## STUDY MODULE DESCRIPTION FORM

| Name of the module/subject **Fundamentals of biomedical engineering** | | Code **1010322331010326097** |
|---|---|---|
| Field of study **Electrical Engineering** | Profile of study (general academic, practical) **(brak)** | Year /Semester **2 / 3** |
| Elective path/specialty **Measurement Systems in Industry and** | Subject offered in: **Polish** | Course (compulsory, elective) **obligatory** |
| Cycle of study: **Second-cycle studies** | Form of study (full-time,part-time) **full-time** | |

| No. of hours | | | | No. of credits |
|---|---|---|---|---|
| Lecture: **30** Classes: **-** Laboratory: **-** Project/seminars: **-** | | | | **3** |

| Status of the course in the study program (Basic, major, other) **(brak)** | (university-wide, from another field) **(brak)** |
|---|---|

| Education areas and fields of science and art **technical sciences** **Technical sciences** | ECTS distribution (number and %**)** **3 100%** **3 100%** |
|---|---|

### Responsible for subject / lecturer:

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### Prerequisites in terms of knowledge, skills and social competencies:

| 1 | **Knowledge** | Basic knowledge in the scope of electrotechnics, physics, optoelectronics, and metrology. |
|---|---|---|
| 2 | **Skills** | Ability of the efficent self-education in the area concerned with the module |
| 3 | **Social competencies** | Awareness of the necessity of competence broadening and ability to show readiness to work as a team |

### Assumptions and objectives of the course:

Knowledge in the scope of physical and medical bases of biomeasurements and medical engineering to understand the methods and systems applied for measurements and diagnostics.

### Study outcomes and reference to the educational results for a field of study

**Knowledge:**

1. Ability to describe the application areas and potential of the modern measurement systems - [K_W11 +++]

2. Ability to explain the principles and techniques of the measurement signals acquisition and processing for the needs of current industrial and biomedical applications - [K_W11 ++ K_W12 +]

**Skills:**

1. Ability to design creatively the modern measurement systems, with the use of possibilities offered by available technologies, taking into account the limitations of present status of knowledge and technique - [K_U01 +]

2. Ability to work independently and as a team in the design and construction companies, research laboratories and industrial centers - [K_U05 +]

**Social competencies:**

1. Understanding a need of the broad populatrization of the knowledge in the area of simple and complex measurement systems used in industry and biomedical engineering - [K_K02 +]

### Assessment methods of study outcomes

Lectures:

- evaluation of the knowledge with a written exam related to the content of lectures (test, computational and problem questions),

- continuous estimation in all classes (awarding attendance in lectures, activity and quality of perception).

## Course description

Updating 2017:

Methods of education are orientated to students to motivate them to participate actively in education process by discussion and reports.

Lectures:

- Multimedia presentations expanded by examples shown on a board.

- Activity of students is taken into consideration in final students evaluation.

- Theoretical questions are presented in the exact reference to the practice.

- Biomeasurements and biomedical engineering: applications, classification, specificity, the state-of-the-art and tendency to development.

- Selected elements of physiology and anatomy.

- Thermodynamics of biological systems.

- Physical background of medical diagnostics.

- Modeling of biological processes.

- Influence of electromagnetic radiation on tissues; human organism protection from harmful factors.

- Medical applications of lasers and fiber optics technique.

- Biosensors and stents.

- Selected elements of bioinformatics ? metrological and technical aspects of recognition of DNA sequences.

- Selected questions of statistics and medical informatics.

- Clinical engineering. Ethics of procedures used in medical examinations.

**Basic bibliography:**

1. Biocybernetyka i Inżynieria Biomedyczna, red. Maciej Nałęcz, Akademicka Oficyna Wydawnicza Exit, Warszawa 2001-2003.

2. A. Cysewska-Sobusiak, Modelowanie i pomiary sygnałów biooptycznych, wyd. Politechniki Poznańskiej, Poznań 2001.

3. R. Tadeusiewicz, Informatyka medyczna, red. R. Tadeusiewicz, W. Wajs, Uczelniane Wyd. AGH, Kraków 1999.

4. G. Pawlicki, Podstawy inżynierii medycznej, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 1997.

**Additional bibliography:**

1. K. Booth, S. Hill, Optoelektronika, WKŁ, Warszawa 2001.

2. W.Z. Traczyk, Fizjologia człowieka w zarysie, PZWL, Warszawa 1992.

3. J. Szabatin, Podstawy teorii sygnałów, wyd. 3, WKŁ, Warszawa 2000.

4. Cysewska-Sobusiak A., Sowier A., Zastosowanie wideoendoskopii w stentowaniu przewodu pokarmowego, Elektronika - technologie, konstrukcje, zastosowania, nr 4, 2013, s. 136-139

5. Cysewska-Sobusiak A., Hulewicz A., Jukiewicz M., Krawiecki Z., Examples of computer-aided combined use of different methods of medical imaging, Computer Applications in Electrical Engineering, vol. 12, 2014, s. 511-520

6. Szymczak K., Cysewska-Sobusiak A., Zastosowanie ultradźwięków w inżynierii biomedycznej, Poznań University of Technology Academic Journals, Electrical Engineering, Issue 79, 2014, s. 9?16

7. Cysewska-Sobusiak A., Parzych J., Prokop D., Wybrane zastosowania transiluminacji tkanek w metrologii biomedycznej, Poznan University of Technology Academic Journals, Electrical Engineering No 88, Computer Applications in Electrical Engineering 2016, Poznan 2016, s. 11-21

8. Jukiewicz M., Cysewska-Sobusiak A., Stimuli design for SSVEP-based brain computer-interface, International Journal of Electronics and Telecommunications, Vol. 62, Nr 2, 2016, s. 109-113

## Result of average student's workload

| Activity | Time (working hours) |
|---|---|
| 1. Participation in lectures | 30 |
| 2. Participation in consulting with the lecturer | 20 |
| 3. Preparation to the exam | 18 |
| 4. Participation in the exam | 3 |

## Student's workload

| Source of workload | hours | ECTS |
|---|---|---|

| Total workload | 71 | 3 |
|---|---|---|
| Contact hours | 53 | 2 |
| Practical activities | 0 | 0 |