

**THE MINISTRY OF EDUCATION AND SCIENCE OF  
UKRAINE**

**KHARKOV NATIONAL UNIVERSITY OF  
RADIOELECTRONICS**

**THE SET OF MANUALS  
FOR MANAGEMENT OF STUDENTS'  
PRACTICAL PLACEMENTS**

Kharkov 2001

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## **THE PREFACE**

This set of manuals was aimed to introduce a new framework for management of students' practical placements, accounting possibility to take the practical training in the foreign partner university.

Thus, the new framework meets the demands of internationalisation of higher education and corresponds to the strategic principals of its development, established in the Bologna Declaration in 1999.

This set of manuals was developed as an outcome of the Tempus compact project UM\_CP-20560-1999 "Development of a New Framework for the M.Sc. Thesis Work". This edition is the result of cooperation between the Kharkov National University of Radioelectronics, Ukraine and the University of Jyväskylä, Finland.

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# THE CONTENT

<b>THE ABSTRACT .....</b>	<b>7</b>
<b>1 GENERAL FRAMEWORK OF THE PRACTICAL TRAINING MANAGEMENT .....</b>	<b>11</b>
1.1 GENERAL REGULATIONS .....	11
1.2 GOALS AND TASKS OF THE PRACTICAL TRAINING .....	16
1.3 THE LOGICAL FRAMEWORK OF MANAGEMENT AND CARRYING OUT OF THE PRACTICAL TRAINING .....	20
1.3.1 <i>The enterprise practical training. Particularities of the enterprise practical training, schematic description of stages, characteristics of the stages .....</i>	<i>22</i>
1.3.2 <i>The thesis practical training. Peculiarities of the thesis practical training, schematic description of the stages, characteristics of the stages .....</i>	<i>26</i>
1.3.3 <i>Other types of practical training. Practical training in the partner university and on the foreign enterprise.....</i>	<i>28</i>
<b>2 MANUALS FOR MANAGEMENT OF PRACTICAL TRAINING.....</b>	<b>32</b>
2.1 THE LIST OF DOCUMENTS FOR THE ORGANIZATION OF PRACTICAL TRAINING. ....	32
2.2 THE BASES FOR PRACTICAL TRAINING .....	45
2.2.1 <i>General regulations.....</i>	<i>45</i>
2.2.2 <i>University as a base for practical training.....</i>	<i>46</i>
2.2.3 <i>Enterprise as a base for practical training .....</i>	<i>47</i>
2.2.4 <i>Partner university as a base for practical training .....</i>	<i>47</i>
2.2.5 <i>Foreign enterprise as a base for practical training.....</i>	<i>50</i>
2.3 WORKING PROGRAM FOR PRACTICAL TRAINING .....	51
2.3.1 <i>Structure and contents of the working program.....</i>	<i>51</i>
2.3.2 <i>The working program for the enterprise as a base for the practical training.....</i>	<i>63</i>
2.3.3 <i>The working program for the university as a base for practical training.....</i>	<i>63</i>
2.4 TECHNIQUES OF PRACTICAL TRAINING .....	64
2.4.1 <i>Individual work of students.....</i>	<i>65</i>
2.4.2 <i>Group work of students.....</i>	<i>65</i>
2.5 ORGANISATIONAL AND METHODOLOGICAL RECOMMENDATIONS FOR PRACTICAL TRAINING .....	69
2.5.1 <i>Recommendations to supervisors from the university .....</i>	<i>69</i>
2.5.2 <i>Recommendations to supervisors from the enterprise .....</i>	<i>73</i>
2.5.3 <i>Recommendations to a home department.....</i>	<i>73</i>
2.5.4 <i>Recommendations to a dean's office of a faculty.....</i>	<i>76</i>

2.5.5	<i>Recommendations to a department of practical training</i>	78
2.5.6	<i>Recommendations to an educational-methodical department</i>	80
<b>3</b>	<b>THE MANUAL FOR PASSING THE PRACTICAL TRAINING FOR STUDENTS</b>	<b>82</b>
3.1	THE STUDENT'S RIGHTS AND DUTIES ON THE DIFFERENT STAGES OF PRACTICAL TRAINING ACCORDING TO PRACTICAL TRAINING BASE ..	82
3.1.1	<i>Passing the practical training at the home university</i>	82
3.1.2	<i>Passing the practical training in the enterprise</i>	82
3.1.3	<i>Passing the practical training at the partner university</i>	83
3.1.4	<i>Passing the practical training in the foreign enterprise</i>	87
3.2	CORRESPONDENCE BETWEEN STUDENT'S THESIS PRACTICAL TRAINING AND THE THESIS WORK	87
3.2.1	<i>Thesis practical training as initial stage of the student's work on the thesis</i>	87
3.2.2	<i>Correspondence between the thesis practical training and the thesis work</i>	88
3.3	THE FEATURES OF THESIS PRACTICAL TRAINING OF THE M.SC. STUDENTS	89
3.4	FINAL CONTROL OF THE PRACTICAL TRAINING RESULTS	90
3.4.1	<i>Structure and content of the practical training reports for each kind of practical training</i>	90
3.4.2	<i>The basic demands to the report writing</i>	91
3.4.3	<i>Features of reports for students that take the practical training in the partner university or in the foreign enterprise</i>	92
3.4.4	<i>Summation of the practical training passing</i>	94
	<b>THE CONCLUSION</b>	<b>97</b>
	<b>REFERENCES</b>	<b>99</b>
	<b>APPENDIX A – PRACTICAL TRAINING DIARY</b>	<b>100</b>
	<b>APPENDIX B - REGISTRATION FORM</b>	<b>104</b>
	<b>APPENDIX C - PROJECT AGREEMENT</b>	<b>106</b>

## **THE ABSTRACT**

Practical training of students is an important compulsory component of the educational professional program for obtaining corresponding degree. The purpose of practical training is the acquirement of necessary professional habits and skills [1].

Students' practical training is carrying out in the modern enterprises and organisations representing different branches of economic activity, science, education, health protection, culture, commerce, state government etc.

Practical training is taken under professional conditions. And university lectures and experts of the concrete industrial, scientific, technical branch guide it.

Practical training has an object to bring up professional skills and habits in a young specialist that are necessary for making independent decisions at the concrete work field under real industrial conditions. That's why students fulfil functional obligations that are peculiar to their future speciality.

All this determines the possible variety of the practical training forms that also depends on the university and the department connections with enterprises, organisations, and firms.

One can also mark out two main approaches to the development of the order of the practical training passing in technical specialities' curricula.

The point of the first approach is in the division of the practical training cycle into the four basic stages. These stages are determined in the curriculum in such a way to provide the continuous practical training and its interaction with the other sections (academic courses) in the curricula.

The second approach point is in the organisation of the joint continuous practical training, when students also study one or more occupation skills.

The experience of the practical training in leading universities of foreign countries (such as USA, Japan, Great Britain) in Ukraine was always taken into account.

For instance in the USA, Japan, Great Britain and other countries the affiliated educational form is widely expanded. Its main aim is to allow student gaining of the production experience before graduation. The basic principles of the form are in different combinations of work and education. The work activity is future speciality oriented and is the obligatory stage of the educational process.

Lately in Japan the student probation period in private firms has spread. This is the instance of graduating student adaptation to the production work conditions.

In the Ukrainian universities (depending on the concrete speciality and specialisation of students) the practical training could be educational, computing, technologic, operating, educational, designing, economic, scientific-research, etc. [2].

The student practical training provides the consistency and continuity of its realisation to obtain the necessary amount of practical knowledge and experience of students according to the Bachelor, Specialist, Master degree.

Nowadays according to the present Ukrainian conditions such as:

- the change to the market relations;
- the change of the production structure;
- the appearance of new informational technologies;

- the expansion of the universities connections with the foreign partners (firms, enterprises, other universities etc.);
- the change to the multi-stage system of the expert training;
- the change of the university entrants' qualities etc.

the necessity of the new practical training realising approach to organisation, principles and education appears.

In the present work are took up the questions, concerning the general framework of the practical training organisation, its' methodical supply. Also it contains recommendations to the students, supervisors of practical training, corresponding university departments, enterprises etc. According to the current university practical training arrangement there are two kinds of the practical training: the enterprise practical training and the thesis practical training.

Due to the fact of the international relations with the partner universities, the necessity of finding of new forms and principles of the practical training appeared.

It is necessary to develop organisational and methodical basis to make available the practical training accounting that students can pass in the partner university, where they stay due to the international exchange. Thus, the next important moments shall be revised: the choice of the supervisor of practical training, the correction of the teaching load, the assignment of the student practical training in the partner university. Registration the practical training order for students who are in the partner university, the form and the terms of the practical training diaries, the terms of report, etc. will be revised, too.

Development of the new framework of the practical training has required a lot of work such as studying of all the types of practical training in a partner university, familiarisation with the current principles of the practical training organisation and carrying out,

analyse of the foreign colleagues experience and introduction the motions about the necessity of change and addition of the current scheme.

All these were accomplished within the international project the TEMPUS UM\_CP-20560 project. The descriptions of the possible practical training forms were based on the experience of the University of Jyväskylä (Finland).

# **1 GENERAL FRAMEWORK OF THE PRACTICAL TRAINING MANAGEMENT**

## **1.1 General regulations**

Depending on the concrete student speciality or specialisation one could find different practical training types such as studying training, technological, operational, designing, economic, research, etc.

As usual the practical training is carrying out in workplaces of a base enterprise. Students familiarise with the concrete workplace, safety measures and obligations of a worker. They fulfil production tasks, study technology of production in the workplace. Also they study the equipment and technological processes, tools and adaptations, which are used at the workplace.

The practical training content shall be available for the student studying. Student also shall describe a planning of a site, shop, other structural division, note lacks or advantages of accommodation, of the equipment, workplaces, passes, offer (if necessary) a variant of planning.

It is very important to give to students an opportunity to familiarise with the nature of work and functional duties of various categories of the workers: controllers, foremen and chiefs of sites.

It is expedient to make the student work on places with the advanced forms of work organisation and advanced work receptions, to familiarise with the measures of work productivity increase, both organisational and technological.

It is necessary to give students an opportunity to study application features of computing and microprocessor techniques, industrial robots and manipulators within fulfilment of various

technological operations, and also activities of mechanisation and automation, both separate operations and the whole technological processes.

The first practical training is carried out after the third course. It lasts for nearly four weeks and could be technological and operational.

The purpose of technological or operational practical training is studying the industrial-economic activity of the industrial enterprise, improvement of the knowledge, receiving technical skills and an experience of the collective work.

During the technological or operational practical training the following tasks have to be solved:

- profound studying of the structure enterprise that appropriate to the speciality direction;
- studying of technological processes of details manufacturing, assemblage of units and products;
- studying of the products' arrangement and the rules of technical exploitation of products, obtaining the appropriate skills;
- studying the problems of labour protection, fire protection, ecology in the base enterprise conditions.

The second practical training is carried out after the fourth course. It lasts for eight weeks and could have technological, designing, economic, scientific-research direction depending on the concrete student speciality.

The basic purpose of this practical training kind is to acquire habits of technological and operational enterprise preparation. During the practical training the profound studying of the economic, scientific organisation of work, enterprise designing and enterprise management is provided.

Students have to familiarise with the problems of reserves' determination of industry, of scientific labour organisation, of studying the standard technological processes, of the optimal construction choice.

Students ought to study profound normative and technological documentation in the base enterprise, to obtain practical skills to apply the systems of standards in production conditions.

The purpose of economic practical training is the deepening and fastening of theoretical knowledge, familiarisation with the forms and methods of organisation of product, obtaining the skills and experience in the future professional activity directions. On completion of the economic practical training students must know:

- modern methods of management;
- methods of complex market research;
- production - resort facilities of the enterprises;
- essence of the financial policy;
- means of the control of financial activity;
- problems of the production economics and organisation;
- measures of efficiency increasing and the quality of the enterprise work.

The purpose of the research practical training is the technical and organisational-economic preparation of students for the independent solving of tasks, with the level of complexity of the Specialist or the M. Sc. degree.

During the research practical training a student can become a member of the technical staff, participating in the researches, development and designing of the complicated objects. During the practical training period student should learn, taking into account peculiarities of the work nature:

- the "know-how", installation, adjustment and operation of the technical equipment;
- the problems of organisation and carrying out both experimental-design and research works;
- equipment, apparatus, computing techniques, automation of the production processes;
- advanced techniques and technology in the field of the speciality;
- advanced experience of the researchers, designers, etc.;
- problems of the economics and the practical training organisation, state and branch standards.

### **Types of practical training in EU universities**

A common feature for all the EU-countries is a well-defined and functional organisational framework for all the aspects of university/enterprise cooperation in the management of practical placement for students.

Training of the students in experimental skills has been partially achieved in the teaching laboratories of the universities. In this context we must notice the higher level of endowment of the laboratories of the EU-universities and the advanced degree of autonomy of the students in their experimental work in the teaching laboratories.

The practical placement (where applicable) is generally intended to facilitate the transition between academic and industrial activities. The experience of EU-universities varies, depending on the particularities of each country, regarding:

- the structure of higher technical education system;
- the structure of the economy of a country, the degree of development of specific industrial branches;

- the size of industrial companies and their distribution in certain geographical areas.

For example:

- in France for Universities (study period 5 years) they have 6 months of compulsory practical placement, divided into three subperiods: one month after the second year (as worker), two months after the third year (as technician) and three months after the fourth year (as engineer), all of periods during summertime;
- in Germany the Fachhochschule (study period 4 years) provides a two semester compulsory practical placement, often prolonged by the students themselves in order to achieve more experience by being involved in projects of the company and finally to be employed in the company after graduation;
- in the U.K. practical placement of the students differs from one university to the other; at some universities the practical placement is recommended but not compulsory;
- in Ireland the program of Bachelor of Engineering (a four year system) includes a compulsory semester of practical placement of 6 months at the end of the third year;
- in Greece and Spain there are no compulsory practical placements in enterprises, this is only recommended and effected by the student on an individual basis, depending on the opportunities in the industry;
- in Finland there are several types of training, some of them are not compulsory, but student has to work at least 3 month in the company to get a degree.

In the partner university of KhNURE – University of Jyväskylä (Finland) – there are two main types of practical training for students of the Faculty of Information Technology: training in the university (so called System Development Project) and practical training in the

companies. The key idea of both types of training is doing a real task, a real project, ordered by the company.

System Development Project is a students' teamwork in the university over the task of a company, which pay money for this type of training. Usually the duration of this type of training is 5-7 months.

The aim of such training is learning to work in a team over the real industry task. Students learn how to manage the project, how to keep the documentation, how to present their work, how to plan the project stages, how to carry on the negotiations with the company representatives.

This type of training is on the Bachelor's level and is not compulsory for it. But is compulsory for students willing to continue in the Master program.

The training in the companies is on the Master's level. It is a student's work outside the university, in the company who orders the project. According to the sources of financing there are: training on the governmental money, training on the company's money and a complex training. The duration of each form of training is 3 months (although you can work more).

Taking one of the forms of training is compulsory. The important feature of the training in the company is an ascent on task execution. The aim is to get acquainted with the principles of work in the enterprise, getting experience in different industrial situations.

## **1.2 Goals and tasks of the practical training**

A practical placement is a learning experience which enables students to develop their knowledge and skills. The practical placements that take place during the academic year are usually a compulsory part of the Diploma for all students. They provide an

opportunity for students to test their theoretical knowledge in a practical way, in consultation with the professional archivists who will supervise them during the placements.

A work experience placement is an opportunity for students to develop their skills beyond the classroom, to build confidence before entering the competitive labour market and to achieve a recent, work-related reference.

The goal of each kind of practical training is the student mastering by up-to-date methods, principles, forms of the production organisation, obtaining the experience in their future profession field. The formation of professional skills and experience for university graduates is very important. Expanding and consolidation of the theoretical knowledge obtained at the institute of higher education and development of skills for self-dependent work performing and taking independent engineer decisions that are necessary for work in real conditions of the concrete market production field is one of the practical training aims. Among the other purposes are: upbringing the necessity of systematic renovation of their knowledge and its creative use in the production, operational, scientific-research work, and acquiring of habits of building interrelation in the group. And receiving the essential skills of registration of technical documentation, including the expert using of different normative documentation is one of the most important goals.

The knowledge, skills and experience that student ought to obtain shall be indicated in each concrete case with reference to the present kind of practical training. Also a list of theoretical disciplines, which are the basis for successful fulfilment of the tasks shall be given.

The complete task list is determined for the concrete specialities and practical training base. Tasks are given in the working practical training program.

The general practical training tasks are:

- studying the enterprises' (organisations') structure and production activity;
- obtaining the practical knowledge and skills of speciality in the concrete working appointment including (if it's possible) assignment of the category, qualification;
- specification of the requirements showed to the experts of a mastered trade, development the interest for it;
- appearance of the basic technical problems that are extremely important for the of the present field specialist;
- fastening of knowledge of the studied theoretical disciplines;
- familiarising with the activities of increase of productivity and work efficiency, of mechanisation and automation of production processes, new equipment, means of measuring and computation techniques;
- familiarising with the program applications;
- familiarising with the problems of organisation and planning of the enterprise activity;
- familiarising with the problems of labour protection – the system of rightful, social-economic, organisational, technical, health, prophylactic measures and means directional on health preservation and the human capacity for work while work process;
- studying and analysis of the urgent decisions of technical problems at the enterprise, development of the offers of perfection of the enterprise activity, development and introduction of;

- receiving the skills of research and rationalisation work;
- acquisition the habits of the organisational – management activity;
- collection of materials for course and thesis projects, that are carrying out in the university (enterprise, organisation).

