



*Biotechnology and Public Health Transnational Network – HealthBioTech*  
BG/04/B/F/T-166032



**Leonardo da Vinci Transnational Network Project**

**“Biotechnology and Public Health Transnational Network (HealthBiotech)”**

**2004-BG/04/B/F/TN-166032**

***State of art of training  
in Biotechnology and Public Health in Bulgaria***

*Training in Biotechnology and Public Health in **Bulgaria** 0*

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## **I. Development of biotechnology in Bulgaria**

The commencement of Biotechnological education in Bulgaria emerged in the early 1980's. when traditional industries - food, beverage and pharmaceutical - were strongly influenced by the ideas of the “new Biotechnology”. An ambitious National program for development of this kind of education has been created and approved in 1983. An year later, in 1984, a leading unit for its government was created - the Inter-University Council of Biotechnology, consisting of representatives from Bulgarian Universities, research and economic organizations in the field of Biotechnology and aiming adaptation, upgrading and coordination of biotechnological education in respect to world trends. The Inter-University Council was also a consulting body of Ministry of Education and in this way it was playing the role of a major Coordinator of higher education in Biotechnology which started in 1984/85 academic year.

An original schedule for organization of this education was accepted. In order to receive a broad base (“common language for communication”) during the first three years, i.e. 1<sup>st</sup> and 2<sup>nd</sup> course, the students learned Biotechnology according to a common program. The educational process was performed at the Sofia University - the oldest Bulgarian higher school, where at that time a new Center of Biotechnology was established. Having in mind the interdisciplinary core of modern Biotechnology, after the successful finishing of second year of their education, the students were distributed into three different specialties towards four different Universities, as follows:

- specialty “Biotechnological processes”, dealing with the molecular biological aspects - at the Sofia University, respectively at the Faculty of Biology and partly in the Faculty of Chemistry;
- specialty “Biotechnology” giving additional knowledge for technological side of the problem - both at the University of Chemical Technology and Metallurgy - Sofia and Higher Institute of Food and Flavor Industry - Plovdiv;
- specialty “Biotechniques”- for engineering aspects of Biotechnology- at the Technical University - Sofia..

In fact, the Biotechnological network created in Bulgaria was consisting of above mentioned four Universities and Inter-University Council, coordinating their activities and curricula in Biotechnology. This combined scheme was operating until 1992. Several hundred students were taught through this interdisciplinary approach. There were students coming from East Germany, Czechoslovakia and other East-European countries.



This powerful start in the development of biotechnological education in Bulgaria assured serious base for continuation and recent advance of this education after acceptance of the new law for University Autonomy and Degree System.

## **II. Degree system for medical and biotechnological education in Bulgaria**

According to Bulgarian State Regulations, Decree 308/30. 07.1997, adoption of higher degrees in specialty “Biotechnology” - “Bachelor” and “Master” is awarded in the Higher Schools, harmonized with specific educational requirements. The forms of education are regular one and correspondence courses and the enrollment of the students is as follows:

- for the educational degree “Bachelor” a written concourse exams in Biology and Chemistry must be gained, and 6 points evaluation system is used (6 points - max).
- for the educational degree “Master”- under the conditions and rules determined by the Universities in accordance to National practice.

The study period for the regular form of education in Biotechnology is as follows:

- the duration of educational degree “Bachelor” is 4 academic years, respectively 8 terms with minimum horarium 3000 academic hours.
- the duration of educational degree “Master” is not less than 1 academic year, after previous awarding of Bachelor degree in the same specialty. The program consists 6 obligatory courses and 2 optional ones with practical which form minimum horarium of 700 academic hours.

The bridge between Biotechnology and other fields of education has been built by introduction of a special paragraph in the law: higher schools can perform education for acquisition of educational degree in Biotechnology for graduates, awarded Bachelor and Master degrees in other specialties. In this case the process of education is envisaged to be performed in accordance with above mentioned items regarding these degrees. The enrollment for the students are determined in accordance with the regulations of each Higher School.

