Ministry of science and education of Ukraine
Ternopil Ivan Puluj National Technical University

Faculty of Applied Information Technologies and Elektrical Engineering
/ name of the faculty /

Department of_Biotechnical Systems
/ name of the department /

Approved by
Dean of the Faculty
_____ V.I. Yaskiv
«____»_____2020

INDUSTRIAL INTERNSHIP
/ discilpline name /

field of knowledge 16 – Chemical and Bioengineering
/ code and name /

level of higher education Bachelor
/ name /

speciality 163 Biomedical Engineering
/ code and name /

educational program Biomedical Engineering
/ name /

specialism _____–_____
/ name /

Ternopil - 2020

Syllabus on ____industrial internship_____
/ name of the discipline /

For students of faculty:
_____Applied Information Technologies and Elektrical Engineering_____
/ name of the faculty /

Authors:
Dept. Assistant, PhD_____ _____ /_____Y.Bg. Palaniza____/
/ position, degree, academic status / / signature / / initials and surname /

_____ _____ /_____/
/ position, degree, academic status / / signature / / initials and surname /

The syllabus was reviewed and approved
at the meeting of department _____ Biotechnical Systems _____
/ name /

Minutes of 14.09.2020 № 3
Head of the department _____ /_____E.B. Yavorska__/
/ signature / / initials and surname /

The syllabus was reviewed and approved by Academic and Methodical Board
of the faculty: __Applied Anformation Technologies and Elektrical Engineering___
Minutes of 06.10.2020 №2

Secretary of AMB _____ /____Yu.B. Kapatsila___/
/ signature / / initials and surname /

Syllabus is signed by:
Speciality _____163 Biomedical Engineering _____
/ code and name /

Educational program _____ Biomedical Engineering _____
/ name /

Head of graduate department _____ /_____E.B. Yavorska ___/
/ signature / / initials and surname /

Head of educational program _____ /_____ B.I. Yavorsky__/
/ signature / / initials and surname /

Speciality _____
/ code and name /

Educational program _____
/ name /

Head of graduate department _____ /_____/
/ signature / / initials and surname /

Head of educational program_____ /_____/
/ signature / / initials and surname /

Description of production practice

<table>
<tr><td rowspan="2">Name of indicators</td><td rowspan="2">Field of knowledge, direction of training, educational and qualification level</td><td colspan="2">Characteristics of the production discipline</td></tr>
<tr><td>full-time education</td><td>external form of education</td></tr>
<tr><td rowspan="2">Number of credits - 3</td><td>16 – Chemical and Bioengineering</td><td colspan="2" rowspan="2">normative</td></tr>
<tr><td>163 Biomedical Engineering</td></tr>
<tr><td>Modules -</td><td rowspan="4">163 Biomedical Engineering</td><td colspan="2">Year of greade:</td></tr>
<tr><td>Content modules -</td><td>2d</td><td>2d</td></tr>
<tr><td>Individual research task: -</td><td colspan="2">Semester</td></tr>
<tr><td>The total number of hours is 90</td><td>4th</td><td>4rd</td></tr>
<tr><td rowspan="10">Weekly hours for full-time study:
classroom -
independent student work -</td><td rowspan="10">Educational and qualification level: bachelor</td><td colspan="2">Lectures</td></tr>
<tr><td>-</td><td>-</td></tr>
<tr><td colspan="2">Practical, seminar</td></tr>
<tr><td>-</td><td>-</td></tr>
<tr><td colspan="2">Laboratory</td></tr>
<tr><td>-</td><td>-</td></tr>
<tr><td colspan="2">Individual work</td></tr>
<tr><td>-</td><td>-</td></tr>
<tr><td colspan="2">Individual tasks: -</td></tr>
<tr><td colspan="2">Type of control: Differential test</td></tr>
<tr><td>Groups</td><td>2020-2021</td><td colspan="2">IRB-22</td></tr>
<tr><td>Period</td><td>2020-2021</td><td colspan="2">18.01.2021-31.01.2021 (2 weeks)</td></tr>
</table>

1 PURPOSE OF PRODUCTION PRACTICE

The internship of students is one of the important types of production work and is carried out in order to acquire production skills to make independent decisions in real production conditions, and. It is designed to prepare future professionals for real practical work, to ensure the appropriate level of their training.

