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

ENGINEERING AND PRODUCTION PRACTICAL TRAINING
/ 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 ____engineering and production practical training_____
/ 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>3rd</td><td>3rd</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>6th</td><td>6rd</td></tr>
<tr><td rowspan="11">Weekly hours for full-time study:
classroom -
independent student work -</td><td rowspan="11">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-32</td></tr>
<tr><td>Period</td><td>2020-2021</td><td colspan="2">18.01.2021-31.01.2021
(2 weeks)</td></tr>
</table>

INTRODUCTION

Student internship is an integral part of training specialists with higher education. It is aimed at consolidating the theoretical knowledge acquired by students during their studies, acquisition and improvement of practical skills and abilities defined by the educational and qualification characteristics (hereinafter OKH) of training specialists in the relevant educational and professional program (hereinafter OPP).

The practice involves continuity and consistency of its implementation, an organic combination with practical and laboratory classes, students receive a sufficient amount of practical knowledge and skills.

According to the content and purpose of practice are divided into educational (introductory), production (production, design and technological, design and engineering, internships in the specialty, etc.) and undergraduate.

The list of all types of practices is determined by the university independently in accordance with the OPP of the relevant educational degree. Graduates of the department include practices in the curriculum for each specialty, indicating their form, timing and form of final control.

The semester and terms of internships in the academic year are determined by the schedule of the educational process of the university and the working curriculum.

***1.*Practice programs should contain the following main sections:**

- introduction;
- purpose and objectives of practice;
- content of practice;
- individual tasks;
- forms and methods of control;
- requirements for the practice report;
- evaluation criteria;
- summarizing the practice;
- Guidelines;
- list of recommended sources.

Students in the field of training (field of knowledge) 163 "Biomedical Engineering" in accordance with the curriculum of training, OPP, OKH educational degree "Bachelor".

Design and technological practice, as a kind of production practice, is an integral part of the process of training specialists with a Bachelor's degree.

***2.*Third-year students undergo design and technological practice.**

Duration of practice - 2 weeks.

Design and technological practice is carried out on appropriately equipped bases of practice - enterprises and organizations of the relevant profile. When organizing and conducting practice, conditions must be created that provide students with consolidation of theoretical knowledge in special disciplines and the acquisition of practical skills in the specialty.

3.Passage of design and technological practice is an independent work of students directly at workplaces equipped with the corresponding equipment, performance by them of specific official duties.

These guidelines address the general issues of organization, conduct and summarizing the design and technological practice. The instructions are made in accordance with the current regulations "On the practice of students of higher educational institutions of Ukraine" from 08.04.1993, developed by the Ministry of Education of Ukraine and on the basis of programs of special disciplines specialty 163 "Biomedical Engineering"

1. GENERAL POSITION

Practical training of students is a component of the educational process, aimed at mastering by students the system of professional skills, is the primary experience of professional activity, promotes self-development of students.

Design and technological practice allows students to acquire new knowledge and skills for future professions. The tasks that students solve during this internship are mainly related to the design and implementation of technological processes, new assembly units and mechanisms, the study of standards and instructions, modern software and its application in production processes.

The internship provides students with the opportunity of real (practical) acquisition of basic engineering knowledge in medical enterprises, laboratories, training and production workshops, research laboratories or institutes, institutions and organizations of various organizational and legal forms.

Third-year students undergo design and technological practice. The duration of practice is determined by the working curriculum and schedule of the educational process and is 2 weeks.

Design and technological practice of students can be carried out in groups and individually in farms and enterprises. Each of the trainee students is in the role of assistant staff member in the relevant position.

During this internship, students must also collect materials for coursework and projects to be completed in the fourth year of study.

Design and technological managementstudents' internships at internships are entrusted to qualified specialists permanently working in them, who are entrusted with a group of interns up to 10 people.

During the internship, students keep diaries, which are systematically checked by practice leaders.

At the end of the design and technological practice, students are graded according to the results of the work done during the practice.

The working program of design and technological practice is an educational and methodical document that determines the content and procedure for this type of practice by students majoring in 163 "Biomedical Engineering".

1.1. The purpose and tasks of design and technologypractices

The purpose and content of design and technological practice are defined by OKH, OPP and work programs of professional disciplines.

Design and technological practice occupies an intermediate place in the list of types of practices. In terms of approaching professional activity, it is a step forward in terms of familiarization and production practices, because students work directly in real workplaces in the conditions of production. But in terms of the content of the work performed, design and technological practice is an intermediate stage preceding the internship (professional practice): students work at the level of the working profession, and with their future responsibilities as a production worker or technician as a middle manager, engineer as the head of the top level is only acquainted in advance.

During this internship, students are required to familiarize themselves with the production process: from design to manufacture of the finished product, from the detection of a malfunction of the unit or part to its complete restoration in the repair area. This practice is the basis for the study of future special disciplines provided by the OPP for the degree of "Bachelor".