If student continues the studying in a partner university according to the program of the international exchange (especial if he/she is going to get the diploma there) the practical training in the partner university or in the foreign company will be necessary. In any case the obtaining of such experience makes the future expert more qualified.

How do training placements benefit the students?

- Students gain practical experience in a real work setting.
- Several months of direct contact with a potential employer results in a high job placement rate for graduates.
- Students don't have to choose between work and study since they can participate in both.

How do training placements benefit the employer?

- A small investment in time assisting in the training of a student can yield a big return in long term gains and productivity.
- Employer gets the ready product mostly.
- Students bring the new modern methods and technologies, which raises the scientific level of works.
- Employers get to know the students before signing a long term contract.

How do training placements benefit the university?

- University remains directly linked to the job market.
- Curriculum can be more tailored to meet the needs of government and industry employers.

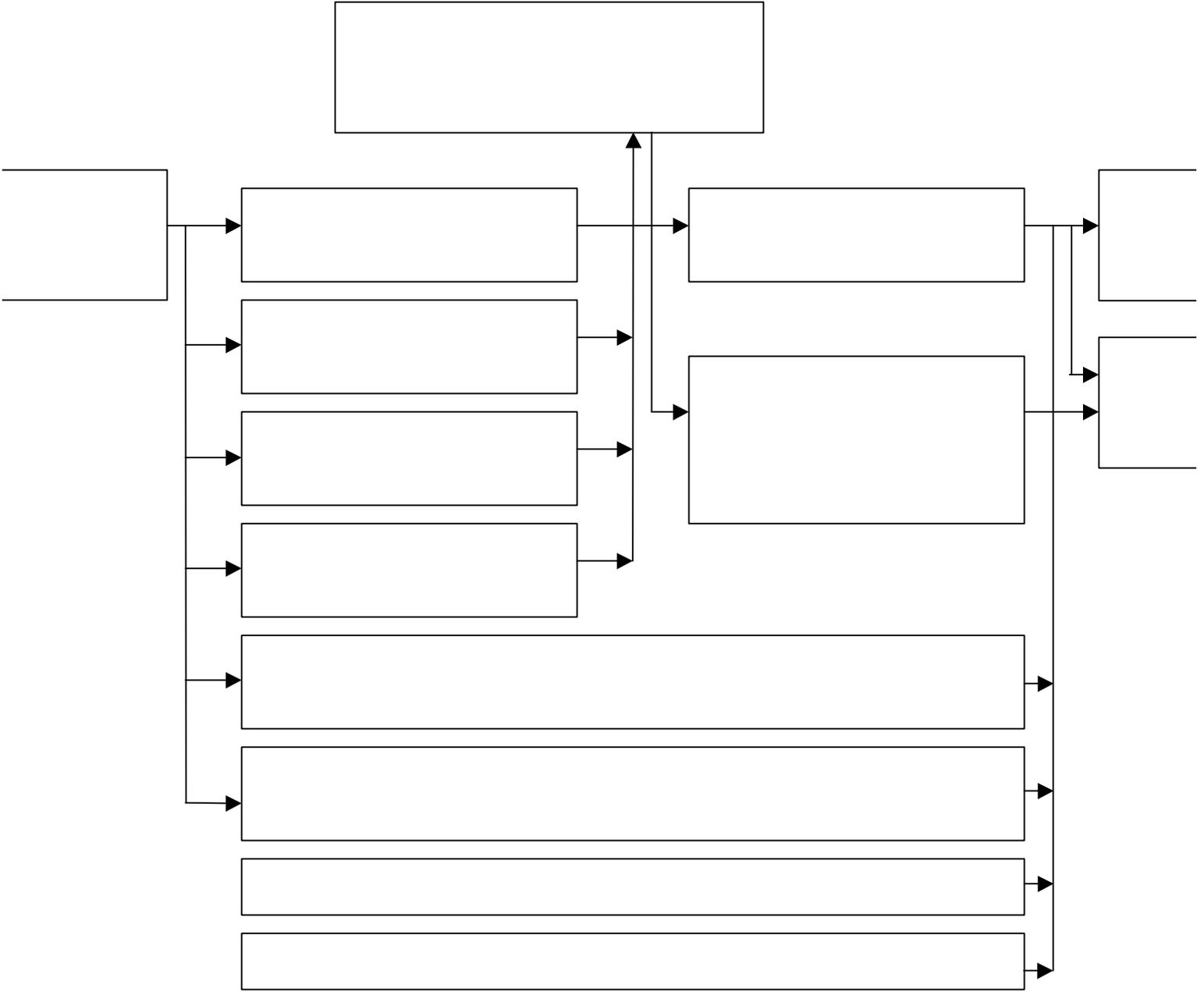
- Practical work placements give students an increased motivation to learn.
- Students practical placements enhance the visibility and reputation of the university in the community.

Thus, student practical placements benefit all three parties. However negative moments appear sometimes. The main of them is that students leave the university before graduation to work in the company full-time. But this is not a problem of any particular university, this is a problem of modern economical society.

### **1.3 The logical framework of management and carrying out of the practical training**

The practical training irrespective of its kind is one of basic forms of the educational process. It has for an object to bring up highly qualified specialist. The logical framework of organisation and carrying out of the practical training for the whole period of student training is represented on the figure 1.1.

The scheme indicates names of the blocks. They reflect basic content and consistency of tasks, which are solving within management and carrying out of practical training.



### **1.3.1 The enterprise practical training. Particularities of the enterprise practical training, schematic description of stages, characteristics of the stages**

The aim of the enterprise practical training is to form at student the clear idea of the nature of the work of the enterprise – the practical training base, its structure, and functional duties of the functionaries and subordinates. Besides it has to give skills of the independent work in the concrete workplaces (one - two places) with fulfilment of the production tasks on a concrete work field in real industrial conditions. It shall give the habits of fulfilment of various duties peculiar to the future professional organisational and management activity [1, 2]. The student should have a clear idea about means' level, harmful factors connected with the activity processes, the influence of the processes on the environment, represent the perspective directions of the enterprise activity.

The enterprise practical training lasts near 4 weeks. The time is allocated in such a way: 80% are given to the practical training itself, 10% are taken by lectures and excursions, the last 10% are given for the making report, for review receiving, for the report check. One of the possible forms of the acquired knowledge strengthening is the science-technical student conference.

It is necessary to mention that the production in conditions of market system of management puts forward the higher demands to the bachelor's schooling rate. In such conditions the bachelors shall take the decisions independently and quickly orient in the production conditions. That is why students should familiarise with the production activity both the structural departments (laboratories, sections, etc.) and the whole enterprise.

Besides it's necessary to provide rational correlation between practical and theoretical skills and knowledge.

Here is the schematic description of the stages and the participators on the each stage.

The enterprise practical training of bachelors should pass in a enterprise (if it's possible). During practical training students shall work in one or two workplaces.

One can mark out the next practical training stages:

- 1) General familiarisation with the enterprise; briefing on safety measures and fire-prevention techniques, workplace registration – 1 or 2 days;
- 2) Production activity in the workplaces (including the fulfilment of the individual tasks) – up to 20 days;
- 3) Lectures and conversations – one time per week in 2-3 hours;
- 4) Industrial excursions to the enterprise - 3-4 hours
- 5) Studying of manufacture and technology in other shops - 4 days;
- 6) Report registration and examination – 2 days.

The supervisor of practical training from the enterprise (due to agreement with the supervisor of practical training) can vary distribution of the work time if this needs the specificity of the enterprise conditions.

The practical training is carried out in accordance with the work program that is adjusted with the enterprise and includes the next stages that are represented on the scheme (figure 1.2).

Students are able to be registered to the job under the condition of the appropriate agreement with the Supervisor of practical training

from the university. This is available if the workplace satisfies the practical training requirements and the salary contributes to the success of works fulfilment.

Individual practical training tasks shall provide for the information collection, that will be used when graduating work and shall include specific for each speciality computing, designing, research, experimental, production works.

The stages of the enterprise practical training are reflected in the scheduler that is a part of the work program and it provides:

- registration and receiving the permits in the enterprise;
- studying the rules of safety measures;
- carrying out educational studies and excursions;
- fulfilment of the individual practical training tasks;
- fulfilment of the individual practical training tasks in the concrete workplace;
- making the report, receiving the reference;
- check of the practical training accounting.

The scheduler can include actions to acquire necessary professional habits and skills.

The individual practical training tasks also be able to include works of analysis, researches, calculations, evaluations, measurements; development of principles, technical documentation, program applications, activities, recommendations, designing. Introduction of equipment, technology, managing programs; evaluation of costs, technical-economic efficiency and the other works concerned with the future thesis designing, integrated course projects, preparation of the bachelor graduating are possible, too.

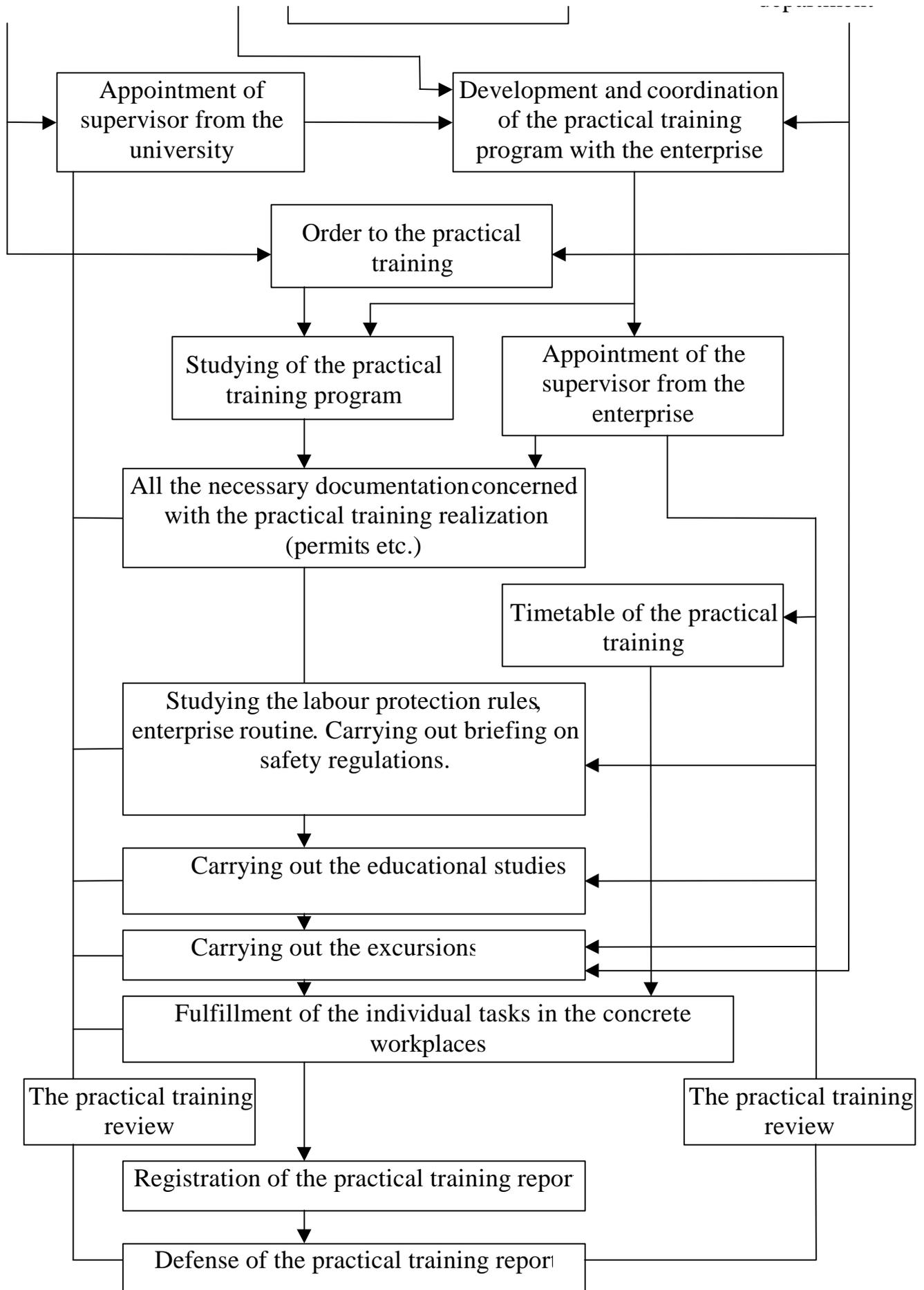


Figure 1.2 – The scheme of the practical training carrying out

### **1.3.2 The thesis practical training. Peculiarities of the thesis practical training, schematic description of the stages, characteristics of the stages**

The students' thesis practical training is an important compulsory component of the educational professional program for obtaining the Specialist or M. Sc. degree. It is carried out in the 10<sup>th</sup> term within 8 weeks, it is the final stage of the student education at an institute of higher education. The organisation and carrying out of the thesis practical training are realised according to the normative documents [1, 2] and the manuals [3, 4].

The choice among majority of real manufacturing tasks, which can be a basis of the thesis project (work) is the main goal of the work of the lecture of the thesis practical training. This makes great demands to his qualification. The pedagogic efficiency of the thesis practical training grows very much if the student self-dependent work is supplemented with other study forms: lectures, seminars, excursions, etc., arranged directly at the enterprise by its specialists.

The leaders of the university also have a possibility to supplement their professional knowledge, this aspect allow to reinforce practical orientation of specialists' training.

Full task list of the thesis practical training is determined by specific of the given speciality and the practical training base, as well as final goal – training the Specialist and M. Sc. degree students.

The main difference between M. Sc. and Specialist degrees lies in increasing the scientific level of M. Sc. thesis work [4]. While Specialist degree student have to use obtained knowledge on practical level, holder of M. Sc. degree emphasises on scientific research. In this connection, the main goal of the M. Sc. thesis practical training is a research on topic of the thesis work and elaboration of the theoretic basis of perspective directions of modern technology development and its practical application.

The content and the execution order of the student work during the thesis practical training are determined by the practical training schedule.

Taking into account the importance of the student thesis practical training, it is necessary to mention that within organising and carrying out the student thesis practical training many subdivisions of the university are engaged: home departments, dean's offices, departments of labour protection, economics and management, studies office. The studies office provides an interaction between the university subdivisions and the practical training bases.

As a whole, the stages of the thesis practical training are the same with the enterprise practical training stages, but its contents differ. The main direction of the thesis practical training is to collect the materials for the accomplishment of the thesis project (work). The content of the thesis practical training mostly depends on the topic of the thesis project (work). The task of the thesis practical training is also the task of the thesis project (work). That is why the university Supervisor of practical training and the thesis project Supervisor of the concrete student is rational to be the same person.

Within their practical training students should:

- get to know with the basic works directions of the enterprise and particularly with works close to the theme of the project;
- understand the main point of the project;
- to make the patent search on the topic of the thesis project (work);
- to master the principles of calculations of the automation designing and modelling;
- to study the technical facilities of automation of experimental researches;
- to fulfil experimental researches in separate directions of the graduation thesis (work);
- to acquaint with new methods of economic planning;
- to find information about labour-intensiveness and other norms of work organisation;
- to acquaint with the modern methods of organisation of works in the production collectives;

- to acquaint with measures of the production sanitation, fire-prevention security, labour and environmental protection;
- to collect and systemise materials on the thesis work topic.

The M. Sc. thesis practical training should provide development of the products, arrangement of experiments, receiving the mathematics models, processing the results of observations, development program applications, testing of the research principles and other works with research nature.

### **1.3.3 Other types of practical training. Practical training in the partner university and on the foreign enterprise**

Despite the differences between existing approaches to practical training in the universities of different countries, there is one common practical placement organisational framework (picture 1.3). So the stages of practical placement in EU-countries have some common and important characteristics.

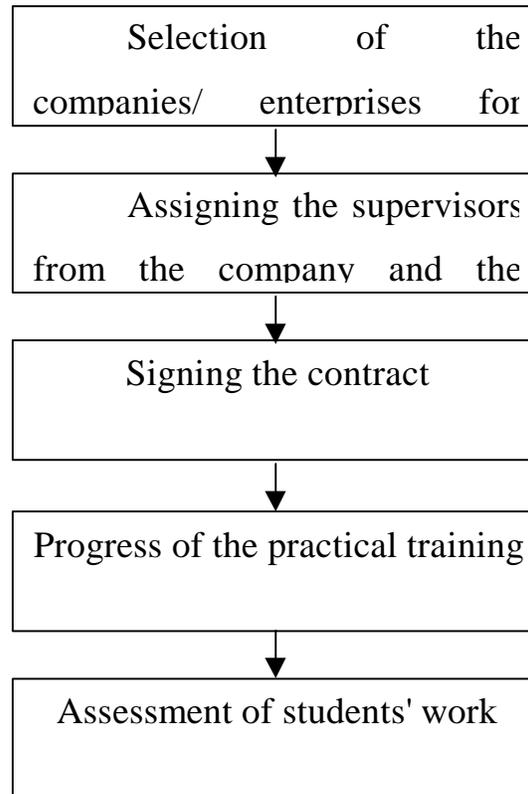
Stage 1. Selection of the companies/enterprises showing availability to accept students in practical placement. It is necessary that (1) the company wants to propose a practical placement; (2) the university (the supervisor from the department) accepts the task for a student.