The purpose of the practice is to consolidate and apply in practice the basic general professional knowledge in the field of engineering, biology and medicine through interdisciplinary developments that combine engineering approaches with the achievements of biomedical science and clinical practice.

2 PROBLEMS OF PRODUCTION PRACTICE

1. Gaining skills in working with modern biotechnical devices and systems for research in the field of biomedical engineering.
2. Familiarity with modern methods of processing, analysis and synthesis of medical and biological information.
3. Acquaintance with the basic rules of registration of results of researches and registration of reports;
4. Ability to present data obtained during the experiment.

3ORGANIZATION OF PRACTICE

Educational and methodological guidance is provided by the Department of Biotechnical Systems.

The person in charge of the internship provides the student with information on the internship bases in a timely manner. Students within the specified period submit to the department in the name of the head of the application with the indication of the base of practice which is chosen.

The official basis for conducting internships for students is an agreement concluded between the university and the medical institution or research institution.

Contracts are concluded at the request of the professional department of biotechnical systems. The procedure for submitting applications and concluding contracts is established by the order of the rector and the order of the dean.

The head of the internship base issues an order for internships, which determines the organization and conduct of internships, measures to create the necessary conditions for interns to implement the internship program, occupational safety and accident prevention, control over students' compliance with internal labor regulations. , other activities, conducting practice in accordance with the Regulations on internships for university students, appoints the head of practice from a medical institution or research institution.

Before the internship, the department holds a meeting of interns and teachers - leaders of the internship to explain the purpose, content and procedure of the internship.

One month before the internship, the person in charge of the internship draws up an internship order with instructions from the supervisors.

Based on the order, the teacher responsible for the internship forms a schedule of visits by student supervisors to their workplaces in order to provide advice and control the internship.

Before being sent to the base of practice, the student must receive a referral, practice diary, program, individual assignment for the thesis and course project (work).

When a student arrives for an internship, he must issue a notice of arrival at the company and the beginning of internship for the first three days, if he came to study from other cities, students undergoing internships at medical enterprises must deliver notifications to the university to the Department of Biotechnology. systems.

Until such notification is received, the student is considered to have failed to appear in practice, which is considered a violation of the educational process. Students who have not completed the internship for valid reasons are sent to the internship within the time limits set by the dean's office.

During the internship the student must:

– perform the tasks provided for in the internship program and calendar schedule;

– to obey the current rules of internal labor regulations of the medical institution, enterprise;

– strictly follow the rules of safety and labor protection;

– work at the workplace, which is specified by the head of practice from the company and be responsible for the work performed and its results along with full-time employees;

– systematically keep a diary of practice.

4BASE OF PRACTICE

The place of internship can be:

a) medical institution (hospital, clinic, clinic, etc.), provided that it has and uses electronic medical equipment;

b) an enterprise specializing in manufactured BTMAS;

c) research institutions of medical orientation.

Consolidation of practice bases should contribute to the establishment and strengthening of long-term direct contacts of the university with medical institutions and medical enterprises, as well as the development of cooperation between them in the field of quality training. Updating the databases should be based on the analysis of the results of the internship in the current year and help improve the quality and efficiency of practical training of students.

The choice of bases of practice is carried out by the department of biotechnical systems taking into account the tasks of practice and the possibility of their implementation.

It is recommended to choose medical institutions and medical enterprises that have an agreement with the university on training specialists for them as bases of practice. The application for registration of the contract with medical institutions as a base of practice the department of biotechnical systems sends to educational department of university which prepares all necessary documentation connected with the conclusion of the contract with the enterprise.

For foreign students, the bases of practice are provided in the relevant contract or agreement on training and can be located both on the territory of the customer countries and on the territory of Ukraine.

