



Zaporizhzhya Polytechnic National University
Faculty of Radio Electronics and Telecommunications
Department of Radio Engineering and Telecommunications
specialty 172 "Telecommunications and radio engineering" educational and
professional program "Telemedicine and biomedical systems"

DESCRIPTION / Syllabus of discipline / module

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| Short name of the university / department date (month / year) | NU «Zaporizhzhya Polytechnic» 08/2020 |
| Module name / Course name | Biomedical signals and signal processing |
| Code: | PPN 04 |

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|--------------------|--|
| Teacher(s) | Department |
| Morshchavka Sergii | Radioengineering and Telecommunication |

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|--------------------|----------------------------|---------------------------|
| Study cycle | Level of the module | Type of the module |
| MSc | 1 | mandatory |

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|--|-------------------------------|--------------------|
| Form of delivery | Duration | Language(s) |
| Lectures/Hands-on Lab session | 15 weeks | Ukrainian |
| Connection with other disciplines | | |
| Previous: | Related (if required): | |
| | | |

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|------------------------------|-------------------------------|----------------------|------------------------------|
| Credits of the module | Total student workload | Contact hours | Individual work hours |
| 5,5 | 165 | 60 | 105 |

Aim of the module (course unit): competences foreseen by the study programme

Providing a clear understanding of the origin and methods of obtaining biomedical signals, methods of their processing and visualization to identify medically significant information about the object.

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| Learning outcomes of module (course unit) | Teaching/learning methods | Assessment methods |
| <ul style="list-style-type: none"> - be fluent in the state language and communicate foreign language; - be able to reasonably choose and effectively apply mathematical methods computer simulation technology as well also methods optimization telecommunications and radio engineering telemedicine and biomedical systems and devices; | <ul style="list-style-type: none"> - using during lectures listening and preparing to practical work and labs. | <ul style="list-style-type: none"> - without separate assessment ; |



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| <ul style="list-style-type: none"> - demonstrate an understanding of the subject area and understanding of professional activity, apply knowledge in practice situations, evaluate and provide quality performed works; - be able to use and improve of the modern software, hardware of telecommunications and radio engineering devices and biomedical systems; - use informational and communication technologies for to search, processing and analysis of information from various sources; be capable of the abstract thinking, analysis and synthesis, work both autonomously and in the team; - be able to elaborate, to improve and use modern hardware and software telecommunications and radio equipment and systems of biomedical purpose. | <ul style="list-style-type: none"> - theoretical knowledge received during lectures and consultations - independent and under supervising preparation and implementation practical work. | <ul style="list-style-type: none"> - evaluate by the report on laboratory works; - assessment during laboratory work and exam. |
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| Themes | Contact work hours | | | | | | Time and tasks for individual work | |
|--|--------------------|--------------|----------|----------------|-----------------|--------------------|------------------------------------|---|
| | Lectures | Consultation | Seminars | Practical work | Laboratory work | Total contact work | Individual work | Tasks |
| Theme 1. Main characteristics of the biomedical signals | 4 | - | - | - | 4 | 8 | 12 | Study basic types of biophysical signals |
| Theme 2. Electrical biomedical signals | 4 | - | - | - | 4 | 8 | 13 | Study and classification of biomedical signal with electrical nature |
| Theme 3. Biomedical signals that obtained by transformation of the physical quantities. | 4 | - | - | - | 4 | 8 | 13 | Study and classification of biomedical signals with non-electric nature |



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|--|-----------|----------|----------|----------|-----------|-----------|------------|---|
| Theme 4. Methods of obtaining and properties of biomedical images. | 4 | - | - | - | 4 | 8 | 13 | Consideration of sources and properties of biomedical images |
| Theme 5. Digital filters, correlation and wavelet analysis for the biomedical signals | 4 | - | - | - | 6 | 10 | 11 | Learning ways of using main methods for the digital signal processing that applicable to biomedical signals |
| Theme 6. Processing of biomedical signals by time-based and frequency-based methods. | 4 | - | - | - | 4 | 8 | 13 | Study of methods biomedical for the time-based and frequency-based digital signal processing. |
| Theme 7. Applied tasks to biomedical signal processing. | 3 | - | - | - | 4 | 7 | 13 | Consideration of the real application examples of digital processing of the biomedical signals on practice. |
| Theme 8. Processing and analysis of biomedical images | 3 | - | - | - | - | 3 | 17 | Study of methods for processing and future analysis of biomedical images. |
| Total 165 hours | 30 | - | - | - | 30 | 60 | 105 | |

| Assessment strategy | Weight in % | Deadlines | Assessment criteria |
|-------------------------|-------------|---------------------|--|
| current assessment | 37 | during the semester | theoretical report on each topic |
| laboratory work defense | 7 | | defense of laboratory work №1 |
| | 7 | | defense of laboratory work №2 |
| | 7 | | defense of laboratory work №3 |
| | 7 | | defense of laboratory work №4 |
| | 7 | | defense of laboratory work №5 |
| | 7 | | defense of laboratory work №6 |
| | 7 | | defense of laboratory work №7 |
| | 7 | | defense of laboratory work №8 |
| | 7 | | defense of laboratory work №9 |
| passing the test | 60-100 | after the module | credited |
| | 35-59 | | not credited with the possibility of re-taking |
| | 1-34 | | not credited with mandatory re-study of the discipline |



| Author | Year of issue | Title | Information about the publication | Place of printing. Printing house or internet link |
|---|---------------|---|-----------------------------------|---|
| Compulsory literature | | | | |
| Rangayan R.M. | 2007 | Analysis biomedical signals. Practical approach | book | M .FIZMATLIT, 2007. - 440p. |
| Abakumov V.G., Geranin V.O., Rybin O.I., Svatosh J., Sinekop Y.S. | 1997 | Biomedical signals and their processing | educational manual | K .: VEK +, 1997. - 352 p |
| Storchun E.V. | 2009 | Biophysical and mathematical basics for instrumental methods of medical diagnostics | educational manual | Lviv: Publishing House "Raster-7", 2009. - 216 p. |
| Additional literature | | | | |
| Abakumov V.G., Rybin O.I., Svatosh J. | 2001 | Biomedical signals. Genesis, processing, monitoring | educational manual | K .: Nora-print, 2001. -516 s. |
| Ultimate A.I., Ultimate R.A., Paul V.A. | 2010 | Digital signal processing | educational manual | Lviv: Publishing house Lviv Polytechnic, 2010. - 368 p. |
| Rudakov P.I., Safonov I.V. | 2000 | Signal and images processing on MATLAB 5.x. | book | M .: DIALOGUE-MYTHS,2000 |
| Oppenheim A. | 2006 | Digital signal processing | book | M .: Technosphere, 2006. -856 |

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