EU universities have strong relations with the industry, with the labour market. Students can quickly find the job after graduation, companies get new ideas and methods of problem solving.

For selection of the companies they use some means:

- collecting the company offers for student practical placement. These offers are received by the students or the Placement Offices from advertisements in newspapers, or by sending the offers directly to the universities;
- personal contacts and links of the students or of their families/relatives with some companies;
- traditional good cooperation of the university with some companies, which constantly offer placements for students;

- international links/agreements of the university with foreign companies or universities and finding practical placements abroad.



Picture 1.3 – The logical scheme for management of students' practical placements

Stage 2. Assigning the supervisors - establishment of contact persons responsible for a good outcome of the student's practical placement. These contact persons are:

- at least one responsible person in the company (industrial mentor, industrial supervisor), ensuring that the students receive satisfactory training;
- one responsible from the university for a group of students (academic tutor, placement co-ordinator) offering consulting for the student regarding the professional content of the placement, visits more time the student at the company and is one of the responsible in the assessment of the practical placement.

Stage 3. Agreement on the contents of the practical placement. This is achieved via the existing agreements between the university and the particular companies involved, by arranging the period of placement, departments involved, general subject, payment conditions for the student's job, where applicable.

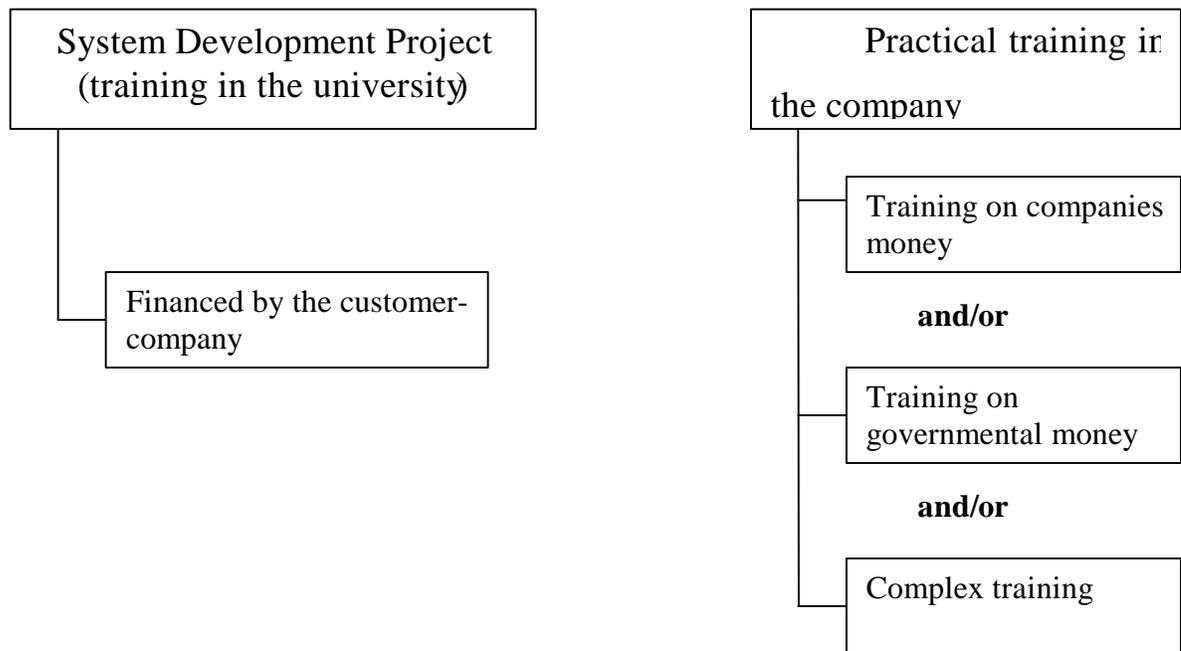
Stage 4. The progress of the practical training. As mentioned before, the success of the activity is supervised by an academic tutor and at least one industrial mentor. The industrial placement may comprise four-stages: introduction in the organisation of the company, achievement of some practical skills, general engineering training (the student becomes acquainted to the main aspects of development, documentation, data preparation, procurement, manufacturing, testing, installation, maintenance, marketing, sales) and a major project. The students prepare a project report on the main problems, solutions, technologies that have been observed during the practical training period.

e) Assessment of students in industrial placements. The student's progress is assessed by the person in the company responsible for the student's training, by the academic tutor, by a commission where the student presents his report or project after his return to the university. The supervisor from the company assesses the practical work of a student, completeness of the task performed. The supervisor from the university assesses the engineering and scientific level of work, gives the credits for training and puts the final grade.

When practical placement is performed abroad, it often appears as an individual option of the student, if all above-mentioned activities are applicable. The other alternative is the framework of an international cooperation with foreign companies or universities, when the responsibilities are transferred to the host institution.

Usually the practical training is financed by the company. Some types of training can be financed by the government. As EU universities have more freedom in curriculum development, students have freedom in choosing appropriate types of training.

The picture 1.4 presents the scheme of different types of training in the University of Jyväskylä (Finland).



Picture 1.4 – The scheme of different types of practical training in the partner university

To get the Master's degree the System Development Project (practical training in the university) is compulsory as well as at least one type of the training in the company.

To get the Bachelor's degree the training in the university is not compulsory. Taking one type of training in the company is enough.

If a student has abilities and desire he/she can take all types of training in the company, and in this case to have maximum number of credit for the practical training in his Diploma Supplement.

Detailed description of types of practical training is given in the chapters 2.2.4 «Partner university as a base for practical training» and 2.2.5 «Foreign enterprise as a base for practical training».

## **2 MANUALS FOR MANAGEMENT OF PRACTICAL TRAINING**

### **2.1 The list of documents for the organisation of practical training.**

The basic normative documents on organisational-methodical questions of realisation of practical training are:

- regulations of practical training;
- the working program of the practical training;
- the documents determining connection of high school with base of the practical training.

Besides the listed common documents in high school directly on questions of the organisation of the practical training are:

- an assignment to the practical training;
- a diary of the practical training;
- accounting to the documents of the practical training.

Below the characteristic of above listed documents.

#### **Regulations of the practical training**

The basic for today the normative document regulating all questions, connected to realisation of students the practical training of high schools in Ukraine, is "Order about realisation of students the practical training in Ukrainian higher educational institutions", who is authorised by the order of the Ministry of Education of Ukraine from April, 8 1993. #93 [ 2 ].

Regulations is coordinated with the Ministries of culture, health protection, an agriculture and the foodstuffs, a forestry, ministry on affairs of youth and sports, the finance, communication, transport of Ukraine etc. and is registered in the Ministry of Justice of Ukraine April, 30 1993. #35.

Order consists of the introduction, five sections and appendices. In introduction are considered the common questions of the organisation, realisation

and summarising of all kinds of students the practical training of various specialities in higher educational institutions of Ukraine, all levels of accreditation, and also conservatories, colleges etc.

The first section defines the practical training - in the most common case - the purpose, the contents and titles of the practical training, and also conditions of reception necessary practical knowledge and skills with reference to various qualifying levels: the younger expert, the bachelor, the expert, the master.

The same section gives precise instructions of that the list of all kinds of the practical training for each speciality or specialisation, their form, duration and terms of realisation are unequivocally defines by curriculum.

Regulations provides (recommends), that one of the practical training tasks may be mastering by students a mass working trade for the given branch which corresponds to a speciality of training.

It is underlined, that the final stage of practical preparation is thesis the practical training of students which will be conduct before carrying out of the degree project or thesis.

The contents and sequence of the practical training is defined by the program of the practical training which is developed by home department or the subject (cyclic) commission according to the curriculum.

The given regulation demands at each stage of the practical training of the program recommendations concerning kinds, forms, tests of a level of knowledge, skills, skills which students should reach. These requirements are united in the through program - the basic-methodical document of the practical training.

The contents of the through program should answer the given regulation, orders and decisions of board of the Ministry of Education and a science of Ukraine be relative of the practical training of students, the curriculum of a speciality and the qualifying characteristic of experts. On the basis of this program working programs of the appropriate kinds of the practical training are developed.

Generally through and working programs of the practical training are confirmed by the supervisor of a higher educational institution. In a case if the

branch ministries and departments have higher educational institutions - through (typical) programs on a speciality may be developed and confirm them.

Regulations also provides, that higher educational institutions may develop, except for the through and working program of the practical training, other methodical documents promoting high quality achievement of students the practical training.

The second section determines of Regulation bases of the practical training. The branch ministries and departments which have higher educational institutions in the submission, as agreed with the Ministry of Education and sciences of Ukraine, may attach to them the enterprise for the term of till 5 years.

At presence at higher educational institutions of the state, regional orders for preparation of experts, the list of bases of the practical training is given these institutions by organs which formed orders for experts.

Base of the practical training are provided in target contracts with the enterprises, organisations, establishments for preparation of experts by higher educational institutions. As bases of preparation of students on working trades may be used industrial the practical training and scientific divisions of higher educational institutions, teaching and educational institutions, technical training colleges, research facilities, ranges, and also the enterprises, the organisations, establishments which have the necessary equipment and the pedagogical staff.

In a case when preparation of experts by higher educational institutions is carried out under requests of physical persons, these persons (in view of requirements of the through program of the practical training and the present Regulation) or higher educational institutions that is stipulated by treaty provisions (contract) on target preparation of the expert, provides bases of the practical training.

For students-foreigners-bases of the practical training are provided by the appropriate contract or the contract on preparation of experts and may be placed both in territory of the country-customer of experts, and within the limits of Ukraine.

Regulation provides the order of passing of the practical training, organisational and its methodical maintenance etc. for students-foreigners, that also will be in detail considered in the appropriate sections of the given work.

According to the present Regulation it is authorised to students independently as agreed with the appropriate faculties (the cyclic commissions) to select places of passing of the practical training themselves and to offer them for use.

For groups of related higher educational institutions study-practical ranges or bases may be created: geodetic, geological, geographical, sea etc.

With bases of the practical training (the enterprises, the organisations, establishments of any kinds of the property) higher educational institutions beforehand conclude contracts on its realisation under the form. Validity of contracts is stipulated by the appropriate contractual sides and may be determined as for the period of a concrete kind of the practical training, and term till 5 years.

The third section consider questions of the organisation and a management of the practical training. It is established, that the responsibility for the organisation, realisation and the control of the practical training is assigned to heads of higher educational institutions. The educational-methodical management and carrying out of programs of the practical training provide the appropriate main faculties or the cyclic commissions of higher educational institutions.

The common organisation of the practical training, the control of its realisation in a higher educational institution carries out the supervisor of the practical training (the head of a department of the practical training etc.) which under the decision of a direction a higher educational institution is part of this or that division with the appropriate submission (the pro-rector on educational and methodical work, educational-methodical management, an educational department etc.).

Skilled teachers and other persons who accepted in direct participation in educational process on which the practical training will be carried out are involved in a management of the practical training of students.

In this section of Regulations rights and duties of supervisors of training from a higher educational institution and from the enterprise are precisely regulated and recommendations concerning distribution of students to the practical training, the organisations of the practical training for the students training on the job are given.

Supervisors from bases of the practical training together with a higher educational institution bear the responsibility for the organisation, quality and results of the practical training of students that finds the reflection in the appropriate contract.

Regulations provide an opportunity of transfer students on vacant permanent appointments if work on them meets the requirements of the program of the practical training. Thus, not less than 50 % of time it is allocated on common preparation according to the program of the practical training.

In the same section, duties of students of higher educational institutions are specified during passage of the practical training.

In the fourth section of Position, the questions connected to summarising of the practical training are considered. More in detail, these questions are stated in chapter 3.4 of the present work.

In the fifth section of Position questions of material maintenance of the practical training are considered. It is established, that sources of financing of the practical training of students of higher educational institutions are determined by the form of the order for experts: state or regional, means of the enterprises, the organisations, establishments of all kinds of property, foreign customers of experts and means of physical persons.

Expenses for the practical training of students of higher educational institutions enter a component into the common expenses for preparation of experts (masters). The size of expenses for the practical training is determined by the estimate-accounting which develops a higher educational institution and coordinates with bases of the practical training, at the rate of cost of passing of the practical training by one student within one week. The list of the existing expenses

connected to the organisation, educational-methodical, material maintenance of the practical training, with a management of the practical training from a higher educational institution and the enterprise, payment of consultations, excursions, other disposable common actions, travel of students to a place of the practical training (in the other city), residing of students at hostels etc. is shown during the practical training.

The form of a payment of experts from base of the practical training is underlined in the contract the practical training and may be carried out through financial organs of bases of the practical training or is direct educational institutions according to the labour agreement under the form given in the appendix to the contract.

Payment of lectures, practical, laboratory and seminar classes, consultations and instructing (the common duration no more than 6 hours per week on group of students) which will be carried out on the basis of the practical training by the qualified experts of structural divisions of these bases (which are not supervisors of the practical training of students) is carried out in actually fulfilled hours on norms of hourly payment according to the existing legislation of Ukraine due to means of higher educational institutions.

In Position it is specified, that during the practical training work on workplaces and posts with payment of wages, students reserve the right on reception of the grant by results of the final control.

To students of last rates of higher educational institutions who are trained on the job and according to the decision of faculties (the cyclic commissions) go for passing of the practical training, supervisors of the enterprises, the organizations and establishments of all kinds of property on whom these students work, give additional holiday without preservation of wages on the basis of an information of higher educational institutions on term of the practical training. During the specified holiday to such students the grant at a rate of not less minimal wages is appointed due to the appropriate enterprises, the organisations, establishments.

The given section of Regulation provides conditions of payment of the daily

allowance to students who are in the practical training outside a site of the given higher educational institution, and also establishes sanctions with reference to students who have missed days of the practical training without valid excuse etc.

Higher educational institutions, in case of need, may develop and confirm on the basis of the given Regulation the instructions which take into account features of training of students on a concrete speciality or specialisation.

### **The working program of the practical training**

The working program of the appropriate kind of the practical training is developed by home department on the basis of the transparent program of the practical training according to a speciality. The transparent program of the practical training provides the uniform complex approach to the organization of industrial practical preparation, continuity and succession of student's training. The through program is a basis for drawing up working programs of the the practical training which is taking into account features of bases of the practical training and concrete conditions of passing of the practical training.

Depending on a direction of preparation of experts (Bachelors) through programs may include such kinds of the practical training: computing, technological, design, educational, operational, special operational, Pro Gradu etc.

In the working program are concretised the purposes, tasks, the contents, the order of passing with the account as kind of the practical training, and bases of the practical training.

Generally the program of the practical training consists of the following sections:

- 1 Introduction.
- 2 The Purposes and tasks of the practical training.
- 3 The Place of the practical training and distribution of time.
- 4 The contents of the practical training.
- 5 Individual tasks.
- 6 Theoretical studies.
- 7 Excursions during the practical training.

8 The recommended literature, manuals, the normative documentation.

9 Methodical instructions.

10 Requirements to the report on the practical training.

11 Terms and a quality monitoring.

Depending on a kind of the practical training, concrete conditions of realisation of the practical training and features of a speciality some of above mentioned sections may be incorporated or excluded.

At drawing up of the program of the practical training it is necessary to take into account that it is the basic program brief which is given out to each student and the supervisor.

Let's result the most common methodical instructions on drawing up of separate sections of the program which should be specified with reference to a concrete kind of the practical training and base of the practical training.

In section "Introduction" except general the place of the practical training should be specified in structure of the working curriculum on specialities, and also concrete questions on the organisation of the given kind of the practical training, the right and a duty of students, supervisors of the practical training from a higher educational institution and from the enterprise, attention is paid to the organisational side of the practical training (registration of necessary documents, it is specified the order of passing of instructing in the safety precautions and investigations of accidents with students during the practical training).

In section "Purposes and tasks of the practical training" are listed both common, and specific goals and tasks with reference to the given kind of the practical training and to the given base of the practical training. Skills which the student should get as a result of performance of the program of the practical training are specified knowledge. The list of theoretical disciplines is resulted also, on the basis of which knowledge probably successful performance of tasks on the practical training.

In section "The place of the practical training and distribution of time" provided the rough list of divisions of the enterprise in which students will pass the

practical training, and also the list of posts occupied with them.

Here the schedule of passing of the practical training where volumes of time and the calendar terms assigned on various kinds of student's work are specified. The possible form of the schedule of the practical training is given in a diary of the practical training. It is more preferable to make such schedule-plan in which should be specified not only amounts of works, but also concrete terms.

Direct addition to this section is the schedule-plan of moving of students on workplaces at the enterprise.

The same section establish time for studying by students of safety precautions regulations, fire preventive maintenance, on common acquaintance with the enterprise, its management, performance of industrial and individual tasks, realisation of excursions and theoretical studies, registration of the report on results of the practical training etc.

The section "The Contents of the practical training" should be stated in the program most in detail. This section gives to students the task on studying new progressive technologies of processes, the modern equipment, design development, questions of economic activities of the enterprise, the organisation and production management.

It is underlined the character of participation of students in carrying out of production targets at the enterprise, considered questions of participation of students in rationalisation and invention work, their acquaintance with an operational experience of innovators of manufacture, is spoken about direct participation of students in the control of quality of output production. During an industrial the practical training direct participation of students in public life of the enterprise is provided.