The educational process in the specialty “Biotechnology” for acquisition Bachelor degree includes obligatory, optional and facultative courses.

The Obligatory courses and their minimal horarium are given in the table below.

№.	Courses	Total horarium (hours)
1	Biochemistry	105
2	Microbiology	90
3	Molecular Biology	90
4	Genetics	60
5	Enzymology	105
6	Separation and Analysis of Bioproducts	75
7	Inorganic Chemistry	75
8	Analytical Chemistry	75
9	Organic Chemistry	120
10	Physicochemistry with Colloidal Chemistry	105
11	Mathematics	105
12	Physics	75
13	Biotechnology Engineering	90
14	Information Systems and Technologies	75
15	Biotechnological Methods in Ecology	75
<b>TOTAL:</b>		<b>1320</b>

The involvement of additional education courses is also optional. The horarium of the facultative courses should not exceed 10 % from the total teaching /training hours.

When the education process is in the form of correspondence courses, the whole horarium must be not less than 35 % from the regular one and the education period is increased with 1 year.

The teaching staff performing lectures along the above mentioned educational process has to be habilitated with optional participation of Ph. D. tutors up to 20 % for Bachelor and 30 % for Master degree tuition.

The main requirements for Higher schools, performing the educational process is that 70 % from the teaching staff has to be on a permanent position.

The graduation of the educational degree “Bachelor” is completed with a final exam - State exam or Diploma Thesis work. For “Master” degree only preparation of Diploma Thesis work is required for graduation. The execution of the State exam or Diploma Thesis public defense is realized under supervision of State Examination

Commission which consists of at least 3 habilitated professors in the corresponding scientific field. The Commission is attended also by habilitated professors from other organizations and users. The members of the Commission are determined by Rector's Approval.

The educational process is finalized by awarding students special document - Diploma for higher degree education with professional qualification "Biotechnologist" or "Master of Science - biotechnologist".

The full-time course in medicine for the qualification degree of "Doctor in Medicine" lasts 6 years of which 10 semesters are dedicated to the teaching process and from 1 year to 13 months to the clinical practice before graduation. It must be pointed out that semesters have different duration according to the Universities study plan: the University of Pleven a semester lasts 14 weeks, in Varna 16 weeks, in Sofia 15 weeks.

Sport is a mandatory course of the first two or three semesters in almost all the faculties investigated; in Pleven sports is an optional course.

Internship has a different duration according to the University: in Pleven the pre-graduation clinical practice lasts 1 year, 13 months in Varna, 10 months in Stara Zagora, in Sofia the pre-graduation internship is covered in 170 days and in 329 days in Plovdiv (*including an Elective Clerkship of 21 days*).

The State examinations for all Medical Universities/Faculties in Bulgaria cover the following subjects: Internal diseases, Surgery, Pediatric diseases, Obstetrics and gynecology, Hygiene and ecology and confer the "Master" degree and the qualification of "Doctor in Medicine" with the rights for general medical practice.

The structure of the medical curricula investigated follow a general pattern where a first stage of 2 years is dedicated mostly to the study of pre-clinical training in order to introduce basic sciences teachings. Nevertheless there are distinctive schemes regarding the distribution/ organization of the study plan that varies according to the University. In fact, the didactic offer of the Higher Institute of Medicine of Varna specifies a propedeutic period of one year and more precisely the 3<sup>rd</sup> year where a number of topics are strongly related to the social aspects of medicine such as Social Medicine, Medical Ethics, Hygiene and Ecology. The curricula of Sofia, Varna and Pleven during the 2<sup>nd</sup> and 3<sup>rd</sup> semester present in the pre-clinical and clinical training the specific topic of Social Medicine, that in Plovdiv is taught during the 4<sup>th</sup> and 5<sup>th</sup> semester.