Students can independently, with the permission of the department, choose for themselves the place of practice and offer them for use.

Consolidation of practice bases is carried out in accordance with the established procedure of the Ministry of Education and Science, Youth and Sports of Ukraine.

The duration of the agreements is agreed by the parties to the agreements and can be determined for the period of practice.

5 TERM OF PRODUCTION PRACTICE

Production practice is carried out in the period specified in the curriculum. Two weeks before the start of the internship, the student must determine the place of the internship and inform the head of the internship. In case of concluding a contract for internship outside the University, the student must submit a certified copy of the contract to the department.

6GUIDENCE AND CONTROL OF THE PRACTICE

The Department of Biotechnical Systems supervises the internship.

The teacher of the department, responsible for the practice:

ensures high-quality implementation of the internship program and high quality of its implementation;

appoints experienced teachers as heads of industrial practice;

distributes on the basis of the agreements concluded with the enterprise of students on bases of practice;

appoints a senior from a group of students who are interns at one institution;

provides the institution, as well as the interns themselves with internship programs;

exercises strict control over the organization and conduct of industrial practice of students in the institution, and compliance with deadlines and content.

Responsibilities of the head of the practice appointed by the department from the university:

ensure that all organizational arrangements are made before sending students to practice;

to ensure high quality of practice and strict responsibility of its curriculum;

provide advice to students on all issues of practice;

to control observance by students-trainees of rules of internal order;

to manage the research work of students, which is provided by the tasks of the department;

to carry out current control of passing of practice according to the calendar schedule;

consider reports of students on practice, provides feedback and conclusion on practice and report;

submit a written report on the internship, provide suggestions and comments on the perfection of practical training of students.

The responsibilities of the head of practice from the company include:

to organize the internship of students assigned to him in close contact with the head of the university;

to acquaint students with the organization of work in a particular workplace;

to exercise constant control over the production work of trainees, to help them correctly perform all tasks at the workplace, to provide advice;

to control the keeping of diaries, preparation of reports by students-interns and to compile for each student a characteristic-response of the head of practice from the enterprise, which is entered in the relevant section of the diary of industrial practice;

to get acquainted with the student's report and evaluate the report and the student's work;

participate in the defense of student reports as experts and examiners.

7 INDIVIDUAL TASK

Much attention should be paid to the implementation of individual tasks, as it develops the independence of students in solving technical problems and expands their horizons as professionals.

Individual assignments can be given to individual (or all) students from the university and the company. The head of the practice from the medical institution gives the student an individual production task as an assistant physician for technical support. It consists in object-oriented medical engineering (correct orientation of electronic medical devices as objects in medical institutions to ensure optimal performance during the process of diagnosis, operations, medical procedures, etc.).

Individual tasks in industrial practice should be aimed at training a specialist who is able to solve the following characteristic tasks:

- operational activity and service:

- participation in the organization and carrying out of diagnostic researches, medical procedures (including in the course of rehabilitation in the recovery period) and biological experiment with use of tool and hardware-software means;
- development of software for solving practical problems of medical and biological practice;
- processing of biomedical information, development and operation of medical databases, expert, monitoring systems, use of modern modern pacts of applied programs of information support of diagnostic and medical processes.

- Research activities
  - analysis of the state and dynamics of quality indicators of objects of activity using the necessary methods and research tools;
  - development of theoretical models that allow predicting the properties, state and behavior of the object of study;
  - development of non-standard equipment and devices for medical and biological research laboratories;
  - development of plans, programs and methods of conducting research and algorithms for processing observation results;
  - participation in development of new methods of research of a condition of biological objects and management of management of this condition, and also new medical technologies with application of technical and computer means.

The head of practice from the university in some cases of his choice can lookto give students the topic of abstracts.

8 THEORETICAL CLASSES AND EXCURSIONS

Along with general introductory lectures, production tours are organized, where students are introduced to advanced medical technologies, special medical equipment, tools, etc.

