

TOPICS FOR THE ENGINEERING DIPLOMA EXAMINATION

field of study: **BIOMEDICAL ENGINEERING**

1. Classification of structural materials
2. Basic mechanical properties of materials – definitions and units, methods of determination (stress, elastic limit, yield point, conventional yield point, tensile strength, elongation A, reduction of area Z, impact strength, hardness, modulus of elasticity E, Hooke's law)
3. Corrosion-induced degradation of materials: types of corrosion and methods of corrosion protection
4. Basic measuring instruments
5. Corrosion of biomaterials
6. Classification of heat treatment and its applications
7. Metallic biomaterials
8. Ceramic biomaterials
9. Polymeric biomaterials
10. Coatings used on implants
11. Biomaterials manufacturing technologies
12. Medical imaging techniques
13. Design of endoprostheses
14. Dental implants
15. Artificial organs
16. Human anatomy and the possibilities for implanting artificial organs
17. Medical robots and their applications
18. The structure of the human musculoskeletal system and the mechanical properties of its tissues
19. Biomechanical analysis of human gait
20. Human motion analysis systems
21. Electromyography and its applications
22. Basic additive manufacturing processes and their medical applications
23. Basic concepts related to virtual reality (VR) and augmented reality (AR)
24. Artificial neural networks and their applications in biomedical engineering
25. Genetic algorithms
26. The structure and role of stents
27. Rehabilitation equipment
28. Lasers in invasive therapy
29. A physical description of blood transport in the circulatory system
30. Electrical properties of biological substances
31. Protection of the patient against the effects of excessive current flow through human tissues; types of protection for the application parts of electromedical devices
32. Magnetic properties of biological substances; the phenomenon of magnetic resonance in living organisms
33. The effects of electromagnetic fields on living organisms
34. Biophysics of the visual system
35. Requirements for medical devices

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36. Physical principles, operating principles and design of electrocardiographic measurement devices
37. Physical principles, operating principles and design of ultrasound scanners
38. The use of the Doppler effect in ultrasound examinations of blood
39. Examples of the use of ultrasound equipment in therapy
40. Physical principles, operating principles and design of spirometers
41. Conditions for spirometric measurements (ATPS, BTPS)
42. Physical principles, operating principles and design of blood pressure measurement devices
43. Contact and non-contact methods of temperature measurement
44. Cold therapy and cryotherapy
45. Interaction of laser radiation with tissue
46. Examples of therapeutic lasers