A period of clinical training follows for 3 years with the study of mandatory courses related to diagnostics and therapies. In fact, the last three years of medical studies at the Medical University of Sofia encompass the modular education in clinical disciplines, with the key objective of improving students' practical skills while giving

consistent opportunities to attend for longer periods clinical departments and thus to monitor patients up to the treatment response.

In the Medical School of Sofia subjects such as Hygiene, Ecology and Occupational diseases are studied in the cycle of training – 4<sup>th</sup> year, while in Varna Hygiene and Ecology are studied separately respectively in the 4<sup>th</sup> and 5<sup>th</sup> semester and in the 8<sup>th</sup> semester in Stara Zagora.

Tropical Diseases is a mandatory course and it is taught mainly in the 5<sup>th</sup> year at the Universities of Sofia, Varna, Stara Zagora and Pleven.

Disaster Medicine is also a mandatory course in Stara Zagora and it is taught in the 8<sup>th</sup> semester and Medicine in disaster situations is mandatory in Sofia in the 5<sup>th</sup> semester.

The third and final stage, of medical studies, implemented in the 6<sup>th</sup> year, regards the pre-graduation internship that is carried out in university hospitals and aims at applying knowledge at the patient bedside and in outpatient office.

There are clinical clerkships in Surgery, Internal Medicine, Gynaecology / Obstetrics and Paediatrics, Hygiene, Epidemiology and Infectious Diseases.

Generally practice accounts for a higher number of hours both in Basic and Clinical Science Courses.

The methodology of teaching consists of lectures, laboratory practice and seminars, tutorials that are mainly provided to small groups, bedside teaching and outpatient practice in selected structures.

In Sofia the total duration of hospital practice after the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> year is 45 days (360 hours), while during the 4<sup>th</sup> and 5<sup>th</sup> year the hospital practice is in the 675 hours equal to 450 days and in the Pre-graduate probation 6<sup>th</sup> year the total hours is 1240 equal 155 days (*TOT. 1915 hours*)

The Pleven Higher Institute of Medicine curriculum includes 16 weeks of hospital practice in the first 4 years of study and a 47-week *State* practice in Hospital before graduation.

In the faculty of Stara Zagora the hospital training is implemented after the 3<sup>rd</sup> and 4<sup>th</sup> year and lasts 300 hours while the duration of the internship before graduation is 45 weeks equal to 315 days. In Plovdiv the clinical clerkship lasts 329 days and in Varna a 13-month clinical practice before graduation

The evaluation consists of assessments and progress tests that are obligatory. Examinations at the end of each course can be oral, written tests, computer adapted tests or MCQ. Other forms of evaluation include short oral examination, analysis of preparations and examination of patient.





All the courses are held in Bulgarian though foreign languages, mainly English, are taught as mandatory courses in first or the first two years. Latin language is a mandatory course mainly related to the study of the medical terminology.

## List of higher education institutions in the field of biotechnology

### The Sofia University “St. Kliment Ohridski”

The most prestigious Bulgarian University “St. Kliment Ohridski” is the first higher school established in the country. Its creation continued the centuries-old cultural and educational tradition, born at the beginning of 9<sup>th</sup> century with the foundation of Slavonic alphabet and first Bulgarian schools of literature, among which is that of St. Kliment Ohridski - the patron of the Sofia University.

The Sofia University was founded in 1888 and it consists of 16 faculties, comprising a total of 72 specialties and is responsible for the education of more than 29 000 students annually, distributed in humanities, natural and social sciences.

The students at the Sofia University are trained according to three degree system: Bachelor, Master and Doctor. As an additional training activity in the field of continuous education exists post-graduate specialization. The University’s permanent academic staff comprises 1200 persons among which 11 Academicians and Corresponding members of Bulgarian Academy of Sciences, 131 professors 1<sup>st</sup> Class, 375 Associate professors, 750 Assistant professors.

