st</sup> Compulsory Credits: 4,5 ECTS

Lecturer(s): António Duarte (CCP), Maria de S. José Centeno (R)

### 1. Contact hours:

Lectures - 28; Theoretical-practical – 88; Laboratory teaching - 24 Total - 140

### 2. Objectives:

The objectives of Biophysics are: to provide basic knowledge on the physical principles of biological functions; to develop critical thinking necessary for its analysis and interpretation and explain the physical basis of ancillary diagnostic clinical support, most relevant to the practice of veterinary medicine.

### 3. Programme:

Theoretical: Electrophysiology: physical basis of action potential; pacemaker potentials and cardiac automatism; principles of electrocardiography. Radiations: electromagnetic radiations. Radiometry and radiometric parameters. Stimulated emission-**LASER**; magnetic resonance imaging. X-rays and radiological techniques; computed axial tomography. Detection/quantification of ionizing radiation; biological effects and quantification of radiation biological damage. Radioactive isotopes: radionuclide used in nuclear medicine; radiopharmaceuticals used in scintigrams and positron emission tomography. Mechanics of fluids: measurement of flow in blood vessels; hemodynamic in arteries; vascular resistance; pressure-flow curves; hemodynamic in veins. Liquid properties: viscosity and superficial tension. Transfer processes: diffusion and osmosis. Heat transfer. Sounds: the ultrasonography. Practical: Lenses and optical instruments. Special techniques used in optical microscopy. Physical methods for particles separation. Determination of heart electrical axis. Decay equations and their application in quantitative analysis.

### 4. Bibliography:

- Baptista, A.O. & Centeno, M.S.J. (2013). Textos de apoio sobre vários temas abordados disponibilizados no e-learning da FMV-UL.
- Cunningham, J.G. (1999). *Tratado de Fisiologia Veterinária*. Guanabara K., Brasil.
- Duncan, G. (1990). *Physics in the life Sciences*. 2<sup>th</sup> ed, Blackwell S.C, London.
- Eckert, R. (1997). *Animal Physiology*. 4<sup>th</sup> ed, Feeman & C<sup>a</sup>, U.S.A.
- Kane, J.W. & Sternheim, M.M. (1988). *Physics*. John Wiley & Sons, New York.
- Levick, J.R. (2000). *Hemodynamic: pressure, flow and resistance*. Arnold, UK.
- Lodish, H., *et al.*, (2000). *Molecular Cell Biology*. 4<sup>th</sup> ed, Freeman & C<sup>a</sup>. USA.
- Marion, J.B. & Hornyak, W.F. (1985). *General Physics with Bioscience Essays*. John Wiley & Sons, New York. U.S.A.
- Martin, M. (2010) – *ECG de Pequenos Animais*, 2<sup>a</sup> ed.
- Salgueiro, L. & Ferreira, J.G. (1991). *Introdução à Biofísica*. Fundação C.G, Lisboa.
- Segel, I.H. (1975). *Biochemical Calculations*. John Wiley & Sons, New York.

### 4. Assessment:

Final evaluation will be performed by a written examination with a theoretical component, including short answers and a practical component with exercises to solve, covering all matter.