Excursions can be conducted both in the basic medical institution (in medical offices (diagnostic rooms, operating rooms), provided by the schedule for practice), and at other medical enterprises, or organizations of interest in connection with the study of medical technology of the enterprise.

Lectures are recommended; related to the specifics of a particular institution and its achievements (construction of a medical facility, the history of the medical institution, the achievements of innovators, advanced medical technologiesprocesses, etc.

It is necessary to provide in lectures of studying of questions of labor protection, safety of vital activity on the given object of medical institution, the organization of management of medical technology, system of the control over observance of rules and measures on labor protection by public organizations and the state inspection on supervision of a state of labor protection in medical institution. and other.

The knowledge gained in lectures and field trips should be reflected in the trainees' reports and included in the amount of knowledge that is monitored in the practice test.

9 CONTENTS OF THE REPORT ON PRODUCTION PRACTICES

Upon completion of the internship, the student must prepare a report. The volume of the report must be at least 10 printed sheets of A4 format. In the report the student reflects results of performance of tasks of industrial practice, namely.

9.1 Content of the report during the internship in medical institutions

The report must contain:

– description of the structure of the medical institution;

– medical problems solved in the institution;

– a description of the functional purpose and scope of use of electronic medical devices available in this medical institution;

– description of the technology of the medical institution;

– description of designs of electronic medical devices;

– explanatory diagrams and sketches;

– Recommendations for improving the technology of the medical institution (ways to improve the orientation of medical electronic devices as a technical tool of the doctor and ensure the optimality of their work as a holistic system (class of objects)).

– conclusions about the effectiveness of the use of existing medical equipment, the need to equip the institution with new modern medical electronic devices to improve the technology of the medical institution.

– The individual task is set on the object of practice and the results of its solution.

9.2 Content of the report during the internship in research institutions, TNTU

The content of the report depends on the work that the student performs during the internship. There may be the following options:

a) acquaintance with the structure, material and technical base of the institution, establishment, the main directions of its research work;

b) participation in research work and preparation of methodological support of the institution.

c) The individual task is set on the object of practice and the results of its solution.

9.2.1 When acquainted with the scientific work carried out in the institution, the institution's report must contain:

– description of the structure of the institution;

– review of research topics conducted in the institution;

– description of characteristics, parameters and functional purpose and scope of medical electronic devices (systems) used in research work or in the educational process;

– description of the technology of the medical side of the research institution, TNTU;

– description of the designs of the selected device (devices);

– explanatory diagrams and sketches;

– description of devices, tools, material and energy resources;

– description of metrology and standardization measures;

– the individual task is set on the object of practice and the results of its solution.

– conclusions.

9.2.2 If during the internship the student participated in research work or preparation of methodological support of the institution (in the University participation in research work of the department or in work on preparation of methodological support of the department), the student reflects the results of the work.

10DRAFTING OF RESULTS OF PRACTICE

Students who have completed an internship are required to complete a diary and report on the implementation of the internship program and protect them.

10.1 Requirements for registration

The report is made in compliance with the requirements of DSTU 3008, on A4 sheets (210-297 mm). The report is performed in handwritten or machine (using computer technology) on one side of a sheet of white paper. When undergoing practice according to the option specified in paragraph 4.1.1 - only by machine. The page should not contain more than 40 lines, provided it is evenly filled and the height of letters and numbers is not less than 1.8 mm.

The text of the report should be printed in compliance with the following dimensions of the banks: upper, left and lower - not less than 20 mm, right not less than 10 mm.

The report is divided into structural units - "INTRODUCTION", "SECTIONS", CONCLUSIONS, "LIST OF SOURCES USED", APPENDICES. Sections are divided into subsections, paragraphs and sub-paragraphs. Sections and subsections must have titles. Items and sub-items may have headings.

Headings of report structural elements and section headings should be placed in the middle of the line and printed in capital letters without a dot at the end, without underlining.

Headings of sections, paragraphs and sub-paragraphs of the report should begin with a paragraph indent and print in small letters, except the first capital letter, without underlining, without a period at the end.