In section "Individual tasks" it is necessary to specify, that each student during the practical training carries out one or several individual tasks on more profound studying the separate sides of manufacture, on gathering materials for student's research works, to carries out of course and thesis projects or on executing of other works in interests of manufacture and high school.

In section "Theoretical studies" specify volume and subjects of the studies carrying out during the practical training in the form of lectures, reports and seminars, consultations and conversations. Theoretical studies during realisation of the practical training should reflect prospect of development of the given enterprise (branch of manufacture), modern "know-how" etc. Such studies will be carried out in regular intervals during all period of the practical training by duration till 4 per one week.

The section of the program concerning excursions during the practical training, determines duration, the purposes and time of realisation of excursions, visiting of thematic exhibitions and other similar actions. The list of textbooks and manuals, books, articles, the normative documentation (industrial instructions, technological cards, departmental specifications, state standards etc.) with which it is necessary for student to familiarise during passage of the practical training, is given in section "The recommended literature, manuals, normative documentation".

The section " Methodical instructions" contains detailed methodical recommendations for performance of all tasks stipulated by the program. These recommendations should help the student quickly and correctly to understand with the big actual material which is given with the practical training, skilfully to allocate the main thing and at the same time to not miss and any minor moments of manufacture. In the same section are resulted recommendations for the most rational sequence of studying of manufacture.

In section "Requirements to the report on the practical training" requirements are resulted in drawing up of the report on the practical training as the basic document describing work of the student during the practical training, its volume, a sequence of a statement of a material, the contents of the report and appendices to it is underlined.

In the report it is necessary to take up all questions stated in section "Contents of the practical training", having accompanied with their deep analysis seen and investigated on the enterprise, offers on improvement of let out

production, increase of labour productivity, decrease of the cost price of production and improvement of its technical and economic, ergonomic and ecological parameters.

The report separate sections should include performance of the individual task, questions of economy and production management, and also a labour safety.

Thus it is necessary to remind students, that it is not necessary to include data of well-known character in the report, the extensive historical information taken from books, notes of lectures, methodical instructions and other widespread sources. Registration of the report should correspond to requirements of normative documents to the textual materials specified in the given section, namely according to requirements of standards to textual documents or according to State standard of Ukraine ??? 3008-95. "The documentation. Reports in sphere of a science and engineering. Structure and rules of registration".

The report should be made out by the end of passing of the practical training, is checked up and signed by the student, and then the supervisor of the practical training from the enterprise and a higher educational institution.

Drawing up of the report is regularly supervised by the supervisor of the practical training. To the report is applied the diary of the practical training and other materials stipulated by the program of the practical training and the individual task. The provisional form of a diary of the practical training is given in appendix A.

In final section of the program " Terms and a quality monitoring" are given recommendations for forms and methods of the current and final control of a course of the practical training, on conducting diaries and regular drawing up of the report. The common instructions on when and in what kind the student represents for the control a material on the practical training here are resulted. For the final control the report, a diary and other materials together with the written industrial characteristic of work of the student are represented checked up and signed by the supervisor of the practical training from the enterprise and high school during the practical training. The final control on the practical training

(differentiate examination) will be carried out before the commission on the basis of the practical training last days of its passing or in a higher educational institution during first ten days of the semester beginning after the practical training.

The commission is appointed managing home department or the pro-rector of a higher educational institution. The structure of the commission includes supervisors of the practical training from a higher educational institution and, whenever possible, from bases of the practical training, teachers of faculties, the subject (cyclic) commission which taught students - probationers special disciplines.

Examination will be carried out in the form of individual conversation of the commission with the student. The commission by results of protection declares an estimation (on 4 mark scale) and will wear out it in the study-examination sheet. At definition of a level is taken into account during the practical training an estimation the level of the received knowledge, skills, performance of the individual task, quality of registration and the substantial part of the report, and also industrial and public work, a labour discipline of the student etc.

The program of an industrial the practical training subscribes the person who has developed it, and managing home department. The program on its contents may be coordinated with other faculties (economic, labour safeties) etc. At the end of the program data on when also it is approved (the methodical commission of faculty, institute, scientific - methodical council of university etc.) by what methodical commission are resulted.

Working programs may be considered by study-methodical associations of high schools on the appropriate speciality.

Not later than for two months prior to the beginning of the practical training the working program is considered by a department of a professional training of the industrial enterprise, coordinated with the appropriate services and it is represented to the director or the main engineer. After the coordination the working program of the practical training is the document which performance is necessary for faculty, the enterprises, the teacher and the student.

Working programs should be updated annually.

**The documents determining connection of high school with base of the practical training.**

The basic documents which determine connection of high school with base (bases) of the practical training are contracts on realisation of the practical training of students of higher educational institutions which consist between high school and the enterprise, the organisation, establishment.

Those are also orders of the branch ministries and departments, which have higher educational institutions in the submission, about fastening to these high schools of the appropriate bases of the practical training (as agreed with the Ministry of Education and sciences of Ukraine).

If the higher educational institution has the branches of faculties at the appropriate enterprises, which represent itself as bases of the practical training, the basic documents in this case are documents on the organisation of branches of faculties.

In case preparation of experts by higher educational institutions is carried out under the order of physical persons, bases of the practical training provide these persons (in view of requirements of the through program of the practical training and Position [2]) or higher educational institutions that is determined by treaty provisions (contract) on preparation of experts.

For students - foreigners of base of the practical training are provided in the appropriate contract or the contract on preparation of experts.

For the precise organisation and realisation of the practical training in high school it is necessary to make plans of works which should provide the decision of all questions on the organisation, to realisation, methodical maintenance, a management, the control and the reporting, and also uniform realisation of these works during all academic year.

Thus the following documents are made:

- the order on high school about a assignment of students on the practical training;

- the contract with the enterprise on realisation of students the practical training;
- the working program of the practical training updated annually, with the schedule diagram of passage of the practical training (chapter 2.3);
- educational orders to supervisors of the practical training (chapter 2.10.2);
- a diary of the practical training of the student;
- the report on the practical training of the student, including individual tasks;
- the examination sheet on the practical training.

Obligatory action for planning the practical training of students should be the edition of the order on high school in which are reflected all organisational questions of its realisation in the current educational year.

The official basis for realisation of an industrial the practical training of students at the enterprise is the contract which concludes between high school and the enterprise till December, 1 of the current year on the practical training in the next calendar year.

Contracts with the enterprises concludes by departments of the practical training under applications of main faculties. The order of requests giving and the conclusions of contracts is established by the order of the rector and the order of the dean.

Reporting documents on the practical training are the diary of the practical training (appendix A) and the report on the practical training. Requirements to their registration are stated in chapter 3.4.

## **2.2 The bases for practical training**

### **2.2.1 General regulations**

As basis of the thesis practical training are chosen leading state enterprises and organisations equipped by modern equipment and utilizing up-to-date technologies.

The choice of the thesis practical training bases for specialists' training and is provided by establishment of the long-term contacts or agreement with the enterprise. For bases could serve production enterprise, scientific-research institutes and educational universities, firms, computation centres, banks etc. in Ukraine and foreign countries.

The practical training base choice is realised by the Home departments in terms of analysing production and economic possibilities of enterprise, which shall correspond to the demands for carrying out of practical training.

### **2.2.2 University as a base for practical training**

Universities have available highly qualified personnel, considerable material and technical basis for scientific research's arrangement, contacts with scientific organisations in Ukraine and abroad.

Leading scientists teach in Universities. Some Universities have modern equipped laboratories and computation centres.

Such kind of the practical training is especially important for those students, who are going to continue education in the magistrates to obtain essential experience at research spheres.

For instance the Kharkov National University of Radioelectronics have got high scientific research potential, great amount of highly qualified specialists is working here. Scientific researches, which are carried out in the university chairs are researches of the word's leading spheres of the science. Such as "metaintelligence", "radiotechnics", "artificial intelligence" etc. Great capacity of works and various directions of contracts with region, Ukrainian and foreign enterprises, modern equipment and program applications guarantee carrying out of all the practical training kinds on the base of home university. During the period of the enterprise practical training for obtaining the Specialist degree and thesis practical training for obtaining M. Sc. degree students can receive important experience for their thesis projects. The topics of the practical training could be connected with the university researches or it could have other nature such as

designing, experimental processing of facilities and program applications, experiments, measurement, development of the technical documentation.

The peculiarity of the practical training in the university is the possibility of student fulfilment as the individual task scientific-research works of the chairs. During the practical training period student should fulfil established task and make essential documentation.

### **2.2.3 Enterprise as a base for practical training**

As the practical training base will be used those enterprises, which have essential conditions for student obtaining experience and skills for their future speciality according to the practical training schedule. The university and the enterprise will solve all the technical questions about its and interaction with students. Enterprise will also provide safety work conditions of students, technical and methodical management of their practical training, excursions and lecture arrangement

As lecture is recommended to invite chief engineer of the enterprise, chief technologist, shop superintendent and other highly qualified specialists.

Production excursions have for a purpose expansion of the student technical knowledge of their speciality; studying organisational, production structure of the enterprise; informational, program, technical and organisational supplying. The excursions' schedule should be adjusted with the enterprise leader beforehand.

### **2.2.4 Partner university as a base for practical training**

Signing the contract about the international exchange with a university from other country opens new bases of practical training for students.

In the case if student is studying in the partner university under the program of the international exchange, he/she can choose the partner university as a practical training base. In such case student receives the opportunity of practical application of his knowledge for the fulfilment of a company order under direct

supervision of lecturers of the partner university. Due to good technical equipment and application of modern techniques of the practical training organisation, the majority of the European universities gives the opportunity to students to show themselves in real business and production atmosphere. The university practical training includes the whole life cycle of creation of finished product: receiving a customer's task, familiarisation with a knowledge domain, formulating of problem statement, collection of data, designing, realisation, testing and service at an initial stage.

An important feature of practical training realisation in a partner university is the emphasis on the student training. Students are learned to work in the collective (group), planning of time on various tasks, keeping the documentation, making the presentations, the skill of working with the real customer, overcoming the working

The practical training passage in the partner university requires modification in the existing framework of the practical training passage at native university or at the local enterprise. Frequently students have no opportunity to return to native university directly before the practical training and directly after it. That is why the importance of the supervisor's role increases. The terms of the check of the practical training reports and diaries are reconsidered. This is regulated with Statute about organisation of the student educational process (that is developed in the university) directed on the training, the thesis practical training and the thesis management in the partner university.

### **Main principals of practical training in the partner university**

Students that take practical training in the partner university should behave according to the rules of holding practical training in that university. Usually the terms of training are fixed but sometimes students have a freedom to decide when they can take training.

Let's describe the main principals of practical training in the partner university by example of the Faculty of Information Technology in the University of Jyväskylä. This type of training is called "System Development Project". The

duration is 5-7 months. This type of training is not compulsory to get the Bachelor's degree, however students usually choose it to learn to execute real tasks. Before training student should fill in the Registration to student projects (Appendix B).

The necessary requirement for taking practical training is the availability of task from the company/enterprise. Faculty collects potential tasks in one year before the training starts. One of the main responsibilities of the supervisor from the university is to select appropriate tasks that correspond to the level of future specialists. Task should not be only a technical problem, it should be some research also.

Each project is implemented by the group of 3-5 students. The contract/agreement is signed between the students group, the Department and the company (Appendix C).

Project group performs some particular task for the customer. It should be a completed software application. First of all students are getting acquainted with the domain. They read the documentation, provided by the customer and/or customer provides the training sessions. After that the application should be modelled, and implemented.

The aim of the System Development Project is to learn to run real industry projects. Students have a special course in their curriculum "Project management". Course presents project manager's tasks, project requirements, and practices to consider in managing both project and team. Topic to be covered include software development (strategy, mistakes, risk management, etc.); design approaches; different cases; communication with team and customers; demonstrations on project management software.

Project control is carried out on regular project meetings, where both student and their supervisors are presented. During the project meetings with supervisors from the customer their wishes are expressed and should be taken into account. Sharing experience while opponent meetings with another project groups also

gives good results. The final presentation should be prepared and the full project documentation should be presented.

The supervisor from the company accepts the task completed. The supervisor from the university takes into account review of the supervisor from the company, evaluates the engineering and scientific level of the work, management skills, and puts the final grade and number of credits for training.

### **2.2.5 Foreign enterprise as a base for practical training**

If a student studies in the partner university he/she can choose a foreign enterprise as a base for practical training. Students have the opportunity to get acquainted with real industry situations, with potential employers.

The existing scheme of studies management in the home university should be renewed for those students, who take the practical training in the foreign enterprise.

All financial agreements and contracts on the training should be signed as they are signed usually in the partner university.

#### **Main principals of practical training in the foreign enterprise**

Students taking training in the foreign enterprise are in fact its temporal employees and should behave ethically. One of the most important things are information security, copyrights.

In this case partner university is not controlling the progress of training, supervisor from the department just accepts the task.

Students execute the customer's task in real work conditions. This type of training is aimed more on the work than on education. Students enhance their skills by implementing theoretical knowledge to the industry tasks.

Often after graduation students get the job in the company where they took the practical training.

Picture 1.4 (chapter 1.3.4) presents the scheme different types of practical training in the partner university.

1) Training on governmental money. As usual government can pay for the projects for several state enterprises. Competition is announced for the best tasks, then departments collect the task formulations, and the supervisor decides what tasks will get budget money. The tasks that demand research are preferred. Usually the government gives the money for 3 month of training. The company can pay the rest, if the task implementation requires more than 3 months. There are no restrictions on the duration of the training.

2) In the most cases training in the company is financed by the company itself. The enterprise/company pays the salary to students (part-time or full-time work), pays to the department for the supervision. However if the task doesn't correspond to the level it will be rejected by the supervisor of the training from university. Foreign companies are attracted by the fact that university professor stands behind the student, who is an expert and can advise new modern solutions. Students work according to the requirements and company's timetable. In the end of training the supervisor from the company accepts the task completed. The supervisor from the university puts final grade and the number of credits for practical training.

3) Complex training. If the task requires the work of specialists in different fields then students from several departments are gathered together in one team. In such a case a separate budget is formed from the money of different departments and other companies. There is no analogue to such type of training in Ukraine.

## **2.3 Working program for practical training**

### **2.3.1 Structure and contents of the working program.**

In the chapter 2.1 was given the characteristic of the working program in a general view, its structure and recommendation for a substantial part of elements of structure. We shall result features of working programs for various kinds of the practical training according to the through program on an example of high schools of an instrument-making structure.

Let's consider the purposes and tasks of various kinds of the practical training and feature of their organisation at stages of baccalaureate preparation and preparation of the expert, the master (thesis the practical training).

### **Educational the practical training**

#### ***The purposes and tasks of the practical training***

The purposes of the practical training:

- acquaintance with the modern instrument-making enterprise;
- fastening of the theoretical knowledge received in institute and practical skills;
- purchase by students of practical skills of work, purchase of a working trade on a structure of the speciality;
- preparation of students for studying the subsequent disciplines of the curriculum of a speciality.

Tasks of the practical training:

- to become acquaint with the basic structural divisions and shops of the enterprise;
- to study process of development, manufacture and test of devices at the enterprise;
- to pay the special attention questions of application of constructional materials, bases of interchangeability and technical measurements by development and manufacturing of devices;
- to carry out independent individual work of students on industrial workplaces in shops of the enterprise, with the purpose of purchase of a working speciality on a structure of specialisation.

#### ***Features of the organisation of educational the practical training***

Educational the practical training will be carried out, as a rule, at the large instrument-making enterprises. The basic regulating document of the given the practical training is the working program of the practical training, including prepared by the supervisor from high school and coordinated with a department of technical training the enterprise, the schedule diagram of passing the practical

training by the students, determining moving on shops and departments of the enterprise of groups of students (on 3-5 and more persons).

Before the beginning of the practical training the supervisor from high school should give out to each student the individual task above which the student works all period of the practical training.

During all period of the practical training each student or group of students serially work on workplaces in various shops and structural divisions of the enterprise. Students may carry out functions of workers and technicians. Expediently during educational the practical training to ensure students of a working trade on a structure of the speciality.

The theme of the individual task is determined by the supervisor of the practical training from institute in view of opinion and a wish of the student. Themes may have survey character and should take into account abilities, wishes and readiness of students, concrete opportunities and conditions of the enterprise.

As themes of individual tasks the following themes may be accepted:

- the "know-how" and the equipment for manufacturing typical details of devices;
- studying and the description of elements and systems of the modern process equipment;
- studying and the description of used means of technical measurements;
- technology and the equipment of assembly works;
- a technique and means of test of concrete devices;
- studying and the description of original units and devices etc.

### **The technological practical training**

#### ***The purposes and tasks of the practical training***

The purposes of the practical training:

- fastening of knowledge and the practical skills received by students at studying of disciplines of a technological structure;
- purchase of practical skills in questions of development of modern devices;
- carrying out the individual task.

Tasks of the practical training:

- studying of the modern process equipment (machine tools with numerical program management, complexes, systems of automatic transportation);
- studying of the automated designing systems ;
- studying of modern techniques of details, units and devices development;
- personal participation of students in development of the technological documentation with application of the automated designing systems technological processes;
- studying organisational structure of the enterprise's technological service as a whole and its separate divisions and shops in particular.

***Features of the organisation of technological the practical training***

Technological the practical training will be carried out, as a rule, at the large modern instrument-making enterprises. The basic regulating and organisational document of the given the practical training is the working program of the practical training, including prepared by the supervisor from high school and coordinated with a department of technical training the enterprise, the schedule diagram of passing of the practical training by students.