The purpose of design and technological practice:

- acquaintance of students-trainees directly at the enterprises (organizations, establishments) with production process and a technological cycle of manufacture, working off of abilities and skills on a specialty;
- consolidation of knowledge gained in the study of general technical and special disciplines and the acquisition of initial practical experience.
- acquaintance with production and economic activity of enterprises, technological processes, structure and principle of operation of technological equipment;
- acquisition of practical skills in maintenance, repair and installation of equipment;
- acquaintance with the organization and performance of design and engineering works in design bureaus and departments;
- mastering practical skills of designing and developing design and technological documentation;
- study of technological processes of manufacturing parts and assembly of assemblies and products;
- study of technological processes of repair production;
- study of devices and tools used in technological processes of medical enterprises.

The main tasksdesign and technological practice:

- formation of professional skills in the specialty in combination with consolidation, expansion and systematization of knowledge obtained at the university on the basis of market economy, scientific organization of labor and management of a particular enterprise, institution, organization, gaining practical experience, professional thinking, instilling organizational skills activities in the labor collective;
- consolidation and deepening of the knowledge received at studying of special disciplines;
- acquaintance of students directly in farms and at the enterprises of medical branch with questions of economy and the organization of manufacture, its production and technological processes;
- from the point of view of interrelation between separate kinds of practices design and technological practice, firstly, generalizes all already passed educational practices, secondly, creates the basis for carrying out internship on a specialty.

Tasks that students must perform during the design and technological practice:

- acquaintance with the history, composition and structure of the enterprise;
- acquaintance with the basic and auxiliary productions of the enterprise, the basic kinds of raw materials and materials, sources of power resources (fuel, the electric power, heat and water supply);
- acquaintance with the system of maintenance and repair of equipment at the enterprise;
- acquaintance with transport and warehousing systems of the enterprise;
- study of basic production and technological processes, basic technological equipment;
- study of technological processes and methods of restoration of details and repair of technological equipment;
- participation in the development of design and technological documentation;
- study of forms of organization and problems of functioning of the structural unit of the organization, where the workplace is located, where students have an internship;
- study by categories of employees at the enterprise;

- acquisition of skills of the main working professions and acquaintance with professional requirements to engineering and technical workers of the enterprises;
- study of professional techniques, methods, equipment and tools;
- acquaintance with technological plans of the enterprise and advanced experience of branch;
- participation in the development of development projects for the structural unit where the student is an intern, or for the entire organization;
- study of the topic and directions of future activity for the subsequent theoretical elaboration and design in the form of term papers, projects and research work;
- acquaintance with measures of labor safety, fire safety, industrial sanitation and ecology at the concrete enterprise;
- gaining experience in the production team, studying employment opportunities.

As a result of the internship, students must:

Knowhistory, composition and organizational structure of the enterprise; issues of economics of production planning and management; increasing labor productivity and product quality in production; main technical and economic indicators of the enterprise; ways to reduce production costs; main technological processes of production; structure of technological and auxiliary equipment; properties and scope of raw materials used in this production; regulatory and technical documentation; organization of the design bureau; issues of labor protection, environment and fire safety at work; organization and carrying out of design works.

Be able to analyze the design features of medical devices and their components, identify the most problematic components or parts, identify the causes of their failures and suggest ways to improve structures; to develop technological processes of manufacturing and restoration of details, equipment repair; select technological equipment to perform appropriate operations; perform constructive calculations; calculate the cost of production and profitability of production.

Acquire skillson the practical design of medical devices and their components; on drawing up and a choice of schemes of technological processes of manufacturing or restoration of details; adjustment, maintenance, operation of technological and auxiliary equipment; on development of technological and design documentation according to State standards and requirements of ESKD.

***Form of final certification in design and technological practice*- differentiated offset.**

1.2. Bases of practice

The choice of practice bases is carried out by the graduating department of "Biotechnical Systems" taking into account the tasks of practice and the possibility of their implementation.

Students practice on the basis of agreements (agreements) concluded between enterprises and Ternopil National Technical University named after Ivan Pulyuy.

Design and technological practice(type of internship) students majoring in 163 "Biomedical Engineering" are on the basis of internships, which ensure the implementation of the internship program for the educational degree "Bachelor".

These should be companies that apply best practices in management and administration. The high level of professionalism of specialists of basic enterprises should provide an opportunity to assist students in acquiring professional skills and abilities.

The bases of design and technological practice can be modern medical enterprises, research and design organizations, technological offices or sectors of assembly, assembly and tool shops, design offices of technological units and the department of chief mechanic, department of chief technologist, department of chief designer, and training offices, laboratories, training and production workshops, training and practice centers, etc., as well as bases outside Ukraine, provided that they ensure the full implementation of working curricula and internships. The number of interns in a group is determined by the capabilities of a particular department, office, sector or laboratory.

In some cases, when the training of specialists is carried out at the request of legal entities or individuals, the bases of practice are provided by customers or higher education institution, which is determined by the terms of the agreement (contract) for the training of specialists.