The University’s faculties are as follows:

- Faculty of Theology
- Faculty of Law
- Faculty of History
- Faculty of Philosophy
- Faculty of Slavic Studies
- Faculty Classical and Modern Philology
- Faculty of Mathematics and Informatics
- Faculty of Physics
- Faculty of Chemistry
- Faculty of Geology and Geography
- Faculty of Biology
- Faculty of Economics and Business Administration
- Faculty of Education
- Faculty of Pre-school and Primary School Education
- Faculty of Journalism and Mass Communication, Social Sciences, European Studies.

The Sofia University has made a specific contribution to the form of effective scientific integration by the problem oriented research laboratories of Biotechnology, laser technology, physics of semiconductors, Chemistry of pure substances. Research centers, small enterprises and program oriented teams are established, assuring rapid and flexible orientation towards the latest strategic direction of scientific and technical progress: electronization, new raw and prime materials, laser technology, Biotechnology, communication technology. In this way University science and education are geared to the real life requirements of the economy and social development.

The faculties involved in Biotechnology education are mainly the Faculty of Biology and partly the Faculty of Chemistry, the Faculty of Law, the Faculty of mathematics and Informatics and the Faculty of Economics and Business Administration.

Biological sciences become part of educational and research programs at Sofia University with the founding of the Department of Botany in 1891 and of Zoology in 1893. In 1904 there were four Departments: General Botany, Special Botany, Anatomy and Taxonomy of Invertebrates and Comparative Animal Anatomy. The Faculty of Biology exists as an independent structure since 1962. It consists of 13 departments and offers 6 specializations:

- Department of Animal and Human Physiology
- Department of Biochemistry
- Department of Biophysics and Radiobiology
- Department of Biotechnology
- Department of Botany
- Department of Cell Biology, Histology and Embryology
- Department of Ecology and Environmental Protection
- Department of Genetics
- Department of General and Industrial Microbiology
- Department of Hydrobiology and Ichthyology
- Department of Methodology
- Department of Plant Physiology
- Department of Zoology and Anthropology



Specialities: Biology  
Molecular biology  
Biotechnology  
Ecology  
Biology and Chemistry  
Geography and Biology

Research activities in the field of biotechnology are as follows: improvement of strain producers of biologically active compounds through mutagenesis, selection and gene manipulations; fermentation kinetics and downstream processing on microbial biomass for obtaining of biologically active compounds; biosynthesis and purification of antibiotics, bacteriocins from lactic acid bacteria; molecular methods for bacteria and yeast taxonomy; biodegradation of plant polymers by microbial cells and enzymes (cellulases, hemicellulases); microorganisms in mineral recovery and removal of heavy metals; plant and animal biotechnology; wastewater treatment and biodegradation of xenobiotics.

**Address:**

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BULGARIA  
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**✚ Selected examples of “bachelor” and/or “master of science” educational programmes in biotechnology in Sofia University “St. Kliment Ohridski”**

**Faculty of Biology**

Educational program

**Approved by:**

Educational degree: BACHELOR

Specialty 8.14.1.: BIOTECHNOLOGY

Professional trend: 8.14.: Biotechnology and Food Technology

Educational period: 4 years

Type of education: Regular

Professional qualification: Biotechnologist



**Educational program**

№	Name of the courses	Hours						Distribution (courses, terms)								
		Type of Courses	Exams	Current mark	Lectures	Seminars	Practical training courses	Total	1 <sup>st</sup> Course		2 <sup>nd</sup> Course		3 <sup>rd</sup> Course		4 <sup>th</sup> Course	
									I term	II term	III term	IV term	V term	VI term	VII term	VIII term
		C,O,F*						(lectures/seminars or practical training courses) per week								
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Cytology	C	1		90	45		45	3/3							
2	General and Inorganic Chemistry	C	1		120	60		60	4/4							
3	Mathematics	C	2		120	60		60	2/2	2/2						
4	English Language	C		2	90	90		90	0/3	0/3						
5	Analytical Chemistry	C	2		75	45		45		2/3						
6	Experiment Design and Analysis	C	2		60	30		30		2/2						
7	Physics	C	2		105	45		45		4/3						
8	Organic Chemistry	C	3		150	75		75		2/3	3/2					