Before the beginning of the practical training the supervisor from high school should give out to each student the individual task. Above the individual task the student should work all period of the practical training.

Distribution of time of the practical training (4 weeks) in divisions of the enterprise is made on concrete conditions of manufacture. Each student for the period of the practical training should work on 1-2-x workplaces. Expediently following distribution of time of the practical training:

1 week in a department of main technologist;

1-2 weeks in mechanical shop;

1-2 weeks in assembly shop.

In department of main technologist students study:

- organisational structure and functions of a department, its connection with technological services of other shops and departments;

- practical methods of application of substantive provisions of Uniform system of technological documentation and Uniform system of technological preparation of manufacture;

- methods of the technological control of design documents, methods of an estimation of adaptability to manufacture of designs and ways of its increase;

- a technique of development of typical and group technological processes, means of mechanisation and automation of productions;

- a technique of designing of industrial equipment, drawing up of managing materials on realisation of adjusting operations;

- technological processes of manufacturing of details and units of devices;

- means of the automated development of technological processes.

In mechanical shop students:

- study and master metal cutting general purpose machine tools and machine tools with numerical program management;

- get practical skills in development of the technological documentation;

- study and trace realisation in manufacture of the developed technological processes;

- take part in operations of quality surveillance of realisation of technological processes and conformity to drawings of made details.

In assembly shop students:

- study structure of shop, its internal and external industrial connections;

- get acquainted with modern and perspective technology of assembly typical and original, including precision units and devices as a whole;

- participate in development of technological adaptations;

- get practical skills in assembly of devices;

- study a quality monitoring and tests of finished goods and its separate units;

- participate in debugging and tests of devices and their units;

- study the practical training of use of robots (manipulators) on assembly of devices, consider efficiency of their application, the circuit, a design, a control system and interaction.

The theme of the individual task is determined by the supervisor of the practical training from high school in view of opinion and a wish of students. Themes of tasks should carry a technological orientation and should take into account abilities, needs and readiness of students, opportunities, conditions and an orientation of the concrete enterprises %o places of passage of the practical training.

As themes of individual tasks the following themes may be recommended:

- development of manufacturing techniques of concrete details of devices with orientation to metal-cutting general purpose machine tools and machine tools with numerical program management;

- development of manufacturing techniques of details or assembly units of devices with attraction of means of the automated designing technological processes;

- development of adaptations for assembly and adjustments of assembly units of devices;

- development of a technique and the equipment for test of assembly unit using means of computer facilities;

- preparation of offers and development of control programs of complex details with the help of perspective means of the control, for example, control and measuring machines, measuring robots etc.;

- preparation and a substantiation of offers on application of robots, manipulators for assembly of assembly units of devices etc.

The student makes out results of carrying out the individual task as the report. The report should include the technological documentation on the given process and to consist from:

- an explanatory note in volume of 30-35 sheets of format A4;
- graphic design documents in volume 1 sheet of format A1.

Explanatory note and the graphic documents signed by the supervisor of the practical training, the student represents the commission on summarising technological the practical training.

## **Design practical training**

### ***The purposes and tasks of the practical training***

The purposes of the practical training:

- fastening of knowledge and the practical skills received by students at studying of disciplines of a design structure;
- purchase of practical skills in designing devices and, first of all, with application of modern means of the automated designing;
- purchase of practical skills in questions of tests of devices with application of means of computer facilities.

Tasks of the practical training:

- to study specificity of design devices developed at the enterprise;
- to master and get practical skills of work on modern means of the automated designing;
- to take part in development of design documents (drawings of details, drawings of assembly units, circuits, specifications, explanatory notes);
- to take part in development of a technique of tests of devices and their units;
- to take part in realisation of tests of devices, processing and the analysis of the measuring information, use of modern means of automation of experimental researches;
- to carry out the individual task.

### ***Features of the organisation of design practical training***

Design practical training will be carried out, as a rule, in design office and in research laboratories of the modern instrument-making enterprises and scientific research institutes. The basic regulating and organisational document of the given the practical training is the working program of the practical training, including prepared by the supervisor from high school and coordinated with a department of technical training the organisation, the planned schedule of passing of the practical training by students. The planned schedule regulates moving during the practical training on subdivisions of the enterprise of separate students or groups of students (on 3-5 persons).

Before the beginning of the practical training the supervisor of the practical training from high school should give out to each student the individual task. Above the individual task the student should work all period of the practical training.

Distribution of time of the practical training on divisions of the enterprise is made on concrete conditions of manufacture. Each student for the period of the practical training works on one or two workplaces - in design office and (or) research laboratory.

When working in design office it is necessary for students:

- to become acquainted with structure the design office and its connections with other divisions of the organisation;

- to become acquainted with specificity, purpose, a scope of devices developed in design office;

- to study and master modern means of the automated designing;

- to repeat the substantive provisions stated in standards of ? ? ? ? and to become acquainted with regulating design documents of the enterprise;

- to accept personal direct participation in release of the design documentation (drawings of details, drawings of assembly units, circuits, specifications, explanatory notes);

- to take part in development of programs of the automated designing;

- to become acquainted with methods of the organisation, planning and material stimulation of work of employees in the design office.

At work in research laboratory it is necessary for the student:

- to study organisational structure of laboratory, its tasks and functions;

- to become acquainted with the capital equipment, measuring and a data-acquisition equipment, the means intended for automation of experimental researches;

- to become acquainted with techniques and objects of experimental researches, methods of processing and the analysis of results of research;

- to master a technique of patent search in a theme of researches;

- to accept personal participation in realisation of patent search, experimental researches, development and operational development of the experimental equipment, in processing results of measurements;

- to accept active participation in the experimental researches which are carried out with application of means of computer facilities;

- to study and strictly to carry out rules under the safety precautions;

- to become acquaint with methods of the organisation, planning and material stimulation of work of employees in laboratory.

The topic of the individual task is determined by the supervisor of the practical training from high school in view of opinion and a wish of the student. Themes of tasks should carry a design or research orientation and take into account abilities, bents and readiness of students, opportunities, conditions and an orientation of the concrete enterprises - places of the practical training passing.

As topics of individual tasks the following themes may be recommended:

- multiple development of a design of unit of the device;

- optimisation of parameters of elements or units of devices on the given criterion functions;

- calculation static, dynamic and precise characteristics, reliability of the device;

- designing and calculation of the stand test for the device or unit of the device;

- development of algorithms, programs of the automated designing of elements and units;

- system engineering, the equipment and programs of automation of experimental researches.

The student represents results of carrying out of the individual task as the report. The report should include design documents on the given unit and to consist from:

- an explanatory note in volume of 30-40 sheets of format A4;

- graphic design documents in volume of 2 sheets of format A1.

As graphic documents of reports on design the practical training may be submitted:

- assembly drawings - the documents containing the image of assembly units and other data, necessary for their manufacturing and the control;
- assembly circuits - documents on which components of a product and connection between them are shown as conditional images or designations;
- specifications- the documents determining structure of assembly unit, a complex, the complete set (table);
- demonstration materials - diagrams, diagrams, tables, algorithms, posters etc.

Graphic documents should meet the requirements of standards.

Explanatory note and the graphic documents signed by supervisors of the practical training, the student gives the commission on summarising design the practical training.

### **The program of the thesis practical training**

#### ***The purposes and tasks of the practical training***

The purposes of the practical training:

- direct practical preparation of students for independent work in posts of the engineer - designer and the engineer - researcher;
- preparation of design documents of the thesis project;
- a deepening and fastening of theoretical knowledge and the practical skills received in high school at a stage of baccalaureate preparation.

Tasks of the practical training:

- studying of the design works organisation in subdivision, stages of development of the design documentation, kinds and completeness of design documents, kinds of products, rules and requirements on registration of design documents;
- studying features of designing of the devices which are let out by the given concrete enterprise;
- studying methods and the equipment, intended for test and research of

devices and their elements;

- independent realisation by students of patent search in a theme of the thesis project;

- purchase by students of practical skills of the designer and the researcher by personal participation in designing and research of devices;

- practical mastering development means of the automated designing, automation of experimental researches, with use of the appropriate software;

- studying and practical application of economic-organisational methods and progressive technologies at creation of new perspective devices;

- studying of actions and means of a labour safety, including the prevention of accidents, preservation of the environment. Application of these means at practical realisation of productions in instrument making.

### ***Features of the organisation of thesis practical training***

Before the beginning of thesis practical training the supervisor of the thesis project (work) should give out to the student the task for the thesis project (work) authorised managing main faculty. The supervisor of thesis is determined by faculty and confirms the order on high school. The task for thesis work should be closely connected to the individual task for thesis the practical training. It is expedient association in one person of the supervisor of thesis the practical training from high school and the supervisor of thesis designing for the concrete student.

Practice will be carried out in design office and (or) in research laboratories of associations, institutes and the high schools which are carrying out independent development of devices. During all term the student works on one workplace. During thesis practical training it is necessary for the student:

- to become acquaint with system of the organisation of development and manufacture of new devices at the enterprise;

- to become acquaint with system of the organisation of works in divisions;

- to repeat substantive provisions of standards;

- to try grasp in essence of the task for the thesis project;

- to study features of designing and designs specificity of the devices

developed in division;

- to carry out patent search in a theme of the thesis project to analyse and generalise the collected materials and to issue the appropriate sections of an explanatory note of the thesis project (work);

- to begin development of graphic and textual design documents of the thesis project;

- to familiarise with techniques of experimental researches of devices and, at an opportunity to take part in researches;

- to study the basic technological processes of device's manufacture at the enterprise, having paid attention as on the traditional technological processes (for example, machining of details, assembly of units), and on more modern (for example, manufacturing of elements of microelectronics);

- to become acquainted with new methods of economic planning design and industrial works, methods of calculation and maintenance of economic efficiency of output devices;

- to become acquainted with modern methods of the organisation of works in work collectives;

- to become acquainted with the accepted measures fire-prevention, preventive maintenance, a labour safety, including the prevention of accidents and an environment;

- to prepare necessary initial materials for settlement-design, technological, research and economic sections, and also the unit of a labour safety of the degree project.

The degree project supervisors of the practical training from the enterprise should render the big help to students on questions of design documents preparation. The help consists in acquaintance with the necessary design documentation of the enterprise, in practical recommendations for development: designs of the given device and a choice of constructional materials, manufacturing techniques of details and units of the device, methods and programs of calculation of characteristics and elements of the device, the most acceptable means of

computer facilities.

The report documents determining an overall performance of students during the predegree practical training submitted to commissions on summarising the predegree practical training design documents of the degree project are:

- an explanatory note (introduction, the review and the analysis of analogues of object of designing);
- graphic design documents in volume 2-3 sheets of format A1.

### **2.3.2 The working program for the enterprise as a base for practical training**

It is made according to the common requirements to the working program (chapter 2.1). The following in this case concerns to features of the working program:

- a kind of the practical training for which the given program is made;
- a structure and opportunities of the enterprise (base of the practical training);
- requirements to vocational training students of various specialities;
- interrelation of theoretical preparation with practical preparation according to a speciality;
- use of results of the practical training for the subsequent work in high school (course, degree designing, scientific work of the student).

### **2.3.3 The working program for the university as a base for practical training**

The working program of the practical training of students in an educational institution where students are trained, is made according to the common requirements to the working program, stated in chapter 2.1.

To features of the working program in this case it is necessary to relate the following moments:

- places of passing of the practical training (faculty - its scientific, educational laboratories; scientific divisions of university - problem research

laboratories, branch laboratories, ranges; computer centre; an experimental plant - shops, sections etc.);

- a concrete special-purpose designation of the given kind of the practical training - participation of the student in research work, development of laboratory plants, breadboard models etc., development of program appendices;

- realisation of excursions on the enterprises, in the organisation, establishments with the purpose of reception of consultations, acquaintance with modern "know-how" etc.;

- introduction of results of the practical training in educational process of faculty, in scientific development (articles, working breadboard models, devices, program appendices etc.);

- a management of the student the practical training by the teacher being, as a rule, and his supervisor of studies on student's scientific works.

## **2.4 Techniques of practical training**

University education frequently is more theoretical and is not so closely connected to daily the practical training. Other big problem of students of universities is lack of their vocational orientation on the future work during training at university. Comprehension of these problems promoted occurrence of model of the experimental training submitted by Kolb [7].

According to model of experimental training, the concept of training is based that students require purchase of experience for training. After reception of personal experience, they should realise it. Comprehension or display, is an essential phase during training by means of which students use the experience by conscious image that conducts to new understanding and behaviour. After comprehension they form the abstract concept of representation of experience. And further they may carry out new experiences in investigated area and thus get new experience for new display etc.

The basic idea of inclusion of the practical training of students in the

working plan consists in the offer to students of the valid practical experience, thus, in granting him of an opportunity to display their experience in many ways, receptions of a feedback from various examples.

#### **2.4.1 Individual work of students**

The most habitual for universities of Ukraine is individual work of students in the practical training (performance of the individual task). It allows the supervisor to estimate work of each student more steadfastly, allows the student to feel an individual responsibility for the carried out task.

At individual work the student receives regular consultations as the supervisor from university, and the supervisor in the company. If the practical training passes not at university, and is direct on a workplace the student works in collective (at the enterprise, in the company). He may carry out one of parts of the complex project. Nevertheless, the task for the practical training is carried out by the student independently, the report on the practical training is made out individual and the student individually is estimated.

#### **2.4.2 Group work of students**

Despite the fact that individual students work has some advantages, it is less effective in many situations. Usually the real task in the company is rather large, it is not for one person. And only the team of 4-5 person can execute a complex task in a short period of time.

The second and most important advantage of a group work is a possibility to learn project management. Students have a chance to try themselves as a project manager, as a secretary, as a developer, learn to plan a timetable, participate in meetings with customer. The experience during the practical training will be irreplaceable in future work.

Eero Tourunen, the lecturer of the University of Jyväskylä, has developed the original method of teamwork during the practical training. This method was approved on several international conferences in high education [5] and is

implemented now on the Faculty of Information Technology for organising the training in the university, so called System Development Project.

Students and supervisors from the university first meet in six month before training starts. Students receive the preliminary information about the training, discuss the potential teams. The last year students are invited to give some useful advises.

### **Team forming**

Team forming is one of the most important stages. Usually it is held in a friendly unofficial atmosphere, outside the university. The optimal group size is 4-5 students. It is enough for execution of a real project and at the same time each student feels responsibility for his work in a small team.

The right choice of students to one team defines the future success of learning and project development. That's why professional psychologists are invited to help to form teams. The teams should be formed evenly. The successful consists of students with different abilities (e.g. a team leader, a developer, a designer, a secretary).

First of all students form the team by their wish. Usually the first teams consist of friends. Then psychologists play with each team different real situations that may happen during the project development. This situation help to find the weak places in each team and student reform the teams.

On the stage of forming teams students know all the proposed tasks for projects development. There are more subjects than groups, so that student groups are given a good possibility to choose their subject according to their own interest. This is of great importance for the motivation of ones work and learning.

The supervisors work on the subjects as long as the subjects are suitable for the Development Project. The client must be able to "sell" one's subject to a student group. For that reason a meeting is organised, where the clients present their projects.

Examples of the projects which recently being developed by the students of the Faculty of Information Technology: 1) a group developed an object oriented

design method for a company which was selling the information and software at the financial markets; 2) a group designed a prototype work station for the university planning coordinators; 3) a group designed and implemented a system for the language study centre, that would help the students to enrol for the language courses; 4) a group investigated and tested the possibilities using the electronic data interchange systems for ordering and invoicing goods between the companies; 7) a group selected a software package for the marketing purposes.

### **Project implementation**

The organisation of the Project is based on the autonomous and responsible groups. The first task of each group is to organise the group. The first project manager and secretary are selected. Each member must in turn act as a manager and secretary. The group makes the decision, what kind of plans to do and what to leave out. For the purpose of learning the group must create, supervise and rework at least the following plans: project plan, phase plans, communication plan, documentation plan, information collection plan, the plan for controlling of the resources and a weekly working plan.

At first the group must get some background information about the subject of the project. Students visit the company of the client and define the methods of communications: electronic mail, fax, phone, mail etc. They also select the governing group consisting of the representatives of the client's organisation as well as the representatives of the university. The governing group makes all project resolutions. It also accepts the outcomes of the project for the client, but not as the examination for the practical training in the university.

Students continue in the investigations of the subject and get quite a large and detailed knowledge about it: organisation, aims, functions, future plans etc. For that reason they make interviews and enter all kinds of interactions with the employees of the client. After having enough information about the subject the group makes a proposal of the project contract. After acceptance of proposal a representative of the client and a representative of the university will sign it.

Each group has a supervisor, who is one of the teachers, taking care of the group education. The supervisor keeps at least one meeting with the whole group every week and one meeting with the project manager. During these meetings they discuss the events, which had occurred since the last meeting and try to foresee, what would happen next week. The supervisor does not give any ready solutions of the tasks. He or she only helps the students to find the essential aspects of the problems.

The supervisor is almost always present at the meetings with the client. Afterwards the group and the supervisor together analyse the meetings. The group sends all the plans they have made to the supervisor and he or she makes some comments on them.

