National Technical University of Ukraine
"Igor Sikorsky Kyiv Polytechnic Institute"

Department of Biosafety and Human Health

LIMB PROSTHETICS METHODS

Working program of basic discipline (Silabus)

Requisites for basic discipline	
Level of higher education	***First (bachelor's)***
Branch of knowledge	*16 Chemical engineering and Bioengineering*
Specialty	*163 Biomedical Engineering*
Educational program	*Medical Engineering*
Discipline status	*Elective educational components*
Form of study	*full-time / day / mixed / remote*
Year of preparation, semester	*4th course, autumn semester*
The scope of discipline	*4 ECTS credits / 120 hours*
Semester control / Control measures	*Final Test, Module Test Work, Abstract Work*
Lessons schedule	*According to the schedule on the site https://schedule.kpi.ua/*
Language of instruction	*English*
Information about course leader / teachers	***Lecturer:*** *Senior Lecturer, Department of Biosafety and Human Health, Melnyk Anna Vitaliivna, annamelnyk1996@gmail.com, +380961574360* ***Practical:*** *Assistant of the Department Snitsar Yevhen Viktorovych, snitsarye@gmail.com, +380982460212*
Course placement	*Platform «Google Classroom» - https://classroom.google.com/c/NzEyMTYxMzU5ODY5?cjc=bixdmfm*

Distribution of hours				
Semester	**Lectures**	**Practical**	**Laboratory**	**Independent Work**
autumn semester	*18*	*36*	*0*	*66*

Curriculum of the discipline

1. Description of the discipline, its purpose, subject of study and learning outcomes

The course program "Limb prosthetics methods" belongs to the elective components of the professional training cycle. A feature of its study is the professionally oriented nature and provision of interdisciplinary connections, which is reflected in the educational goals and content of the course.

In the conditions of a significant increase in the number of patients with limb amputations, the question arises of structuring and expanding the knowledge necessary for the most effective prosthetics and rehabilitation of such patients.

Course objective:

To increase the competence of students in the areas of lower and upper limb prosthetics, clinical psychology, prosthetic rehabilitation and determining the quality of prosthetics.

Main tasks:

- *acquire skills in working in a multidisciplinary rehabilitation team;*
- *acquire skills in manufacturing lower and upper limb receiving sleeves using modern technologies;*
- *acquire knowledge and skills in manufacturing receiving sleeves with various limb prosthetic fastening systems;*
- *acquire knowledge in the selection of functional components of limb prostheses, learn how to choose alternative components for prostheses depending on the clinical case;*
- *acquire skills in adjusting and optimizing the operation of knee modules during dynamic fitting;*
- *acquire skills in patient rehabilitation during prosthetics.*

The study of the educational component strengthens the following special (professional) competencies:

PC 1 *- Ability to apply engineering software packages for research, analysis, processing, and presentation of results, as well as for automated design of medical devices and systems.*

PC 11 *- Ability to develop, plan, and conduct experiments using specified technical and biomedical techniques, applying mathematical methods in the analysis and modelling of the functioning of living organisms, systems, and processes in biology and medicine, computer processing, analysis, and synthesis of the obtained results.*

The study of the educational component enhances the following program learning outcomes:

PLO 2 *- Formulate logical conclusions and reasoned recommendations regarding the assessment, operation, and implementation of biotechnical, medical-technical, and bioengineering tools and methods.*

PLO 5 *- Be able to use databases, mathematical and software tools for data processing and computer modelling of biotechnical systems.*

PLO 20 *- Knowledge and application of research methods in biomedical engineering, methods and tools for organizing and processing experimental data, statistical methods for modelling and simulating processes and systems of physical and biological nature, modern programming technologies and supporting tools, methods for designing digital and microprocessor-based medical systems.*

PLO 23 *- Development and implementation of modern diagnostic and therapeutic methods associated with the use of biotechnology, computer, and nanotechnology through the improvement of technical elements of medical devices and systems, as well as medical products, in the process of professional activity.*

2. Prerequisites and postrequisites of the discipline (place in the structural and logical scheme of education according to the relevant educational program)

The discipline "Limb prosthetics methods" belongs to the cycle of elective disciplines and is interdisciplinary in nature.

The discipline integrates, according to its subject, knowledge from other academic disciplines: human anatomy and physiology, biochemistry, mechanics and biomechanics, physics, materials science and structural materials, biomaterials and biocompatibility.