9	Information Systems and Technologies	C	3		75	45		45			2/3				
10	Physico-chemistry and Colloid Chemistry	C	3		120	45		45			5/3				
11	Anatomy, Systematics and Physiology of Plants	C	4		150	60		60			3/3	4/2			
12	Zoology and Physiology	C	4		150	60		60			3/3	4/2			
13	Bioproducts ' Separation and Analysis	C	4		105	45		45				4/3			
14	Genetics	C	5		75	30		30					3/2		
15	Biochemistr	C	5		150	60		60				3/2	3/2		



	y															
16	Biophysics and Radiobiology	C	5		135	75		75				2/2	2/3			
17	Biotechnology Engineering	C	5		90	45		45					3/3			
18	Molecular Biology	C	5		90	60		30					4/2			
19	Ecology and Environment Protection	C		6	60	45		15						3/1		
20	Microbiology	C	6		135	60		75					2/2	2/3		
22	Fundamentals of Biotechnological Industry	C	6		105	60		45						4/3		
23	Introduction in Genetic Engineering	C	6		60	30		30						2/2		





24	Plant Cell and Tissue Cultures	C		6	60	30		30						2/2		
25	Animal Cell Cultures and Hybridoma Techniques	C		6	60	30		30						2/2		
26	Enzymology	C	7		105	45		60						<sup>3</sup> / <sub>4</sub>		
21	Biotechnological Methods in Ecology	C	8		75	45		30								3/2
27	Biotechnology of Primary Metabolites	C	8		150	75		75							3/3	2/2
28	Biotechnology of Secondary Metabolites	C	8		150	75		75							3/3	2/2
29	Specialized Practical Training	C		8	90	0		90								0/6



**Optional Courses (two by choice in VII and VIII terms)**

1	Genetics of Microorganisms	O	7		60	30	30							2/2	
2	Methods for Obtaining of Strains-Overproducers	O	7		60	30	30							2/2	
3	Virology	O	7		60	30	30							2/2	
4	Immunobiotechnology	O	7		60	30	30							2/2	
5	Biotechnology of Proteins from Nonconventional Sources	O	7		60	30	30							2/2	
6	Biotransformation of Organic Compounds	O	8		60	30	30								2/2
7	Biotechnology of Food Products	O	8		60	30	30								2/2
8	Biotechnology of Alcohol Products	O	8		60	30	30								2/2
9	Histology and Embryology	O	8		60	30	30								2/2
10	Industrial bio-objects - Introduction and Patent Regulations	O	8		60	30	30								2/2
11	Fundamentals of Modern Physics	O	8		60	30	30								3/1
12	Technological Bioenergetics	O	8		60	30	30								2/2
13	Biodegradation Processes	O	8		60	30	30								2/2



**Facultative Courses**

1	Mineral Biotechnology	F		8	60	30		3										2/2
2	Cryobiology and Freeze Drying	F		8	60	30		3										2/2
3	Management and Marketing in Biotechnological Industry	F		8	60	30		3										2/2
4	Biotechnology Design of Physiological Processes in Plants	F		8	60	30		3										2/2
5	Biotechnology of Organopreparations	F		8	60	30		3										2/2
6	Control and Management of Bioresources	F		8	60	30		3										2/2
7	Foreign Language	F			60													
8	Sports	F			60													
9	Courses in Humanities (other Faculties)	F																



**Total for the whole period of education**

1	Hours (compulsory courses)			2970	1470		1500	21	28	28	24	31	28	19	19
2	Number of exams (compulsory courses)		24					2	4	3	3	5	3	1	3
3	Number of current marks (compulsory courses)			5									3		1



**EDUCATIONAL PRACTICES:** with a statute of compulsory courses, organized as summer practical training courses: field, laboratory, and industrial.