### **Evaluation of group work**

There are two interval evaluations – in the middle of the project and in the end. The evaluation is organised so that both the groups and the supervisors make the analyses of working of the group separately. The opinion of the group comes out in the common discussion. At the end of the Development Project the teachers of the course collect all the evaluation material and add to that their final opinions of the clients concerning the work of the group. After that the group takes its evaluation material for an analysis, writes an evaluation of that material (meta-evaluation). After the supervisors have read the meta-evaluations, there is a meeting with each group and debate on the whole evaluation material. Then the supervisors assign the credits for the group. Both supervisors and students have the right to suggest some student a credit that differs from the credit given to the group. These personal credits are given on the basis of mutual agreement whole group.

During the group work students learn how to communicate in a more fluent way. So in many situations the groups are more balanced at the final phase. Students have achieved a professional approach to the design work. This is very important for the students because of their professional development and career.

The information systems are mostly developed by using the methods of teamwork.

## **2.5 Organisational and methodical recommendations for practical training**

### **2.5.1 Recommendations to supervisors from the university**

General laws and duties of supervisors of the practical training from university should be added with positions, are determined by features of bases of the practical training:

#### **Management of the practical training at home university**

Supervisors of the practical training at home university should:

- become acquaint with the Through program of the practical training;
- make the schedule diagram of passing of the practical training;
- develop for each student the individual task for the practical training;
- hold the organisational meeting;
- inform students on terms of realisation of the practical training;
- set the task and acquaint the student with the schedule diagram of passing of the practical training;
- give out diaries of the practical training;
- give the recommendation for their conducting;
- place students on their workplaces;
- be active to promote performance of individual tasks;
- check up carrying out of the individual tasks by students;
- take part in the commission on reception of offsets on the practical training.

In a case when the supervisor of the practical training is also the supervisor of scientific work of the student it is natural, that he too purposefully, supervises over work of the student more particularly and renders to him regular support in scientific researches.

When the supervisor on one base of the practical training simultaneously has some students, it is offered to use a technique of work in the groups, described in

chapter 2.4 (the Technique of practical training). In that case the supervisor should help students to generate group to supervise not only performance of the task for the practical training, but also the organisation of work inside the group, to help to resolve conflicts.

The estimation system of projects by the group of students during the practical training should be complex. We cite as an example the estimation system group work of students at faculty of information technologies of university of Jyväskylä [6]. The complex estimation develops of evaluation on 7 parameters, each of which has the factor of the importance (specified brackets):

- a subject domain (10 %) - acquaintance with a subject of researches, statement of a task;
- result (20 %) - the created system, the report on the practical training, importance of results for the customer;
- methods (12 %) - use of existing methods, creation of the methods of the decision of a task in view;
- work in group (13 %) - the organisation of group, the analysis and the decision of conflicts and problems;
- regular work (15 %) - plans, a goals from a spelling of plans;
- interaction (15 %) - meetings with representatives of the customer, relations with the customer;
- training (7 %) - work with the supervisor, seminars, reputation of group at a level of other groups;
- participation (8 %) - the relation of group to work, eagerness.

It is obviously possible for us to take for a basis such estimate system of works in the practical training at university for complex tasks. Certainly, it is necessary to reconsider all parameters and their importance at removal of a complex estimation proceeding from the purposes and tasks of each kind of the practical training.

Management of the practical training outside of university

The most important for qualitative realisation of the practical training

outside of university is the preparatory period. In this period the supervisor of the practical training should:

- to acquainted with the necessary study-methodical documentation on realisation of the practical training;
- to acquainted with the contents and features of the contract on the practical training concluded with the enterprise;
- to familiarise with group of the students directed on the practical training (the academic progress, discipline, propensities etc.);
- to develop and coordinate the schedule diagram with the enterprise not later than for two months prior to the beginning of the practical training;
- to prepare and give out to students the necessary educational-methodical documentation;
- to provide realisation of all organisational actions before departure of students to the practical training (instructing about the order of passing of the practical training, under the prevention of accident etc.);
- in case of need organise additional studies of students for learning base of the practical training, training to their necessary practical skills etc.;
- for 7-8 days prior to the beginning of the practical training direct to the enterprise lists of students and other materials necessary for reception of passings;
- to check reception by students of the daily allowance and travel money, and also purchase of tickets by them for travel to a place of the practical training;
- for 2-3 days prior to the beginning of the practical training to arrive on base of the practical training for the organisation of necessary preparation for arrival of students - probationers.

For high quality maintenance of passing of the practical training the supervisor of the practical training performs the following works:

- organises a meeting of the students who have arrived on the practical training, and helps them in accommodation in a hostel, reception of

passes on the enterprise and in the decision of household questions (a meal, transport etc.);

- acquaints students with distribution on workplaces and with supervisors of the practical training from the enterprise;
- organises, proceeding from the requirement of the program, on the basis of the practical training together with the supervisor of the practical training from the enterprise obligatory studies for students, and also lectures and seminars on economy, technologies and to production management, a labour safety, engineering psychology, standardisation, quality surveillance of production, wildlife management, on legal and other questions;
- carries out the control of maintenance of normal working conditions and a life of students, behind realisation of obligatory instructing in a labour safety, in particular under the safety precautions, performance by probationers of rules of the internal labour schedule of the enterprise and schedule diagrams of passage of the practical training.

During end of the practical training the supervisor of the practical training:

- considers reports of student's the practical training, gives a response about their work and represents managing faculty the written report on realisation of the practical training with remarks and offers on practical preparation of students;
- checks delivery by all students of passes, literatures and property of the enterprise;
- organises departure of students the enterprise (the ending of the practical training);
- takes part in examinations of the practical training and in preparation of scientific student's conferences on results of an industrial the practical training.

It is natural, that the teacher conducts all work in close interaction with the supervisor of the practical training from the enterprise.

### **2.5.2 Recommendations to supervisors from the enterprise**

Supervisors from the enterprise should:

- get acquainted with working program of practical training;
- meet students on their first day of work and arrange the workplaces;
- arrange the safety regulations lectures;
- approve the timetable and individual task of each student;
- tell students about principals of work in the enterprise;
- help students in all training issues;
- check the results of practical training;
- evaluate each student after finishing the training;
- etc.

### **2.5.3 Recommendations to a home department**

Educational-methodical management of activity of the teachers conducting the practical training, the home department carries out, promoting approximation of conditions of realisation practical preparation to real conditions of industrial activity. Thus managing faculty:

- allocates for a management of the practical training of the most skilled professors, senior lecturers and the teachers well knowing manufacture;
- provides executing of the works plan on the organisation and realisation of the practical training (representation of applications, lists, plans of departure for the practical training etc.);
- participates in realisation of organisational meetings of students before the beginning of the practical training;
- appoints the commissions on reception of credit on the practical training;
- supervises realisation of the practical training as one of kinds of educational process.

Besides that faculty manager organises realisation of the following actions:

- studying of the enterprises with the goals of their most effective use for the

- practical training;
- development of the working program of the practical training;
- distribution of students in places of the practical training;
- distribution to students of individual tasks on the practical training;
- presentation in dean's office prior to the beginning of thesis the practical training offers on attach to students that of thesis projects (works), supervisors and terms of performance of projects (works);
- gathering of reports and diaries of students on the practical training and the organisation of their storage not less than one year after the ending of the practical training;
- discussion on faculty meeting questions of an industrial the practical training, development actions for improvement of a management of the practical training.

It is necessary for the home department directing students on training and graduating in the university-partner under the program of the international exchange of students, to be guided by the appropriate regulations about the organisation of educational process for the specified students.

The home department directing students on an exchange in the university-partner, beforehand should appoint the supervisor of the practical training for these students. The supervisor should hold organisational meeting of students before their departure. At meeting ways and the plan of remote interactions of students with the supervisor are discussed. The supervisor gives out diaries of the practical training, the educational schedule, the curriculum of 9-th semester etc. materials of methodical maintenance of educational process according to the decision of faculty.

On 4-th educational week the coordinator from home department on the international exchange receives the list of subjects from students which are studied in the university - partner for drawing up individual curricula for the specified students.

The home department manager together with the dean's assistant forms a

cycle of a free choice disciplines and a cycle of disciplines of a choice of high school on 9-th semester.

Faculty manager develops the individual plan of training of the student directed in the university-partner, and coordinates it with the dean of faculty.

For each student directed on an exchange, faculty manager together with the dean's assistant makes the plan of additional passes on subjects differs between the individual curriculum on a speciality on 9-10 term, made in native university, and the curriculum of the student in the university-partner. The faculty gives students an opportunity to study only the above-mentioned disciplines in the individual order under the appropriate references, using periodic consultations of faculty teachers by usual mail or a e-mail, or under the appropriate conditions with the help of ways of the remote form training.

The list of the students, who are taking place the practical training in the university-partner, is given in a department of the practical training. Preliminary as base of the practical training is underlined the faculty of the university-partner where students go on an exchange.

The faculty prepares the separate order on the practical training of the students who are taking place in the university-partner.

Diaries and reports on the practical training surrender in faculty archive at returning students in native university.

The student who is trained in the university-partner, till 26-th week of curret academic year coordinates a theme of the degree project(work) with home department and starts its carrying out, using periodic consultations of the supervisor of the degree project from university.

Home department together with dean's office form the order on thesis project of students who are trained under the program of the international exchange, after passing by students of differs in curricula and credit on thesis the practical training, but not later than on 42-nd educational week. In the order on degree projects (works) are defined themes of projects, supervisors of degree projects (works), consultant from home department of university. Consultations on

questions of a labour safety and economy are carried out by the supervisor of the degree project (work) or the consultant from home department.

The explanatory note to the degree project (work) may be written by the student on state, or in foreign language, according to requirements of home department of university for the subsequent defence of the project (work) before the State Examining Board. The presentation of the degree project (work) is carrying out with use of modern computer technologies.

#### **2.5.4 Recommendations to a dean's office of a faculty**

Deans of faculties:

- carry out the control of work of faculties and teachers on the organisation and realisation of the practical training of students;
- watch duly for development, reprinting of programs of the practical training;
- prior to the beginning of the practical training make out the order on university about direction of students on the practical training, and also fastening to students that of degree projects (works) in case of thesis practical training;
- consider questions of the organisation, realisation and the control of the practical training on faculty meeting;
- determine directions of perfection of various kinds of the practical training and their efficiency.

For the organisation of educational process of the students directed on training in the university-partner under the program of the international exchange the following additional functions of dean's office are entered according to regulations about the organisation of educational process of five year students directed on training, thesis practical training and graduating in the university-partner under the program of the international students exchange:

- the dean of the appropriate faculty order to establish individual training of the specified students at 9-10 term from 1-st to a 44-th educational week of the

current academic year;

- the dean's assistant together with manager of home department form a cycle of disciplines of a free choice and a cycle of disciplines of a choice of high school on 9-th semester proceeding from the list of subject which are studied by the student in the university-partner. The dean's assistant makes the specified changes to the curriculum of 9-th semester on the appropriate speciality till 9-th week of the current academic year;

- the dean asserts the individual curriculum of the student directed to training at the university-partner;

- the dean's assistant on 5-th educational week establishes differences between the individual curriculum of the student on a speciality on 9-10 semester and the curriculum of the student in the university-partner and together with manager of home department makes the plan of liquidation of the specified differences;

- the dean's office makes out the separate order on university about a direction on the practical training of the students, training in the university-partner with the instruction of bases of the practical training, terms of its realisation, tasks and supervisors of the practical training;

- the dean's assistant carries out accounting of subjects of a free choice and a choice of high school on the basis of the personal application of the student and the academic information ( ECTS-information) given to the student by the university-partner which confirms the list of the mastered disciplines, amount of educational credits and the received estimations;

- the dean's assistant admits the specified students to delivery of on thesis practical training after carrying out the plan of liquidation of differences(item 6 of Position);

- the dean's office makes out the separate order of thesis work the students training under the program of the international exchange, after passing of differences in curriculum and getting credit on thesis the practical training.

## **2.5.5 Recommendations to a department of practical training**

### **Direction of students on the practical training**

Distribution of students in places of the practical training will be carried out by the special order on university on the basis of the appropriate requests of main faculties, requests of the enterprises, contracts about preparation of experts not later than for one month prior to the beginning of the practical training. In the order are necessarily specified: faculty, year, group, surnames, names, middle names of the students directed to the practical training on the given enterprise, terms of passing of the practical training, supervisors of the practical training from university, terms of their stay on the basis of the practical training.

Lists of students represent to the enterprise not later than for one week prior to the beginning of the practical training.

For 2-3 weeks prior to the beginning of the practical training the supervisor receives in a department of the practical training of university for all students who are taking place the practical training, forms of the following accompanying documents: diaries and travelling certificates (for the students leaving on the practical training for limits of the given city); a direction to the enterprise, a direction for accommodation in a hostel and requests to order and reception of railway tickets.

The organisational meeting of students be held before leaving for the practical training. Representatives of faculties of economy and a labour safety, the supervisor of the practical training from the home department and the manager this faculty participate in it. In necessary cases the dean of faculty is invited to meeting.

### **Interrelation of a department of the practical training with bases of the practical training**

Many subdivisions of university take part in the organisation and realisation of student's the practical training: main faculties, dean's offices, faculties of a labour safety and economy, an educational department (sector) of the practical training. Interaction of various subdivisions of university and bases of the practical training is provided with educational-methodical management.

At university it is necessary to have duty regulations and a number of other documents regulating the rights and duties of employees, are occupied with questions of the practical training.

Practice of students will be carried out according to the contract which consists between university and base of the practical training till December, 1 of the current year on direction to the practical training in the next calendar year. Contracts conclude with the enterprise for applications of main faculties.

Contracts fill in duplicate. Number given to the contract is marked in the request of home department. The contract is sent to the base enterprise with the accompaniment letter which text depends whether or not the given enterprise attached to university as base of the practical training. The order of representation of requests and the conclusions of contracts is established by the rector's and dean's order.

The director of bases issues the order on the practical training, defining in it the regulations of the organisation and realisation of the practical training, action for creation of necessary conditions to students for carrying out of the practical training by them, on maintenance with their overalls and hostels, on a labour safety and prevention of accidents, under the control of performance by students of rules of the internal labour schedule, other actions providing qualitative realisation of the practical training according to the program of the practical training, appoints the supervisor of the practical training from the enterprise.

### **Direction of students on the practical training to the partner university**

When home department directs students to the partner university it should give the list of exchange students to the department of practical training in advance. Students receive the practical training diaries before departure.

Before starting the practical training exchange students send the letter to the faculty about bases and terms for training, task for training, supervisor. The copy of this letter should be kept in the department of practical training.

### **Practice in a place of the future work**

In the event that the student is trained under the contract paid by the enterprise, or preparation of the expert is carried out under the order of the enterprise all kinds of the practical training will be carried out at the given enterprises (naturally, that at the given enterprises all necessary conditions for pass the practical training - carrying out all requirements stated in the working program of the practical training and in regulation [2]) should be provided.

In case the student has independently found a place of the future work on a speciality, he may be directed on the practical training under the appropriate letter (the enterprises, the organisations, establishments, etc.) at observance of above mentioned requirements.

### **2.5.6 Recommendations to an educational-methodical department**

An educational-methodical department of the university including in the structure a department of the practical training, educational and methodical departments, solves the following tasks connected with the organisation of the practical training:

- supervises timeliness of preparation of development of orders on the practical training;
- develops regulations about the organisation of educational process of students directed on training in the university-partner;
- develops a technique of formation and updating of an academic load of the teachers working with students trained under the program of the international exchange;
- plans volumes of educational commissions to the faculties which are manage the practical training;
- makes updating (recalculation) of an academic load to faculties which teachers work with the students training under the program of the international exchange according to an authorised technique;
- carries out the control of passing of all kinds of the practical training (in view of passing by students of the practical training to the university-

- partner and at the foreign enterprises);
- regularly informs dean's offices and faculties about receiving managing materials by the university;
  - carries out the control of development methodical maintenance of the practical training;
  - studies experience of the organisation and realisation of the practical training at other universities, including in universities-partners and at the foreign enterprises;
  - prepares for the final information on the practical training for the report of university.

## **3 THE MANUAL FOR PASSING PRACTICAL TRAINING FOR STUDENTS**

### **3.1 The student's rights and duties on the different stages of practical training according to practical training base**

#### **3.1.1 Passing of the practical training at the home university**

The duties of the student passing the practical training in the university are determined by the normative documents [1, 2], the practical training program and routine rules of university.

In accordance with the clause [2] for the practical training passing students shall :

- receive before the beginning of the practical training from the supervisor consultation about registration of all the necessary documents;
- be in the practical training place in time;
- receive an individual task of the practical training and familiarise with the peculiarities of its fulfilment;
- carry out all the tasks provided for the practical training program and for the individual tasks;
- familiarise with the scientific-research work carrying out in the laboratory, the department, the university department in the chosen direction of the practical training;
- account of the done work;
- observe the routine rules of the university;
- make and defence the practical training report in time.

#### **3.1.2 Passing the practical training in the enterprise**

Students of the university passing the practical training in the enterprise shall know at the latest 10-15 days before the practical training carrying out:

- what enterprise they passing the practical training in;

- the practical training terms;
- scheduler of the practical training passing;
- content of the individual tasks and the peculiarities of its fulfilment;
- time and place of the meeting with the Supervisor of practical training in the first day of the practical training.

On the arrival in the enterprise students shall receive the permits and take the briefing of safety measures with the registration of all the necessary documentation.