The practical skills obtained and theoretical knowledge acquired during the study of the academic discipline "Limb prosthetics methods" can be used in the future when completing Pre-diploma Practice and Diploma Design.

3. The content of the discipline

The main sections and topics that will be considered in the process of studying the course:

Section 1. Anatomy, Biomechanics and Prosthetic Rehabilitation

Subject 1.1: Multidisciplinary approach and regulatory framework in prosthetics.

Subject 1.2: Anatomical features of the lower and upper extremities. Surgical features of amputation of the lower and upper extremities. Complications after amputations.

Subject 1.3: Determining the readiness of the limb for prosthetics. Contraindications to prosthetics. Rehabilitation aids and modern technologies for early verticalization. Teaching the patient how to use and maintain the prosthesis and care for the stump.

Subject 1.4: Walking pattern. Walking deviations at different levels of amputations.

Section 2. Prosthetics technologies and prosthetic components

Subject 2.1: Diagrams of upper and lower limb prostheses. Prosthetic components.

Subject 2.2: Materials and equipment for prosthetics.

Subject 2.3: Typical designs of the receiving sleeve in upper limb prosthetics. Fixation systems for upper limb prostheses. Design selection based on specific prosthetic cases.

Subject 2.4: Typical socket designs for lower limb prosthetics. Fixation systems for lower limb prostheses. Design selection based on specific prosthetic cases.

Subject 2.5: Manufacturing technologies for receiving sleeves for the upper and lower extremities. OSSUR'S TF DIRECT SOCKET. Process overview.

Subject 2.6: Application of CAD/CAM technologies in prosthetics. Quality assessment.

Subject 2.7: Osteointegrative prosthetics.

Subject 2.8: Selection of functional components for upper and lower limb prosthetics.

Subject 2.9: Prosthesis adjustment and selection of alternative components for lower limb prostheses.

Subject 2.10: Adjusting and optimizing knee modules during dynamic fitting.

4. Training materials and resources

Basic literature:

1. *Конструювання та технології виготовлення протезів нижніх кінцівок: навч. посіб. / А. Д. Салєєва, О. Г. Аврунін, П. О. Баєв, С. В. Корнєєв, Я. В. Носова, І. В. Кабаненко, М. В. Зайцев, Т. О. Трофименко, І. Л. Тимофєєв. - Харків: ХНУРЕ, 2023. - 481 с. . – Режим доступу до ресурсу: https://openarchive.nure.ua/entities/publication/cb2ce967-2377-430f-95ac-6993ad871c23*
2. *Конструювання та технології виготовлення протезів верхніх кінцівок: навч. посіб. / А.Д. Салєєва, О.Г. Аврунін, О.М. Литвиненко, О.Г. Скрипка, Л.О. Бєлєвцова, Т.О. Трофименко, О.С. Істоміна, К.Г. Селіванова. Харків: ХНУРЕ, 2023. - 226 с. . – Режим доступу до ресурсу: https://openarchive.nure.ua/bitstreams/d746f657-5c85-40ea-9db0-dfcfe97817c8/download*
3. *Технології виготовлення гільзи протезу [Електронний ресурс]. – 2020. – Режим доступу до ресурсу: https://learn.ztu.edu.ua/mod/resource/view.php?id=180493*
4. *Протезування та штучні органи. Конспект лекцій [Електронний ресурс] : навчальний посібник для здобувачів ступеня доктора філософії за освітньою програмою «Біомедична інженерія» спеціальності 163 «Біомедична інженерія» / І. Ю. Худецький, Ю. В. Антонова-Рафі, Г. В. Мельник, Є. В. Сніцар ; КПІ ім. Ігоря Сікорського. – Електронні текстові дані (1 файл: 5,61 Мбайт). – Київ : КПІ ім. Ігоря Сікорського, 2021. – 184 с. https://ela.kpi.ua/handle/123456789/45797*

Additional literature:

1. *Доступно про протезування та реабілітацію [Електронний ресурс] / [І. Ткач, А. Новосад, О. Стеценко та ін.] – Режим доступу до ресурсу: https://bazaznan.protezhub.com/*
2. *Що потрібно знати про протези [Електронний ресурс] – Режим доступу до ресурсу: https://ossur.com.ua/useful-information-ukr/*
3. *Протезування [Електронний ресурс] – Режим доступу до ресурсу: https://moz.gov.ua/protezuvannja*
4. *Гільзи та системи кріплення протезів нижніх кінцівок [Електронний ресурс] – Режим доступу до ресурсу: https://langs.physio-pedia.com/uk/lower-limb-prosthetic-sockets-and-suspension-systems-uk/*
5. *Деякі питання протезування та ортезування виробами підвищеної функціональності за новітніми технологіями та технологіями виготовлення, які відсутні в Україні, та/або спеціальними виробами для занять спортом окремих категорій громадян, які втратили функціональні можливості кінцівки або кінцівок [Електронний ресурс] – Режим доступу до ресурсу: https://zakon.rada.gov.ua/laws/show/518-2014-%D0%BF#Text*
6. *Каталог комплектувальних виробів для виготовлення технічних засобів реабілітації індивідуального виробництва [Електронний ресурс] – Режим доступу до ресурсу: http://wheelchairs.protez.eu/Wheelchairs/CatalogAccessories/Accessories.*

Educational content

5. Methods of mastering the discipline (educational component)

№ s/n	*Subject*	*Number of hours*	*Lectures*	*Practical works*
1	**Anatomy, Biomechanics and Prosthetic Rehabilitation**	***16***	***8***	***8***
1.1	Multidisciplinary approach and regulatory framework in prosthetics.		*2*	2
1.2	Anatomical features of the lower and upper extremities. Surgical features of amputation of the lower and upper extremities. Complications after amputations.		*2*	2
1.3	Determining the readiness of the limb for prosthetics. Contraindications to prosthetics. Rehabilitation aids and modern technologies for early verticalization. Teaching the patient how to use and maintain the prosthesis and care for the stump.		*2*	2
1.4	Walking pattern. Walking deviations at different levels of amputations.		*2*	*2*
2	**Prosthetics technologies and prosthetic components**	***32***	***10***	***28***
2.1	Diagrams of upper and lower limb prostheses. Prosthetic components.		*2*	*2*
2.2	Materials and equipment for prosthetics.		*2*	*2*
2.3	Typical designs of the receiving sleeve in upper limb prosthetics. Fixation systems for upper limb prostheses. Design selection based on specific prosthetic cases.			*2*
2.4	Typical socket designs for lower limb prosthetics. Fixation systems for lower limb prostheses. Design selection based on specific prosthetic cases.			*2*
2.5	Manufacturing technologies for receiving sleeves for the upper and lower extremities. OSSUR'S TF DIRECT SOCKET. Process overview.		2	*4*
2.6	Application of CAD/CAM technologies in prosthetics. Quality assessment.		2	*2*
2.7	Osteointegrative prosthetics.		*2*	*2*
2.8	Selection of functional components for upper and lower limb prosthetics.			*2*
2.9	Prosthesis adjustment and selection of alternative components for lower limb prostheses.			*2*
2.10	Adjusting and optimizing knee modules during dynamic fitting.			*2*
	Abstract Work	*4*		*4*
	Preparation for modular control work	*2*		*2*
	Total hours:	***54***	***18***	***36***

6. Independent student work

Types of independent work *(preparation for classroom lessons, calculations based on primary data obtained in laboratory classes, solving problems, writing an essay, performing calculation work, completing homework, etc.):*

№ s/n	Types of work submitted for independent work	Duration in hours IW
1	Review of lecture material and study of questions assigned for independent work	10
2	Preparation for practical works	36
4	Preparation for modular control work	4
5	Abstract Work	10
6	Preparation for the Final test	6
Total hours		66

One of the main types of semester control during the mastering of the academic discipline "Limb prosthetics methods" is writing and defending an abstract. The volume of the abstract is 12 - 15 pages of A4 format, Times New Roman font, line spacing - 1.5, width alignment. The Abstract work must contain a title page, introduction, main part, conclusions and a list of used sources drawn up in accordance with DSTU (on the website https://vak.in.ua). The list of topics for the abstract is given in ***Appendix 1****.*

The deadline for submitting an Abstract work for verification: 13-14th week of study.

The Abstract work is not checked for plagiarism, but must meet the requirements of academic integrity. In case of detection of academic dishonesty, the work is canceled and not checked.

Policy and control

7. Policy of academic discipline (educational component)

Attendance at classes

Attendance at lectures is not mandatory. Attendance at practical classes is desirable, as they include writing express tests, practicing lecture material, acquiring practical skills, and defending a creative task and an Abstract.