The paragraph indent should be the same throughout the text of the report and equal to five characters.

The spacing between the headings and the subsequent or previous text must be at least two lines.

The distance between the bases of the title lines, as well as between the two headings is taken as in the text.

The pages of the report should be numbered in Arabic numerals. The page number is placed in the upper right corner of the page without a dot at the end. The title page is included in the general page numbering. The page number is not affixed on the title page.

10.2 Numbering of sections, subsections, items, sub-items

Sections, subsections, paragraphs, sub-paragraphs of the report should be numbered in Arabic numerals. Sections of the report should be sequentially numbered within the statement of the essence of the report and be denoted by Arabic numerals without a period, such as 1, 2, 3, etc.

Units must be numbered sequentially within each section. The subdivision number consists of a section number and a serial number of the subdivision, separated by a period. After the unit number do not put a full stop, for example, 1.1, 1.2, etc.

Items must be numbered sequentially within each unit. The item number consists of a section number, a subsection number and a serial number of the item, separated by a period. After the item number do not put a full stop, for example, 1.1.1, 1.1.2, etc.

If the text is divided only into paragraphs, they should be numbered.

The sub-item number consists of the section number, the serial number of the subsection, the serial number of the item and the serial number of the sub-item, separated by a period. After the number of the subparagraph do not put a dot, for example, 1.1.1.1, 1.1.1.2, etc.

10.3 Illustrations

Illustrations (drawings, figures, graphs, diagrams, charts, photographs) should be placed in the report immediately after the text where they are mentioned for the first time, or on the next page. All illustrations must be referenced in the report.

Illustrations can have a title, which is placed under the illustration. If necessary, explanatory data (pictorial text) are placed under the illustration.

Illustrations are denoted by the word “Figure ___”, which together with the name of the illustration is placed after the explanatory data, for example, “Figure 3.1 - Layout scheme”.

Illustrations should be numbered in Arabic numerals with ordinal numbers within the section, except for the illustrations in the appendices.

10.4 Tables

Digital material is usually made in the form of tables. The table should be placed immediately after the text where it is mentioned for the first time, or on the next page. All tables must be referenced in the text of the report.

Tables should be numbered in Arabic numerals with ordinal numbers within the section, for example, table 2.1 - the first table of the second section.

Part of the table can be moved to the next page. The word "Table -" is indicated once on the left above the first part of the table, above the other parts write: "Continuation of the table ___" with the table number.

10.5 Title page

For a sample title page of the practice report, see Appendix A.

10.6 Appendices

The appendices should be formatted as a continuation of the report on its next pages, placing the appendices in the order in which they appear in the text of the report.

Each application must start on a new page. The application should have a title printed at the top in lower case with the first capital symmetrically relative to the text of the page. In the middle of the line above the title, the word "Appendix__" and a capital letter denoting the appendix should be printed in small letters with the first capital letter.

Appendices should be marked consecutively with capital letters of the Ukrainian alphabet, except for the letters E, C, I, I, J, O, H, b, for example, Appendix A, Appendix B, etc.

11 EVALUATION OF PERFORMANCE RESULTS PRODUCTION PRACTICE

The report on the implementation of the internship program together with the completed internship diary is submitted for review and signature to the internship manager.

The conclusion of the head of practice from the University should reflect the level of theoretical knowledge acquired by the student and the ability to apply them in practice, information about the student's implementation of all sections of the practice program, the correctness of reporting documentation, conclusions and suggestions for evaluation.

On the last working day of the internship, a differentiated internship test is held, in which students individually defend reports and diaries on the internship before a commission appointed by the head of the graduating department. The commission

consists of the head of the department (or his deputy), heads of practice from a higher educational institution. During the defense, the student must describe the work done on the basis of practice, offer their suggestions for its improvement. The practice test is evaluated on a five-point scale. The grade for the internship is entered in the credit-examination list and the student's record book under the signatures of the members of the commission.