Summer Educational Practice				Educational - Industrial Practice			
Name	Course	Days	Hours	Name	Course	Days	Hours
Zoology	2 <sup>nd</sup>	12	48	Biotechnology	3 <sup>rd</sup>	24	96
Botany	2 <sup>nd</sup>	12	48				
Informatics	2 <sup>nd</sup>	6	24				

**FINAL EXAMS:** State Exam or Public Diploma Thesis Defence

- 
- \* C - Compulsory
  - O - Optional
  - F - Facultative



## **Faculty of Biology**

*Environmental Biotechnology*  
Masters of Science Degree Program

## **Educational program**

Educational degree “Master of Science” in *Environmental Biotechnology*

Specialty 8.14.1. “**Biotechnology**”

Professional Trend 8.14. “**Biotechnology and Food Technology**”

## **Previous qualification required:**

- a/ educational degree “Bachelor” in specialty “Biotechnology”;
- b/ educational degree “Bachelor” in other related specialties in accordance with Article 3, pt. 1 of the State Regulations, approved with Decree 308/30.07.1997.

**Education period:**

three terms - for bachelors in “Biotechnology”  
four terms - for bachelors in other related specialties.

№	Course	term	type of evaluation	Hours		
				lectures	practical training courses	total

***A COMPULSORY***

1	Environmental Biotechnology	I	Exam	60	45	105
2	Physiology and Biochemistry of Microorganisms	I	Exam		45	90
3	Ecological Biochemistry	I	Exam	30	45	75
4	Mechanisms of Biodegradation processes	I/II	Exam	45	30	75
5	Biological Control	II	Exam	45	60	105
6	Environmental Management	II	Exam	60	45	105
7	pre-Diploma Practicum	II	Current mark	-	75	75

**B OPTIONAL**

1	Genetic and Molecular-Biological Methods in Environmental Biotechnology		Exam	30	15	45
2	Computer Modeling in Environmental Biotechnology		Current mark	15	30	45
3	Biogeotechnology		Exam	30	15	45
4	Utilization of Secondary Products		Exam	30	15	45
5	Selected Chapters from Biochemical ecology		Current mark	30	15	45
<p><b>Diploma Thesis - III<sup>rd</sup> (IV<sup>th</sup>) term - 12 weeks x 5 days x 6 hours = 360 hours</b></p>						

- Notice:**
1. The students chose minimum one optional course for each term. In this way the horarium per term is 360 hours, i.e. 720 hours in total.
  2. The education of bachelors from other related specialties is prolonged with one preliminary term, the so called “Preparatory term”. After successful performance of this term they joint the above mentioned educational programme.
  3. The last term is envisaged for preparation and public defence of Diploma Thesis, i.e. the whole educational period is three, respectively four terms.

**Final exams:** Defence of Diploma Thesis at State Examination Commission.

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**Content of curriculum units and credits distribution**

<b>Compulsory courses</b>	<b>Optional courses</b>	<b>Course units</b>	<b>Credits</b>
Environmental Biotechnology		4	8/10
Biochemistry of		3	6/8
Ecological Biochemistry		2	4/6
Mechanisms of Biodegradation processes		3	6/8
Biological Control		3	6/8
Environmental Management		4	8/10
pre-Diploma Practicum		2	4/6
	Genetic and Molecular- Biological Methods in Environmental Biotechnology	2	4/6
	Computer Modeling in Environmental Biotechnology	2	4/6
	Biogeotechnology	2	4/6
	Utilization of Secondary products	2	4/6
	Selected Chapters from Biochemical ecology	2	4/6
Advanced English			
Diploma Thesis preparation			

### **Qualification Characteristics**

for Master of Science Degree in  
**“Environmental Biotechnology”**

The students, successfully graduated the three- (four-) terms Master programme in *Environmental Biotechnology* upgrade their knowledge and skills with most recent achievements in the field of technical, economic and legal sciences, concerning the problems of environment protection.