Enterprises, institutions and organizations that can be the basis of practice, ie for design and technology, must meet the following requirements:

- ability to ensure student performance programsdesign and technological practice;
- the presence of structures, industries that correspond specialties(specialization) for which training is carried out;
- possibility of qualified management of students' practice;
- opportunity to provide students with internships;

- providing students with the opportunity to work in full-time positions, the work of which corresponds to the internship program (if there are relevant vacancies);

- giving students the right to use the library, laboratories, technical and other documentation necessary to implement the internship program, taking into account the privacy policy of the enterprise;

- the possibility of further employment of university graduates (on general grounds in the presence of vacancies);

- availability of housing (if necessary).

Students can independently, with the permission of the graduating department, choose a place for internship and offer it for use. Ternopil National Technical University named after Ivan Pulyuy concludes an agreement with such practice bases in advance (Appendix 1) for its implementation.

The duration of the internship agreement is agreed by the parties and can be determined for the period of internship.

Functions of the enterprise-base of practice:

- to provide high-quality instruction on fire safety, labor protection, safety and industrial sanitation;

- to provide students with places of practice in accordance with the work program, which ensure the greatest efficiency of its passage;

- create the necessary conditions for students to obtain knowledge during the specialty during the internship;

- adhere to the calendar schedule of practice;

- to provide students-interns with the opportunity to use literature, design, technical and economic and other documentation;

- to ensure and control the observance by students-trainees of the rules of internal labor regulations, which are established for a specific enterprise, including the time of beginning and end of work.

Direct management of the practice is entrusted by order of the head of the enterprise to the leading specialists of structural units.

The distribution of students on the basis of practice and appointment of supervisors from the university is carried out by the dean's office of the FTP faculty and approved by the head of the department "Biotechnical Systems", organizational and legal department, chief accountant, educational department, vice-rector for educational work and approved by the rector.

ORGANIZATION OF CONSTRUCTION AND TECHNOLOGICAL PRACTICE

Students of the Department of Biotechnical Systems of Ternopil National Technical University named after Ivan Pulyuy practice on the basis of practice that meets the requirements of the program.

For internships, students are sent to institutions and organizations equipped with modern medical equipment, which employ qualified and experienced professionals.

The period and duration of practice are determined by the approved working curriculum of training in the specialty 163 "Biomedical Engineering" and the program developed by the Department of "Biotechnical Systems". Duration of design and technological practice - 2 weeks.

The general management of practice from the university is carried out by leading teachers of the department.

At the enterprise by the order of the head the head of practice from the enterprise from among leading experts is appointed.

Prior to the beginning of design and technological practice, the relevant engineering and technical workers must acquaint students with the specific requirements of labor protection, industrial sanitation, fire safety rules and internal regulations of the enterprise.

Direct management of students in the shops, departments or divisions of the enterprise is carried out by the heads of individual departments, who acquaint students with the organization of work in specific workplaces, equipment construction, control and regulation of technological processes, labor protection, industrial ecology and safety, as well as constant control for the work of students, give advice on production issues.

During the design and technological practice, students must comply with the rules of internal regulations in force at the enterprise. The work must be performed in accordance with the instructions provided to them at the workplace and additional instructions of the practice managers from the enterprise in accordance with the calendar plan.

Students undergo design and technological practice on the basis of agreements (Appendix 1) concluded by Ternopil National Technical University named after Ivan Pulyuy with enterprises-bases of practice.

The head of the enterprise (practice base) issues an order for design and technological practice, which determines the organization and conduct of practice, measures to create the necessary conditions for students-interns to implement their internship program, labor protection and accident prevention, control over implementation students of the rules of internal labor regulations, other measures in accordance with the provisions on the practice of students of higher educational institutions of Ukraine, appoints the head of practice from the enterprise.

Responsibility for the organization, conduct and control of design and technological practice rests with the head of the graduating department, and educational and methodological guidance for the implementation of the internship program is provided by the graduating department.

The internship should take place directly at the workplace of a specialist under the guidance of qualified specialists. At each stage of the internship, the student performs a separate job.

Independent work of students is the main condition for internship.

Prior to the internship, the internship supervisors from the university hold a meeting at which the students are informed by the order of the rector of the university on the distribution of internships, give the necessary instructions for the internship program and instruct on safety during the internship.

Students who have passed a medical examination and safety instruction are admitted to the design and technological practice, about which there is a corresponding entry in the registration journal.

When sending a student to practice he is issued:

- **referral to practice**(Appendix 2);
- **work program**(given guidelines);
- **practice diary**(Appendix 4).

Students who come to the internship must appear in the personnel department of the enterprise. Upon arrival at the internship, students must issue a notice of arrival at the company (Appendix 3) and the beginning of the internship within the first three days. Until such a notice is received, the student is considered not to have appeared in practice, and is considered a violation of the educational process. Students who have not passed the design and technological practice for good reasons, are sent to practice in the time specified by the dean's office.

At the enterprise, students are instructed in safety, they are assigned a head of practice from the enterprise. Students are enrolled in practice by order of the enterprise.

Alterations and amendments to the Syllabus

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