During the period of the practical training students submit to the routine rules of the enterprise. During the whole practical training period students regularly and independently work on the fulfilment of the personal tasks received from the Supervisor of practical training.

At the end of the practical training students:

- complete the work on the individual tasks;
- deliver the technical documentation, literature and the rest of the enterprise property of temporary use;
- register the roundabout list and deliver it and the permit to the department of production-technical studying or the personnel department of the enterprise;
- register and defend the report of the practical training to the committee consisting of the representatives of the Home department and the enterprise – the practical training base.

### **3.1.3 Passing the practical training at the partner university**

Organisation of the educational process of students of university who are appointed for the studying, the thesis practical training and the thesis management to a partner university due to the program of the international exchange is determined by the appropriate Position.

Students who are appointed for the education to the partner university shall receive in the home department the essential documents. Among them are the curriculum of the 9th semester, the thesis practical training diary, and the other documents of the organisational and scientific-research providing of the educational process in accordance with the home department determination.

Before departure to the partner university students should meet the supervisor and determine the schedule and the interaction methods (if the supervisor is not a representative in the partner university). The supervisor tells the demands producing by the university to the practical training task. Student shall take them into account when concordance of the task in the partner university.

The students who are studying in the partner university on the fourth week of the training send to the home department the list of the studied educational disciplines for making the individual scheduler for the whole educational term.

Up to the 21 week of the current year (up to the 20-25 of January) students get to know by letter the dean's office and the home department about the bases, the terms of thesis practical training carrying out, the practical training tasks and the supervisors from the partner university. The letter shall be attested by the dean of the appropriate faculty of the partner university. On the basis of these data the home department prepares the order of the thesis practical training of students participating in the exchange.

The students studying in the partner university up to the 26th week of current year co-ordinate the thesis project topics with the home department. Tutorials on the labour protection and economic questions are realised by the project supervisor or by tutor from the home department.

The accounting of the disciplines of university's and student's free choice that are included in the curriculum of the 9th term is available for students appointed due to the international exchange. Accounting is realised on the basis of personal petition if student and the document given by a partner university that confirm the list of studied disciplines with indication of the amount of grades (ECTS-information). The accounting of practical training is made by the

supervisor from the home university according to the ECTS-information, where credits and grade mark are.

### **Forms of practical training**

Students that continue their studies in the partner university choose this university or the foreign company as bases for practical training.

The form of training depends of those accepted in the partner university. This can be individual or group work, etc.

In the University of Jyväskylä (Finland) on the Faculty of Information Technology the Development Project exists as the type of training in the university (chapter 2.2.4 «Partner university as a base for practical training»). This is the form of group work over the real tasks.

The method of team work is described in chapter 2.4 «Methods of practical training». Students form the groups of 4-5 students with the help of psychologists. Then the group selects the task from a set of proposed projects.

Each team selects a manager and a secretary. During the training this roles will be changed and each student will try himself as a manager.

The responsibilities of a team manager:

- to manage the project execution;
- to organise the work within the team;
- to take part in the work of governing group;
- to give own evaluation of work for every student.

The responsibilities of a team secretary:

- to keep the project documentation;
- to organise the project meetings at least every week;
- to organise the opponents meetings.

### **Project documentation**

Keeping the project documentation is very important in project development process. Documentation allows seeing the current state of the project, to define the problems. A secretary is responsible for documentation. He/she collects all the

input information, project plan, mailing with a supervisor and a customer, meeting reports.

Documentation is kept in electronic form. Each stage of project execution is reflected in documentation, that help a lot in writing the final report.

### **Communication**

Constant communication with the supervisors and the customer ensures the success of the training.

Communication with the customer is organised on interviews in the company for data collection in a specific domain and also via mail and e-mail. Regular communication with the supervisor is held usually via e-mail. Project meetings give the opportunity to students, supervisors and representatives from the company to meet altogether and to discuss the current problems of the project.

The duty of a team manager is to coordinates those meetings and other lines of communication in a most effective way. The duty of a secretary is to keep the minutes of meetings, to keep the e-mails, to analyse project documentation.

Students should organise project meetings weekly. On those meetings all team members are present as well as a supervisor and representatives from the customer. Every meeting should be planned in a perfect way, the current results should be presented by students, all current problems should be discussed, the plan on the next week of work should be composed.

Opponent meetings are held twice during the practical training. The most interesting thing is that the students from other groups act as opponents. All groups gather together and make the presentations of their projects. After every meeting secretary prepares the report, which will be included to the final project documentation.

At the end of practical training each group makes the final presentation of the project developed.

Students should remember that their work during all stages of training would be taken into account, not only the final result. The scheme for putting the grade mark is described in the chapter 2.5.1.

### **3.1.4 Passing the practical training in the foreign enterprise**

Students that pass their training in the foreign enterprise should:

- keep the rules and discipline of the company;
- execute the demand on information security;
- present the results of their work outside the company only with authorisation of a customer;
- keep the contract, that was signed before starting the training.

## **3.2 Correspondence between the student's thesis practical training and the thesis work**

### **3.2.1 Thesis practical training as initial stage of the student's work on the thesis**

The thesis practical training, in fact, is the most important preliminary phase of the thesis work implementation for future Specialists and Masters of Science.

The topic of thesis or attestation work greatly influences the Thesis practical training content. Specific character of the requirements to training of various degree students, "Specialist" and "Master of Science", have to be reflected in the individual tasks for the thesis practical training.

A student, during the Thesis practical training period, has to implement general practical training tasks as well as to collect and summarise materials which are directly concerned with his/her thesis topic. These materials shall be included as a consistent part of the thesis or attestation work. It concerns with a fact that a lot of materials for the thesis work implementation, comprising up-to-date manufacturing level, can be found by student only at the concrete enterprise. There he obtains necessary works experience as well.

The efficiency of the Thesis practical training as one of the forms of the educational activity depends on its contribution to the Specialists' (M. Sc.) training in the aggregate with the other educational activity forms. The production activity of students in the period shall satisfy the demands of the educational process. They

are conformity of the solving problems to the future professional activity of the Specialist (M. Sc.), gradual complication of tasks to be fulfilled as the size of receiving knowledge grows and fulfilment of the proposing production tasks within terms determined by the curriculum.

The aim of the thesis practical training (that determines the practical training educational loading) is to form in student in production conditions the professional skills on the basis of using of his/her theoretical knowledge in different situations that are peculiar to the future professional activity of the expert That's why the Thesis practical training as a form of educational training is made in such a way to provide in the best way the fulfilment of the real production tasks determined by the practical training program.

During the Thesis practical training a student ought to study the questions of the current state of the scientific researches, techniques, economics and organisation of the production, that have direct attitude to the topic of the thesis project (work) of specialist , thesis work of M. Sc. he/she should study the literature sources, find the patent materials, normative documentation and other initial data, be oriented in methods and directions of solving the problems of the thesis designing.

### **3.2.2 Correspondence between the thesis practical training and the thesis work**

It is obligatory that the topic of the thesis project (attestation work of (M. Sc.) matches the practical training task and both of them shall match the task of the thesis management.

The fulfilment of the Thesis practical training creates in the student complex conception of the developed problem and gives the material for the making of proceeding parts of the technical task analysis. It helps in choice of the analogue and the prototype of the technical task, calculation of the economic showings and the development of labour and environmental protection measures.

During the practical training passing students familiarise with the normative-technical materials that is obligatory to use within development of production, registration of the technical materials and documents.

During the Thesis practical training students could realise the experimental testing of the separate theoretical states, functional dependencies, the development of the program applications and necessary measures and testing. Also they could solve the testing tasks necessary to the enterprise – the practical training base and available for the ground of the technical decisions, that are taken in the thesis.

As usual in the occidental universities the practical training that is carried out during the M. Sc. training could aren't being concerned with the further thesis management. It isn't called "the thesis practical training". However, the task that is realised for the company could serve the basis for the thesis projects creation (if its theoretical level matches the demands that are making to the thesis work of the speciality). The company can pay for the part of the thesis work time if the company will use the results of the work in the future.

### **3.3 The features of thesis practical training of the M.Sc. students**

One of the main differences between M. Sc. and Specialist degrees lies in increasing the scientific level of M. Sc. thesis work [4]. So the M. Sc. thesis work has its form and content differences.

First of all more strict demands are made to the practical training topic. It has to correspond to the M. Sc. degree. It shall contain not only the theoretical appendix but also the problem statement. The thesis work shall approximate to the Ph.D. thesis. That is why the undergraduate's practical work during the practical training realisation shall correspond to the approbation of the traced theoretical researches.

The thesis supervisor of practical training has obligatory to be a professor or a leading research assistant.

Seminars carried out during the thesis practical training by the science supervisor of the thesis work are compulsory to the undergraduates. The higher level of the thesis work is the reason that it isn't enough for student only the consultations from the enterprise supervisor.

According to the new framework of the thesis management of undergraduates, during the thesis practical training period undergraduates are provided by the academic independence as at the rest stages of the thesis management [4].

### **3.4.1 Final control of the practical training results**

After finishing the practical training, students report about fulfilment of the program and individual task. The general report form of the student practical training is accordance of the paper report, certified with necessary signatures.

In general case the report shall contain information about the student fulfilment of all the parts of the practical training program, of individual task. It has to include the economic and labour protection parts, references and all kinds of applications.

### **3.4.1 Structure and content of the practical training reports for each kind of practical training**

The practical training reports according to the demands of the Home departments can be given as abstracts (the educational practical training), explanatory proceedings and sets of technical documentation (technological, designing etc.) and reports directly.

In general case the reports shall contain:

- *title-page;*
- *student's individual task;*
- *content;*
- *preface;*
- *main content;*

- *conclusion;*
- *references;*
- *appendixes.*

Content contains the names of all parts, subsections and items (if they have names) with indication of the page numbers. Those are the initial pages of the parts, subsections and items.

In introduction is indicated the practical training passing place, its features. The enterprise profile and its basic production are linking with the topic of the individual task etc.

The main content of the report (the basic parts) is in summarising the materials to the point of the problems examined during the practical training realisation. The materials of the individual task fulfilment also shall be given.

Conclusion shall briefly describe the basic results of the fulfilled work. It also shall contain proposals and recommendations to the further work perfection of the corresponding practical training base department, improvement of the forms and methods of the practical training arrangement.

In the list of references the used literature on the questions connecting to the practical training program realising is given.

The specific content of the report is mostly determined by the content of the work program of the given practical training type. The list of the problems solving by each of the practical training kind is given at the subsection 2.3 of the present work.

### **3.4.2 The basic demands to the report writing**

The practical training report is register according to the demands of Intergovernmental standards. The practical training report shall be typewritten or hand-written, be printed on a white standard sheet of paper ? 4 (210?297mm).

The general demands to the report are:

- brevity and clearness of the formulations excluding ambiguity of their interpretation;

- concrete work results statement;
- scientific validity of conclusions, recommendations, appendixes

Design of the graphical part of the report drawings of details, drawings of assembly units, demonstration posters - diagrams, diagrams, tables, graphic algorithms; the circuits of various kinds and types, specifications, sheets etc is making due to the domestic demands and the international standards.

### **3.4.3 Features of reports for students that take the practical training in the partner university or in the foreign enterprise**

Students that choose the partner university or the foreign company as a base for practical training fill in two copies of the training diary – on the native language and in English. The report can be written in English.

Contents of the report can differ from the accepted in the home university, but all the required information should be present in it. Sometimes students even have not rights to put their reports openly, in such a case company representative should write in the diary that the report is the property of the company.

The project report can be complex and include outcome report, mailing with the customer and supervisors, project meetings.

The example of complex manual. as it is accepted in the Faculty of Information Technology, University of Jyväskylä.

Contents of the project manual:

Project plan. Is prepared after the 1st project month. About 10-15 pages length. Contains:

*Abstract*

*1. Introduction*

*2. Backgrounds and goals of the project*

*3. Glossary of terms*

*4. Implementation of the application*

*5. Division of responsibilities among the students*

6. *Timetable*

7. *Testing*

**Project manual.** Is prepared before the end of the project. About 25-35 pages length. Contains:

*Abstract*

1. *Introduction*

2. *Backgrounds and goals of the project*

3. *Terminology*

4. *Theoretical part*

5. *Implementation of the application (model, user interface, software tools and equipment used, components of the software, functions, etc.)*

6. *Testing*

7. *Division of responsibilities*

8. *Timetable (with delays from the planned timetable and explanations)*

9. *The progress of the project implementation*

10. *Further development of the application*

11. *Instruction for the maintainer*

12. *Personal experiences from the project (personal feeling of every student)*

13. *Conclusions*

1.4 *References*

**Project meeting and opponent meeting reports.** About 15 project meeting and 2 opponent meetings.

Project meeting report contains:

1. *Time, place, and people present*

2. *Schedule*

3. *Detailed questions discussed*

4. *Current state of the project*

5. *Further work*

Opponents meeting report contains:

1. *Time, place, and people present*
2. *Brief description of what was presented by your group.*
3. *Questions of other groups and answers*
4. *Comments of supervisors and other groups*

**Working time lists of project members.** Each project member writes his time list of work within the project. The time list contains:

1. *Date*
2. *Time (number of hours)*
3. *The exact description of the task*

The average number of hours performed by each student during the project is about 300h.

**E-mails.** E-mails from the supervisor(s) with observations of the current application, weak places found, comments and advises. Also other useful e-mails between project members can be included.

**Project inputs.** Documents and other recourses that were given by the customer.

**Project outcomes.** HTML-pages, system interface, program codes in program language used, Help for the system, etc.

**CD .** Contains all this and the working application of course.

### **3.4.4 Summation of the practical training passing**

The final stage of the practical training summation in the current year can be a complex of the next measures.

Audition of the practical training carrying out results is hold in the department meetings, faculty and university councils and scientific-research conferences.

It is necessary to listen to the Supervisor of practical training, group leaders and separate students during. It is also necessary to examine and put forward the best student works for reports on the student conferences

The university councils are able to examine not only the totals of the practical training carrying out in the elapsed year and problems of the future practical training arrangement. They also can view separate important problems of the practical training holding as work of the methodical commissions of the problems of scientific-methodical practical training advice; educational and methodical practical training management of the Home departments, labour protection and economic departments. Besides, they discuss the participation of the technical university departments in the student practical training management

The examination on the university council the practical training problems is illustrated by the posters, tables and diagrams reflecting, quantity of the students taking place practical training in high school, at the industrial and research enterprises in city, where the high school, on departure is located. The also show university provision with the practical training bases, geographical location of the practical training bases etc. The council takes decision directed on improvement and further perfection of the student practical training, with the indication of the concrete executors and terms of the planned measures fulfilment.

The scientific - methodical practical training conferences of faculties or of a university give a possibility to summarise the practical training and to design ways of its perfection. Besides, they promote the students and teachers acquaintance with last achievements of science and engineering, expansion of their technical outlook, experience spreading of the practical training passing and management. The employees of the enterprises, on which students passed the practical training, shall be invited to the conferences. The students' and supervisors' appearance at conferences shall disclose the most important and interesting aspects of the practical training, both positive and negative, the ways of its improvement and perfection.

It is expedient to organise on the conferences demonstration of the best student works, the samples of the scientific-methodical and accompanying documentation. It's important to expose stands with responses of the enterprises about the student practical training

The reviews - competitions promote student activation in the practical training. They are directed on popularisation of the best works of the separate students and revelation of the best groups. The training practical training works (reports, diaries etc.) can participate in reviews – competitions on a level with other kinds of student works such as course and degree projects etc. The reviews - competitions organisers are the methodical commissions of the faculties. The reviews - competitions are hold according to the developed Statute

High profile for perfection and popularisation of the student practical training experience belongs the university publications Coverage of the positive and negative aspects of the practical training realisation is of great importance. It is expedient to publish the student and teacher articles on the subject of experience exchange of the practical training organisation, realisation and management, the results of reviews – competitions of the best practical training student work

## THE CONCLUSION

The present set of manuals for management of students' practical placements sets the general principles of practical training. The basic normative documents on the practical training are analysed. The problems of obligations and interaction between structural subdivisions of a higher educational institution and an enterprise, both home and foreign are given.

The efficiency of practical training first of all is determined by:

- distinct organisation of works during all the practical training periods (including preparatory);
- the responsible attitude to work of the participants of the process (students and supervisors) to their duties;
- a scientific-research level of practical training bases;
- variety of forms and methods of the practical training carrying out depending on students' educational degree and speciality;
- presence of clear logical correlation of specialist's theoretical education and his/her practical training;
- systematic, single-minded, individual and independent work of the students, combined with a group work.

The introduction of new forms and methods of the practical training passing makes the practical training to be much more corresponding to the up-to-date requirements of the labour market and of modern level of experts. The choice of a partner university or foreign enterprise as a practical training base gives Ukrainian students a possibility to apply their knowledge in solving up-to-date practical problems of a global level.

The developed framework of the practical training management is one more forward step in the direction of integration of the Ukrainian higher educational system to the European one.

It is the fact that internationalisation of education is a natural event of the present society development rate. Besides it is the guiding line of the current

educational policy in the countries of the European Union in the beginning of the XXI century and it determines new set of demands to the technical oriented specialists' training.

From this point of view, logical clear unification of the student theoretical and practical training is very important problem both in the Ukrainian and foreign universities. Its solution provides a possibility of training modern specialists possessing such characteristics as flexibility, prompt response, knowledge of the modern production, ability of adaptation to changes and to studying.