The assessment system is focused on receiving points for student activity, as well as completing tasks that can develop practical skills and abilities.

Missed test works

Missed tests (Abstract defense) must be completed in the following classes.

Academic Integrity

The policy and principles of academic integrity are defined in Section 3 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". More information: https://kpi.ua/code.

Standards of Ethical Conduct

The standards of ethical conduct of students and employees are defined in Section 2 of the Code of Honor of the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". More information: https://kpi.ua/code.

Procedure for appealing the results of control measures

Students have the opportunity to raise any issue related to the control measures procedure and expect that it will be considered in accordance with the pre-defined procedures.

A student has the right to appeal the results of the control measure in accordance with the approved Regulation On Appeals at Igor Sikorsky Kyiv Polytechnic Institute (approved by order No. HOH/128/2021 dated 05/20/2021) - https://osvita.kpi.ua/index.php/node/182.

Inclusive Education

The discipline "Limb prosthetics methods" can be taught to most students with special educational needs, except for students with severe visual impairments that prevent them from completing tasks using personal computers, laptops, and/or other technical means.

Distance learning

Distance learning takes place through the Google Classroom distance learning platform.

Distance learning through additional online courses on a specific topic is allowed subject to agreement with students. If a small number of students wish to take an online course on a specific topic, studying the material using such courses is allowed, but students must complete all the tasks provided for in the academic discipline.

The list of courses is offered by the teacher after students express their desire (since the bank of available courses is updated almost monthly).

The student provides a document confirming completion of the distance course (in the case of completing the full course) or provides completed practical tasks from the distance course and, subject to an oral interview with the teacher on the topics covered, can receive grades for control measures provided for the

topics studied (express control / test tasks, practical work).

Foreign Language Teaching

English language teaching is provided only for foreign students.

At the request of students, it is allowed to study the material using English-language online courses on topics that correspond to the topics of specific classes.

8. Monitor and evaluate the system of evaluation of learning outcomes (Rating System of Evaluation)

Evaluation system (current control):

№ s/n	Control measure	%	Weight points	Number	Total
1.	Express control work / test tasks	10	5	2	10
2.	Creative task	15	15	1	15
3.	Abstract work	15	15	1	15
4.	Completion and defense of practical work	45	3	15	45
5.	Modular control work (MCW)	15	15	1	15
	Total				100

Scoring criteria:

1. Express-control works are estimated at 5 points (only 2 works for a total of 10 points):
– tests with one correct answer - 10 tests for 0.2 points - a total of 2 points
– tests with several correct answers - 10 tests for 0.3 points - a total of 3 points

2. Work in practical classes is estimated at 3 points (only 15 answers in practical classes for a total of 45 points):
– the complete answer to the question/task - 3 points;
– the sufficiently complete answer or a complete answer with minor inaccuracies - 2.5 points;
– an incomplete answer and minor errors - 2 points;
– passive work - 0 points;

3. Execution and defense of the abstract – 15 points
The topics of the Abstracts are given in Appendix 1.
The deadline for submitting the Abstract for verification and defense: 13-14th week of study.
The abstract is not checked for plagiarism, but must meet the requirements of academic integrity. If academic dishonesty is detected, the work is canceled and not checked.
– creatively executed and defended work without comments – 14 - 15 points;
– the work is executed and defended with minor shortcomings – 13 - 12 points;
– the work is executed and defended with certain errors – 9 -11 points;
– the work is not credited (not executed or there are gross errors) – 0 points.

4. Completion and defense of a creative task – 15 points
Instructions for completing a creative task are given in Appendix 2.
Deadline for submitting a creative task for review and defense: 10-12th week of study.
– creatively completed and defended work without comments – 14 - 15 points;
– work completed and defended with minor flaws – 13 - 12 points;
– work completed and defended with certain errors – 9 -11 points;
– work not credited (not completed or contains gross errors) – 0 points.

5. Writing a modular test (MKR) - 15 points
MKR is presented to students in the form of a test:
- tests with one correct answer - 30 tests of 0.2 points each - a total of 6 points
- tests with several correct answers - 10 tests of 0.5 points each - a total of 5 points
- tests with a short answer - 5 tests of 0.8 points each - a total of 4 points.