The Educational Master Programme is elaborated with the participation of 5 West-European Universities - Georg August University, Goettingen, Germany; University Louis Pasteur, Strasbourg, France; University of Nantes, France; University of Siena, Siena, Italy and The Higher Katholike School “St. Lieven”, Gent, Belgium. The research and research/applied orientation of the programme allows the Masters of Science:

- freely to use methodological and technical approaches, typical for the inter-disciplinary area of biotechnology and environment protection;
- to evaluate the role of the biological factor, in particular, the biological systems, in management and control of environmental quality;
- actively to use these factors in bioremediation practice, including field trials and large scale manufactures;
- to communicate in a creative manner with other related specialists in respect different aspects of ecological problems;
- successfully to combine the most recent tendencies in the target field with classical approaches.

The graduated Masters of Science may achieve professional realization in research institutes, industrial enterprises, regional services for environment protection, waste treatment plants, as well as in companies and other organizations interested in exploitation and protection of environmental resources. They can also perform pedagogic activities (in case of additionally covered modules) in appropriate professional secondary schools and colleges.

## **COURSES DESCRIPTION**

### **A. Compulsory courses**

#### ***1. Environmental biotechnology (60 + 40 h)***

This course possesses well established interdisciplinary character and allows students to be acquainted with the fundamentals of environmental biotechnology. Special attention is paid to the functional common links between the structural components with natural and technological character. In accordance with methodological concept, the course is composed of consistently following modules; “Introduction in Environmental Biotechnology”; “Ecology of microorganisms”; “Genetic diversity and Environmental Biotechnology”; “Aerobic and anaerobic methods of waste treatment” and “Ecological alternatives”.

#### ***2. Physiology and Biochemistry of Microorganisms ( 45 + 45 h)***

The course is profiled in ecological trend, keeping in mind the leading role of biochemical activity of microorganisms for biodegradation treatment processes. Students will be acquainted with the biodegradative potential of different physiological groups as a function of real ecological background.

Three modules are included in the course: “Physiological and metabolic characteristics of microorganisms”; “Microorganisms and biogeochemical cycles” and “Specificity and Regulation of microbial metabolism”.

#### ***3. Ecological Biochemistry (30 + 45 h)***

The course contributes to better understanding of the theoretical fundamentals of biotreatment processes. The students are allowed to touch the joint area of ecology, biochemistry and enzymology.

Two modules cover the information core of the course: “Enzymological aspects in bioconversion of pollutants” and “Ecological-biochemical interactions between living systems and xenobiotics”. The problems of this specific area of biotechnology are discussed in an applied aspect.

#### ***4. Mechanisms of Biodegradative Processes (45 + 30 h)***

The course is a logic continuation and further development of the previous one. The students are acquainted with the peculiarities of biodegradation of

different type of pollutants. Meanwhile attention is paid to the economic and sanitary-toxicological aspects of the problem.

Through two modules - “Biodegradation of natural polymers” and “Biodegradation of xenobiotics” - the mechanisms of technologies for waste treatment are studied.

### **5. Biological Control (45 + 60 h)**

The main aim of the course is to enrich the students knowledge and skills with organization and practice of specific control activities in environment protection. Together with the development of a strategy, attention is paid also to applied problems.

The microbiological, biochemical and chemical aspects of ecological biomonitoring are the information core of this compulsory course. Four modules are included in it; “Microbiological control of natural resources”; “Biochemical and chemical design of control”; “Bioremediation techniques for soils and sludge” and “Evaluation of the effectiveness of treatment”.

### **6. Environmental Management (60 + 40 h)**

On the basis of the already obtained knowledge from the previous courses, through this course the students will be able to generalize the studied problems and to enter specific for this area organizational and managerial approaches.

As a typical interdisciplinary task the Environmental Management is performed in the frames of 4 modules; “Quality management of environment”; “Biological tools for environmental management”; “Environmental laws” and “Economical aspects of strategy for sustainable development”.