The process of assessing students' knowledge includes:

- checking the practice diary and practice report by practice leaders and writing a review;
- defense of the report by the student before the commission.

During the defense is assessed:

- completeness of the internship program;
- student's answers to the questions.

The grade "excellent" is given to the student on condition of full, timely implementation of the internship program without significant comments and thorough answers to the questions.

Grade "good" - provided that the program of practice is implemented by 80% and clear answers to questions.

Assessment "satisfactory" - subject to the implementation of the internship program by 60% and clear answers to most questions.

12 RECOMMENDED LITERATURE

1. Aznakaev, EG Biomedical engineering [Text]: (fundamental and applied aspects): textbook. manual for universities / EG Aznakayev. - K.: НАУ, 2007. - 389 с.
2. Biomedical measuring equipment: a textbook for universities / edited by LV Ilyasov. - M .: Высшая школа, 2007. - 342 с.
3. Apparatus and methods of clinical monitoring / ed. L.I. Kalakutskogo - M .: Higher School, 2004 -156 p.- Approved by the Ministry of Education and Science of the Russian Federation. - ISBN 5-94836-069-5 /
4. Gusev, VG Obtaining information about the parameters and characteristics of the organism and physical methods of influencing it: textbook. manual for universities / VG Gusev. - M .: Mashinostroenie, 2004.- 597p. - Bibliogr .: p. 581-588. ISBN 5-217-03258-8.
5. DSTU 3008-95. Documentation. Reports in the field of science and technology. Structure and design rules. - Kyiv: State Standard of Ukraine, 1995. - 36 p.
6. Egorov NS Biotechnology: a textbook for universities (in 8 books). Book 1: Problems and prospects / NS Egorov, VD Samuilov [Ed. Egorova NS]. - M .: Higher. school, 1987. - 159 p.
7. Kanyukov VN Medical diagnostic equipment: a textbook / V.N. Канюков, Р.Ш. Тайгузин, О.М. Trubina, R.N. Podoprigora; Orenburg state. un-t. - Orenburg: OGU, 2010. - 110 p.
8. Korenevsky NA Medical devices, devices, systems and complexes: textbook. manual for universities / NA Korenevsky, EP Popechitelev, SP Seregin; Ministry of Education and Science Ros. Federation, Kursk state. tech. un-t; St. Petersburg. state electrotechn. un-t. - 2nd ed. - Курск: ИПП "Курск", 2009. - 986 с.
9. Medical equipment. Complete directory/ M. Yu. Ishmanov [et al.]. - M.: Эксмо, 2007. - 608 с. - Author. decree. on the turnover of tit. l - ISBN 978-5-699-24312-9.
10. Pakharkov GN Biomedical engineering. Problems and prospects:
11. Учеябник для вузов / Г.Н. Пахарьков. -СПб.: Политехника, 2011. - 232 с.

12. Popechitelev, EP Analytical research in medicine, biology and ecology / E.P. Trustees, ON Startseva. - M .: Высшая школа, 2003.- 279 с .: ил. - Bibliogr .: p. 262-264 - ISBN 5-06-004389-4.
13. Regulations on the organization of the educational process in higher educational institutions. Order of the Ministry of Education of Ukraine № 161 of June 2, 1993 // Education of Ukraine. Collection of regulations. - Kharkiv: Svit - Press, 1999 - p. 168 - 188.
14. Physical methods and technical means for therapeutic effects: textbook. allowance/V.G. Гусев; Уфимск. Gos. aviation-technical un-tet. Ufa, 2001. - 126 p. 5-86911-349-0.

APPENDIX A

Sample design of the title page of the report

Ministry of Education and Science, Youth and Sports of Ukraine
Ternopil National Technical University
named after Ivan Pulyuy

Department of Biotechnical Systems

REPORT
FROM PRODUCTION PRACTICES

Completed: student of group _____
Name

Accepted: position, full name

Ternopil, 20___

Alterations and amendments to the Syllabus

№	Contents	Date and № of minutes of the Department meeting	Notes
*			