Calendar control (CC) *- is carried out twice a semester as a monitoring of the current state of implementation of the syllabus requirements. The purpose of calendar control is to improve the quality of student learning and monitor the implementation of the educational process schedule by students.*

The condition for a positive first attestation is to obtain at least 16 points for work in practical classes. The condition for a positive second attestation is to obtain at least 28 points and complete all mandatory tasks (at the time of attestation).

Semester control: Final test.
The Final test is held at the credit session.
The maximum amount of points is 100. A prerequisite for admission to the credit is to obtain a final rating for the semester of at least 50 points and successfully write the MCR and submit the Abstract work.
Students, who have a rating of less than 60 points at the end of the semester, as well as those who want to increase their grade, perform credit control work. In this case, the points earned by the student are canceled, and the grade for the credit test is final.
Applicants take the credit test orally according to the questions (Appendix 3) of the ticket.
The ticket consists of 4 theoretical questions - 25 points for each question.
The maximum number of points for the credit test = 25 points x 4 questions = 100 points.
If an applicant who took the credit test to increase his rating score and received fewer points than the number of points received based on the results of current control measures, then the final rating score based on the results of the semester control (credit test) is entered into the semester control report.

Criteria for calculating points:
– "excellent" - a complete answer (at least 95% of the required information) - 24 - 25 points;
– "good" – sufficiently complete answer (at least 75% of the required information) or a complete answer with minor inaccuracies – 19 – 25 points;
– "satisfactory" – incomplete answer (at least 60% of the required information) and minor errors – 15 – 18 points;
– "unsatisfactory" – the answer does not meet the requirements for "satisfactory" – 0 points.

Table of translation of rating points to grades on a university scale:

Number points	*Assessment on the university scale*
100-95	*Perfectly*
94-85	*Very good*
84-75	*Good*
74-65	*Satisfactorily*
64-60	*Enough*
Less 60	*Unsatisfactorily*
Admission conditions are not met	*Not allowed*

9. Additional information on the discipline (educational component)

Distance learning through additional online courses on a specific topic is allowed subject to agreement with students. If a small number of students wish to take an online course on a specific topic, studying the material using such courses is allowed, but students must complete all the tasks provided for in the academic discipline.

The list of courses is offered by the teacher after students express their desire (since the bank of available courses is updated almost monthly).

The student provides a document confirming completion of the distance course (in the case of completing the full course) or provides completed practical tasks from the distance course and, subject to an oral interview with the teacher on the topics covered, can receive grades for control measures provided for the topics studied (express control / test tasks, practical work).

Work program of the discipline (syllabus):

Compiled by *Senior Lecturer, Department of Biosafety and Human Health, Melnyk Anna Vitaliivna, Assistant of the Department Snitsar Yevhen Viktorovych*
Approved by *the Department of Biomedical Engineering (protocol № 16 of June 21, 2024)*

Approved by *the Methodical Commission of the Faculty of Biomedical Engineering (protocol № 9 of June 26, 2024)*

Appendix 1.

For syllabus of the discipline "Limb prosthetics methods"

List of topics for writing Abstract work

1. *Upper limb exoprosthetics, prosthetic systems.*
2. *Modern technologies of prosthetics and orthotics of the upper limbs.*
3. *Problems that arise during limb prosthetics.*
4. *Bionic upper limb prostheses.*
5. *Lower limb exoprosthetics, prosthetic systems.*
6. *Selection of components for a patient with transtibial lower limb amputation at the stage of training with a prosthesis.*
7. *Selection of components for a healthy active patient aged 30 with transtibial lower limb amputation at the stage of follow-up.*
8. *Selection of components for a 25-year-old patient who is professionally engaged in running with transtibial lower limb amputation at the stage of follow-up.*
9. *Selection of components for a 40-year-old patient who is professionally engaged in swimming with transtibial lower limb amputation at the stage of follow-up.*
10. *Selection of components for a healthy active patient aged 30 with a transfemoral lower limb amputation at the stage of training with a prosthesis.*
11. *Selection of components for a patient aged 25 who are professionally engaged in running with a transfemoral lower limb amputation at the stage of further observation.*
12. *Selection of components for a patient aged 40 who are professionally engaged in swimming with a transfemoral lower limb amputation at the stage of further observation.*
13. *Selection of components for a patient with a hemipelvectomy at the stage of training with a prosthesis.*
14. *Selection of components for a patient with a hemipelvectomy at the stage of further observation.*
15. *Selection of components for a patient with an upper limb amputation at the level of the forearm.*
16. *Selection of components for a patient with an upper limb amputation at the level of the shoulder.*
17. *Multidisciplinary / interdisciplinary management of amputees*
18. *Complications after amputation*
19. *Performance evaluation criteria for patients with lower limb amputations*
20. *Preparing the patient with a lower limb amputation for prosthetics*
21. *Acute postoperative management of the amputee*
22. *Typical physical therapy techniques during and after lower limb prosthetics*
23. *Emotional and psychological reactions to amputation*
24. *Gait pattern. Gait deviations at different levels of amputation*
25. *Modern technologies for early verticalization of the patient*
26. *Comorbidities and injuries of patients with limb amputations*
27. *Assessment of the capabilities of a patient with an upper limb amputation and determination of prosthetic needs*
28. *Performing tasks of daily living and returning to professional activity after an upper limb amputation.*