In conclusion it's necessary to mention that by development of the present set were used the methodical materials, that were developed by the scientific-methodical center of higher education in Ukraine on the different topics: on increase of quality of preparation of the experts on the basis of educational, scientific, production integration, professional and practical training preparation of students of engineering specialities. The manual of carrying out various kinds of practical training developed by professor-teaching staff of the Kharkov National University of Radioelectronics, and information and materials given by the lecturers of University of Jyväskylä, Finland, were used.

The present set of manuals determines the clear framework of the practical training management. It takes into account the internalisation and is of interest for students, teachers and departments of the Kharkov National University of Radioelectronics and for students who are studying in the partner universities – the University of Jyväskylä (Finland) and the Vrije University (Netherlands).



# **Appendix A – Practical Training Diary**







**Appendix B - REGISTRATION FORM**  
**REGISTRATION TO CUM LAUDE STUDENT**  
**PROJECTS IN COMPUTER SCIENCE**  
**IN ACADEMIC YEAR 2001-2002**

Name: \_\_\_\_\_ Personal ID: \_\_\_\_\_

Address: \_\_\_\_\_

Email: \_\_\_\_\_

Phone: \_\_\_\_\_

I am registering on  autumn term 2001  autumn term 2001  either

Which is your (planned) major subject in your studies in computer science.

Major subject \_\_\_\_\_

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Mobile computing | <input type="checkbox"/> Software engineering | <input type="checkbox"/> Teacher education |
| <input type="checkbox"/> Embedded systems | <input type="checkbox"/> Scientific computing | <input type="checkbox"/> Telecommunication |

In which stage are your studies in computer science? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

In which stage are your studies in mathematics? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

What are your language skills? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Do you have a job when you are participating in a student project? Where, and how many hours per week?

\_\_\_\_\_  
\_\_\_\_\_

What are your hobbies? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

What is your wish for the topic of your student project? \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Specify persons that you wish to establish a work group with: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

In the boxes of the following questions you can express, if you are experienced (write E) or beginner (B) or if you want to learn (L) the techniques or tool is under consideration in student project.

Which topics are you familiar with from a job or personal interests? Please, identify them:

- |   |   |
|---|---|
| <input type="checkbox"/> Object oriented progr.:_____   | <input type="checkbox"/> Modelling methods:_____    |
| <input type="checkbox"/> Telecommunication:_____        | <input type="checkbox"/> Hardware level:_____       |
| <input type="checkbox"/> Databases:_____                | <input type="checkbox"/> Structured documents:_____ |
| <input type="checkbox"/> Handheld computers.:_____      | <input type="checkbox"/> Embedded systems:_____     |
| <input type="checkbox"/> Security:_____                 | <input type="checkbox"/> Crypting methods:_____     |
| <input type="checkbox"/> Maintenance of server SW:_____ | <input type="checkbox"/> WWW-programming:_____      |
| <input type="checkbox"/> Distributed systems:_____      | <input type="checkbox"/> Others:_____               |

Which operating systems have you used?

- Linux  Unix  DOS  Win 95/98  Win NT/2000  Others:  
\_\_\_\_\_

Which programming languages and what IDEs are you familiar with?

- C  Java  Delphi  Visual C++  PHP  TCL/Tk  Perl  Python  
 C++  Pascal  Fortran  Visual Basic  JSP  Others:\_\_\_\_\_

What software are you familiar with ? Please, identify them:

- |   |  |
|---|--|
| <input type="checkbox"/> Editors:_____                  | <input type="checkbox"/> Database applications:_____ |
| <input type="checkbox"/> Word processors:_____          | <input type="checkbox"/> Mathematical programs:_____ |
| <input type="checkbox"/> Spreadsheet applications:_____ | <input type="checkbox"/> Graphical programs:_____    |
| <input type="checkbox"/> Multimedia:_____               | <input type="checkbox"/> Internet applications:_____ |
| <input type="checkbox"/> CAD:_____                      | <input type="checkbox"/> Others:_____                |

Please, return this form by 7<sup>th</sup> of September 2001.

# Appendix C - Project Agreement

## 1 Contracting Parties

This project agreement (hereinafter the Agreement) is a document between *Euro-Huus Oy* (hereinafter the Commissioning Party), *the Department of Mathematical Information Technology* at the University of Jyväskylä (hereinafter the Department) and *the Nerd student project group* (hereinafter the Group).

## 2 Subject of Agreement

This Agreement shall be applied in the student software project called Nerd (hereinafter the Project).

The Project will develop the software called CADLEGO (hereinafter the Software) to the Windows NT environment by using Visual C++ and Open GL as the software development tools. The software can be used to design prefabricated building units and to create instructions for the element assembly.

The Project has begun *September 15<sup>th</sup> 1998* and it will be finished by the end of December 1998. The Project consists of the following activities:

- getting acquainted with the subject and the present system,
- drawing up the project plan,
- implementation and testing of the Software,
- user manual and documentation for the Software.

The Project and the Software will be more thoroughly described in the project plan which will be drawn up during the first four weeks of the Project. If the project plan is already drawn up, this paragraph can also be formulated as A

*more thorough description of the Project is given in the project plan (see Appendix 1).*

### 3 Background

*The Commissioning Party has a software called CADHUUS for planning the properties and the structures of the prefabricated building units (CADELEM) as well planning and giving instructions for the erection of the units (CADLEGO).*

*The present software is programmed with the Fortran 77 programming language and the VMS Workstation graphics library and it is running in the Open VMS Motif environment. A new version of the CADHUUS software is developed by the Commissioning Party by using the Visual C++ programming language and the Open GL graphics library. The Commissioning Party has already finished a new version of the CADELEM part.*

### 4 Responsibilities of the Parties

#### 4.1 Commissioning Party

The Commissioning Party shall define with the Group more thoroughly the details related to the project plan and the subject as a whole. The Commissioning Party will also provide tutoring and training related to the subject so that the Group can reach the goals set.

The Commissioning Party shall make the payment specified in the paragraph 6. The Commissioning Party shall provide the licenses of the necessary software development tools as specified in Paragraph 5.7 excluding the full licenses available from the Department. *In this paragraph should be identified the software development tools (even by the license numbers) provided*

*by the Commissioning Party. In this case the general formulation in the beginning of paragraph is not needed.*

From the Commissioning Party the tutoring and the supervision related to the subject and the software development tools will be given by *Harri Hakkerila*.

#### 4.2 Department

The Department shall provide to the Group a corner of lockable room. The Department shall also provide two PCs containing the necessary operating systems and software excluding the software development tools which will be provided by the Commissioning Party. *In this paragraph the PCs, the devices and the software provided by the Department can be identified.* The Department shall also provide necessary material and accessories for the Group as well as shall pay the travelling expenses related to trips between the Department and the office of the Commissioning Party.

The Department shall also provide tutoring to the Group so that the Group can reach the goals set. The progress of the Project is directed by *Lauri Lukkainen* and the programming of the software is guided by *Arto Apulainen*.

#### 4.3 Group

The Group shall carry out the Project according to the project plan as well as the changes and specifications made to it later on.

The Group consists of the following information technology students from The Department:

- Tiina Bittnas,
- Mauri Nettiila and
- Veikko Olioinen.

The work load of the Project for each of the Group members will be at least 200 hours.

## 5 Rights of the Parties

The division of the rights between the Commissioning Party, the Department and the members of the Group depends on the price category chosen by the Commissioning Party (see Paragraphs 5.6 and 6).

### 5.1 Commissioning Party

The Commissioning party shall receive all the intellectual property rights to the results which the Group shall deliver to the Commissioning Party. The results in question include the software, the source codes, the reports, the material and the other documents described in the project plan.

### 5.2 Department

The Department shall receive from the Commissioning Party the payment described in Paragraph 6 when the Project is finished.

The Department has right to use the Project as a reference. The Department has right to use the results of the Project for teaching and demonstration purposes excluding the results and the material which the Commissioning Party considers as confidential information. The Department has right to place the project file (containing the educational results of the project) in the premises of the Department to be accessed publicly. The Commissioning Party though is able to check and define which parts of the material can be accessed freely in the Department as described in Paragraphs 5.2 and 10.

### 5.3 Group

The members of the Group have right to use the project as a reference. The members of the Group have right to use the results of the Project for demonstration purposes excluding the results and the material which the Commissioning Party considers as confidential information.

The members of the Group shall retain the copyrights of the project file i.e. the educational results of the project. The Commissioning Party though is able to define which parts of the material shall remain on the possession of the Group members as described in Paragraph 10.

### 5.4 Intellectual Property Rights

The intellectual property rights i.e. inventions, patents, literary as well as artistic works and other intellectual properties shall be transferred to the Commissioning Party excluding the exceptions mentioned in Paragraphs 5.1, 5.2, 5.3 and 5.6.

### 5.5 Rights of Documents and Material

The Commissioning Party shall receive the intellectual property rights to the documents and the material created by the Group as agreed in Paragraphs 5.1, 5.2, 5.3 and 5.6.

The PCs, devices and the software supplied by the parties are owned by the supplier. *An exception to this practice is the possible EDU-license provided by the Commissioning Party (see Paragraph 5.7), because the EDU-license can only be owned by a student.*

### 5.6 Rights in Price Categories

There are two price categories available in the student software projects and the prices are described in Paragraph 6. These categories differ from each other by the different practices related to the division of the rights.

In the lower price category, the source codes, executable programs and the documents are freely accessed (i.e. public) at least for the components of general use. In addition to the Commissioning Party also the Group and the University of Jyväskylä shall have the right to use and own these general components. This means that the Group as well as the staff and the students of the University of Jyväskylä can freely access the Software by running it as well as using the components of the source code as a part of another software. The Software shall not be used as a whole separately or as a part of another software. The free access of the software and the material also means among other things that they can be used in publications as well as they can be made accessible via Internet.

In the lower price category confidential business information can be left out from the documents, the source code and the executable program placed in the Department. For example the parameter values of a real product can be considered as confidential information.

In the higher price category all the source codes and the executable programs are confidential information and they shall not be included into the project document which can be accessed freely from the Department.

### 5.7 Surrendering the Rights

The rights mentioned in Paragraphs 5.1 – 5.6 shall be transferred to the Commissioning Party, when the following terms are fulfilled:

- The Commissioning Party has paid the charges mentioned in the Paragraph 6.

- If the Group is using in the programming of the Software the software development tools manufactured by Inprise,
  - the Commissioning Party shall supply in the beginning of the Project at least one license of each of the software development tools by Inprise to the Group or
    - the Commissioning Party shall acquire by the end of the Project at least one license of each of the software development tools. The license should be a so called full license acquired to the Commissioning Party or a less expensive so called EDU-license which shall remain to one of the Group members.
- If the Group is using a software development tool manufactured by some other company, the Commissioning Party should supply adequate number of licenses to the Group. These licenses shall return to the Commissioning Party when the Project is finished.
- If the Department already has some unused full licenses of the needed software development tools (i.e. not educational licenses), the Commissioning Party doesn't have to provide the licenses for the Group.

*If the terms above are not fulfilled within two months after the Project is finished, all the rights to the Software, and the material created by the Group shall remain to the Group.*

## 6 Pricing and Invoicing

There are two price categories in the student software projects for the commissioning parties outside the University of Jyväskylä. They differ from each other by the division of rights as described in Paragraph 5.6.

In the lower price category the Department invoices the Commissioning Party 4000 Finnish marks (+VAT, i.e. value added tax) per the Group member. In the higher price category the Department invoices the Commissioning Party 8000 Finnish marks (+VAT) per Group member.

So in the case of the Group of three students the Commissioning Party shall be charged 12000 Finnish marks (+VAT) in the lower price category and 24000 Finnish marks (+VAT) in the higher price category. The Commissioning Party should decide the price category by the end of the Project. If the Project is not carried out in the way which the parties have agreed, the price can be reduced by the decision of the management group of the project.

The Commissioning Party shall pay the invoice within one month after receiving the invoice sent by the Department.

## 7 Changes to the Agreement

Excluding the project plan, any changes or additions to the agreement shall be agreed in written and signed agreement between the parties.

## 8 Reporting and Project Management

The Group shall report the progress of the Project to the management group of the Project according to the project plan.

The management group of the Project consists of the following persons:

- Ilmo Isotalo      Product Manager      Euro-Huus Oy
- Harri Hakkerila      Software Engineer      Euro-Huus Oy
- Lauri Lukainen      Lecturer      University of Jyväskylä
- Arto Apulainen      Assistant      University of Jyväskylä

- Tiina Bittnas Science Student Nerd Group

Changes to the project plan can be made by unanimous decision, if the changes does not have affect on the Agreement or on the other appendices. The changes must be reported as such to the record or its appendix which can also be a new version of the project plan.

## 9 Guarantee and Liability

Because the project is a student work, neither the Group, the Department nor the University of Jyväskylä shall give any guarantee to the results of the Project. The Group, the Department or the University of Jyväskylä shall not be liable for fixing any errors in the Software or provide maintenance to it. Instead the errors found during the project shall be fixed if possible.

The members of the Group can continue developing the software as employees of the Commissioning Party or do it as a form of another course. Each member of the Group shall agree separately on the possible continuation with the Commissioning Party and in the case of the studies also with the Department.

The parties are not liable to each other for indirect damage. In teh case of immediate damages the liability is limited in all cases to the charge to be paid to the Department by the Commissioning Party.

The parties of the Agreement shall be independently responsible for the possible compensation of the damages to the third parties.

## 10 Confidentiality and Non Disclosure

A separate undertaking has been made for the confidentiality and non disclosure of the Project. The confidential documents shall be identified by the end of the Project.

In the case of the both price categories defined in the paragraph 5.6, the confidentiality of the documents, the source code and the software created by the Group shall be examined by the Commissioning Party. This means that the Commissioning Party shall define and remove the confidential information from the project material (i.e. project file) to remain freely accessible in the Department. The documents and the material provided by the Commissioning Party shall not be included without permission into the material to remain accessible freely in the Department.

*In the higher price category it might be reasonable to add here "All the source codes and the executable programs are considered as confidential and they shall not be included into the documents to remain into the possession of the Department or the Group".*

## 11 Transferring the Agreement

The contract may not be transferred to a third party without a written permission of the other parties of the Agreement.

## 12 Term and Termination

This agreement shall be terminated when the Project described in the project plan is considered to be finished by the management group of the Project though not later than *January 31<sup>st</sup> 1999*.

The agreement can also be cancelled earlier by a written agreement of the parties if the continuation of the Project is shown to be unreasonable. Should the Agreement be cancelled, no compensation for cancellation shall be done by any of the parties.

## 13 Appendices and Their Priorities

*The Agreement contains the following appendix:*

**Appendix 1.** *The project plan.*

*If the Agreement and the appendices contain some conflicting information, the Agreement shall be applied first and after it the appendices in the descending order.*

14 Approval of Agreement

This Agreement has been executed as of the date when all parties have signed it. Five identical copies of the Agreement has been made, one for each party.

Jyväskylä October 15<sup>th</sup> 1998

Euro-Huus Oy

Ilmo Isotalo

Product Manager

Jyväskylä October 15<sup>th</sup> 1998

University of Jyväskylä

Department of Mathematical  
Information Technology

Ville Varapopomo

Professor

Head of the Department

Jyväskylä October 15<sup>th</sup> 1998

Nerd Group

Tiina Bittnas

Science Student

Mauri Nettiila

Science Student

Veikko Olionen

Science Student

# Non Disclosure Undertaking

## 1 Subject of Undertaking

The software project called *Nerd* (hereinafter the Project) will develop the software called CADLEGO to the Windows NT environment by using Visual C++ and Open GL as the software development tools. The CADLEGO software can be used to design prefabricated building units and to create instructions for the element assembly.

This is a undertaking for the Project while the scope of the work is defined in the separate project agreement. The contracting parties of this undertaking are Euro-Huus Oy (hereinafter the Commissioning Party), Arto Apulainen and Lauri Lukiainen (hereinafter the Supervisors) from the Univesrity of Jyväskylä and the information technology students Tiina Biitnas, Mauri Nettila and Veikko Olioinen (hereinafter the Students).

## 2 Undertaking for Non Disclosure and not to Compete

The Supervisors and the Students will receive during the Project from the Commissioning Party technical, commercial and financial information of businesses, facilities, products, techniques and processes (hereinafter Information). The Supervisors and the Students undertake to treat as secret and to keep all Information received in whatever form as strictly confidential. The Supervisors and the Students will not disclose Information nor copy it nor store it (in electronic form or otherwise) to third parties without the prior written permission of the Commissioning Party.

The Supervisors and the Students will also undertake not to use the Information received during the Project for any purpose other than for the

purpose of carrying out the Project without the prior written permission of the Commissioning Party.

Further, the Supervisors and the Students will undertake to return all Information in their possession in whatever form to the Commissioning Party upon the completion of the Project without retaining any copies thereof.

### 3 Term and Termination

This Non Disclosure Undertaking shall be valid until the completion of the project and three (3) years thereafter.

Six identical copies of the Undertaking have been made, one for each contracting party. This Undertaking has been executed as of the date when all the parties have signed it.

Jyväskylä October 10<sup>th</sup> 1998  
1998

Jyväskylä October 15<sup>th</sup>

Lauri Lukainen  
Lecturer  
University of Jyväskylä

Arto Apulainen  
Assistant  
University of Jyväskylä

Tiina Bittnas  
Science Student

Mauri Nettiila  
Science Student

Veikko Olionen  
Science Student