Appendix 2.

For syllabus of the discipline "Limb prosthetics methods"

Instructions for completing the Creative task

1. Analyse the patient (level of amputation, level of activity).

2. Analyse the purpose of the prosthesis.

3. Select approximate components of a modular prosthesis (from the College Park, Ottobock, Trulife catalogs).

For primary prosthetics, training and permanent.

For swimming, regular and swimming

For greenhouses, regular on two legs

4. Justify the choice of components.

The task options are listed in Table 1.

Table 1 – Options for completing a creative task

№	Вік	Стать	Рівень ампутації та довжина кукси	Рівень активності (шкала К)	Протезування	Протез
1	25	Чоловік	Вище коліна (стегно), довга кукса	К4 (спортсмен, високий рівень активності)	первинне	звичайнинй
2	60	Жінка	Нижче коліна (гомілка), коротка кукса	К1 (пенсіонерка, повільна хода)	не первинне	звичайнинй
3	30	Жінка	Вище коліна (стегно), середня кукса	К3 (активний спосіб життя)	не первинне	звичайнинй
4	18	Чоловік	Колінний суглоб (дизарткуляція)	К4 (студент, фізична активність)	первинне	купальний
5	70	Чоловік	Нижче коліна (гомілка), довга кукса	К1 (низька активність, обмежена рухливість)	не первинне	звичайнинй
6	35	Жінка	Тазостегновий суглоб (висока ампутація)	К2 (базова активність)	первинне	звичайнинй
7	20	Жінка	Вище коліна (стегно), коротка кукса	К4 (активний стиль життя)	первинне	звичайнинй
8	67	Чоловік	Колінний суглоб (дизарткуляція)	К1 (мала рухливість)	не первинне	звичайнинй
9	29	Жінка	Нижче коліна (гомілка), довга кукса	К4 (бігун-любитель)	не первинне	купальний
10	50	Чоловік	Нижче коліна (гомілка), середня кукса	К2 (середня активність, помірне пересування)	первинне	купальний
11	28	Жінка	Нижче коліна (гомілка), середня кукса	К3 (спортсменка-любителька)	не первинне	звичайнинй
12	65	Чоловік	Тазостегновий суглоб (висока ампутація)	К1 (низька рухливість, пенсіонер)	не первинне	звичайнинй
13	55	Жінка	Колінний суглоб (дизарткуляція)	К2 (побутова активність)	не первинне	купальний
14	22	Чоловік	Вище коліна (стегно), середня кукса	К4 (військовий ветеран, висока активність)	первинне	звичайнинй
15	35	Жінка	Нижче коліна (гомілка), коротка кукса	К3 (туризм, активний стиль життя)	первинне	звичайнинй
16	45	Чоловік	Парна ампутація нижче коліна, середні кукси	К3 (робота в офісі, активний пересування)	первинне	звичайнинй
17	50	Жінка	Парна ампутація вище коліна, короткі кукси	К2 (активність у межах дому)	первинне	звичайнинй
18	32	Чоловік	Парна ампутація нижче коліна, довгі кукси	К4 (спортсмен-любитель)	не первинне	купальний
19	38	Чоловік	Парна ампутація вище коліна, середні кукси	К3 (активний спосіб життя, туризм)	первинне	звичайнинй
20	70	Жінка	Парна ампутація нижче коліна, короткі кукси	К1 (низька рухливість)	первинне	звичайнинй
21	52	Чоловік	Парна ампутація колінного суглоба	К2 (активність у межах дому)	первинне	купальний
22	65	Чоловік	Вище коліна (стегно), коротка кукса	К1 (низька рухливість, пенсіонер)	первинне	звичайнинй

Appendix 3.

For syllabus of the discipline "Limb prosthetics methods"

List of questions for the Final test

1. *Anatomical and functional characteristics of the bones and joints of the lower limb, relevant for prosthetics.*
2. *Anatomical and functional characteristics of the upper limb in the context of restoring grasping function.*
3. *Biomechanical role of the hip, knee and ankle joints in walking.*
4. *Biomechanics of upper limb movements and its significance for the selection of functional components of the prosthesis.*
5. *The influence of the level of amputation on the biomechanics of movement and the patient's energy expenditure.*
6. *Basic principles of prosthetic rehabilitation of patients after amputation.*
7. *Composition and functions of a multidisciplinary team in limb prosthetics.*
8. *The role of a physical and rehabilitation medicine doctor in the prosthetics process.*
9. *The role of a physical therapist and occupational therapist in prosthetic rehabilitation.*
10. *Regulatory and legal principles for providing individuals with prosthetic and orthopedic products in Ukraine.*
11. *Documentation and indications for referring a patient for prosthetics.*
12. *Anatomical features of lower limb amputations at different levels.*
13. *Anatomical features of upper limb amputations.*
14. *Surgical principles of forming a stump optimal for prosthetics.*
15. *Features of muscle balance after amputation and their significance for prosthetics.*
16. *Early and late complications after amputations.*
17. *Pain syndromes after amputation (phantom pain, neuromas) and their impact on prosthetics.*
18. *Clinical criteria for the readiness of the stump for primary prosthetics.*
19. *Absolute and relative contraindications to prosthetics.*
20. *Assessment of the condition of the skin, scar and soft tissues of the stump.*
21. *Rehabilitation aids in the pre-prosthetic period.*
22. *Modern technologies for early verticalization after amputation.*
23. *Teaching the patient how to care for the stump and prosthesis.*
24. *Normal gait pattern: phases and key characteristics.*
25. *Changes in the gait pattern in amputation at the level of the lower leg.*
26. *Gait deviations in amputation at the level of the hip.*
27. *Typical errors in using the prosthesis that affect gait.*
28. *The influence of prosthesis adjustment on the symmetry and stability of walking.*
29. *Classification of upper and lower limb prostheses.*
30. *Basic schemes for constructing lower limb prostheses.*
31. *Basic schemes for constructing upper limb prostheses.*
32. *Prosthetic components: purpose and functional differences.*
33. *Criteria for selecting components depending on the patient's activity level.*
34. *Typical designs of receiving sleeves for upper limb prostheses.*
35. *Upper limb prosthesis attachment systems: advantages and disadvantages.*
36. *Typical designs of receiving sleeves for lower limb prostheses.*
37. *Lower limb prosthesis attachment systems.*
38. *Clinical factors in choosing a receiving sleeve design.*
39. *Main stages of manufacturing a receiving sleeve using the traditional method.*
40. *Technology for manufacturing a sleeve using the Össur TF Direct Socket system.*
41. *Advantages and limitations of direct sleeve molding.*
42. *Application of CAD/CAM technologies in prosthetics.*
43. *Criteria for assessing the quality of a digitally manufactured receiving sleeve.*
44. *Principles of osseointegrative prosthetics.*

45. *Indications and contraindications for osseointegration.*
46. *Selection of functional components for upper limb prostheses.*
47. *Selection of functional components for lower limb prostheses.*
48. *Main stages of static and dynamic prosthesis adjustment.*
49. *Selection of alternative components in case of changes in the patient's functional state.*
50. *Classification of knee modules for hip prostheses.*
51. *Mechanical, hydraulic and microprocessor knee modules: comparative characteristics.*
52. *Main parameters of knee module adjustment.*
53. *Typical errors in knee module adjustment and their clinical manifestations.*
54. *The role of dynamic fitting in increasing the functionality of the prosthesis.*
55. *Assessment of the safety and stability of the prosthesis during walking.*
56. *Adaptation of knee module settings to different walking speeds.*
57. *Influence of body weight and activity level on knee module selection.*
58. *Interaction between prosthetist and physical therapist during optimization of settings.*
59. *Criteria for success of prosthetics from the perspective of function, safety and quality of life of the patient.*