## **B. Optional courses**

### ***1. Genetic and Molecular Biological Methods in Environmental Biotechnology (30 + 15 h)***

The general aim of this optional course is to acquaint the students with modern molecular methods and techniques for studying different biological systems, concerning environmental biotechnology. It deals with problems, connected with utilization of genetic engineering for enrichment of natural gene resources and application of molecular-ecological approach in environment protection. The course includes two modules: “Molecular biology in environmental biotechnology” and “Molecular ecology”.

### ***2. Computer Modeling in Environmental Biotechnology (15 + 30 h)***

This is the second optional course which main tasks are to introduce to students modern interactive methods for education, self-education and self-assessment in multimedia conditions in the specific area of environmental biotechnology.

The course includes acquaintance with software products and nets, suitable for practical application in evaluation of environmental conditions and management.

### ***3. Biogeotechnology (30 + 15 h)***

The importance and functions of biogeotechnological approaches in solving actual problems of environmental biotechnology comprises the content of the two modules of this course. Attention is paid to lithotrophic as well as to chemoorganotrophic microorganisms as main factors in biogeotechnology.

### ***4. Utilization of Secondary products (30 + 15 h)***

This is a two-modules optional course in which emphasis is given to current problems of utilization of waste by-products from meat and dairy industries as well as other branches of industry. Important subjects such as solving protein and fodder problems in the context of ecological requirements and the conception for minimizing of wastes are discussed.

### ***5. Selected Chapters of Biochemical Ecology ( 30 + 15 h)***



The course main task is to discuss from biochemical stand point the intertaxon relationships and in abiotic aspect - the specific characteristics of the major types of pollutants.

### **The University of Chemical Technology and Metallurgy - Sofia**

The University of Chemical Technology and Metallurgy (UCTM) was founded in 1953 and inherited the best traditions of the Bulgarian chemical education. Today the University is an educational and research center with strong reputation in training highly skilled specialists with career opportunities in industry, research and special fields in designing, operating and managing various production methods and industrial enterprises.

UCTM trains about 3000 students annually, with a total of 423 lecturers (more than half of them professors and associate professors) engaged in teaching and research.

The educational and research policy of the University is focussed on new materials, high technologies in the field of biotechnological, chemical and metallurgical engineering and their influence on the environment.

The University comprises four faculties among which the Faculty of Chemical and Systemic Engineering is responsible for the biotechnological education. The Faculty comprises four Departments - Department of Chemical Sciences, Department of Physical-Chemical Sciences, Department of Humanitary Sciences and Department of Biotechnology.

The major research trends of the University in the field of biotechnology are as follows: isolation and purification enzymes and study of immobilized enzymes and cells; biotransformation with enzymes and cells; biogas production; elaboration of clinic tests and biosensors, bacterial leaching; biotechnological approaches in ecology.

#### **Address:**

bul. Kl. Ohridski 8, 1756 Sofia,  
BULGARIA  
tel: (359 2) 681513  
fax: (359 2) 685488  
<http://www.uctm.edu/>



- ✚ Selected examples of “bachelor” and/or “master of science” educational programmes in biotechnology in University of Chemical Technology and Metallurgy - Sofia

### **Educational program**

*approved by: Prof. D-r K. Velev  
Rector of UCTM*

Educational degree “Bachelor in Biotechnology”  
Specialty 8.14.1. “**Biotechnology**”



№	Educational program			Hours		
	Course	term	type of evaluation	lectures	practical training courses	total
1	Stechiometric Calculations	1	CM*	0	45	45
2	Mathematics - part I	1	E*	60	60	120
3	Engineering Graphics	1	CM	30	45	75
4	Sports	1	-	0	30	30
5	Informatics - part I	1	E	45	45	90
6	Humanities (by choice - one of the courses):	1				
6a	- Ecology and Technical Civilization	1	CM	45	0	45
6b	-Engineering Psychology and Ergonomy	1	CM	45	0	45
6c	- Philosophy	1	CM	45	0	45
<b>TOTAL for the 1<sup>st</sup> term - 375 hours</b>						
7	Mathematics - part II	2	E	60	60	120
8	General and Inorganic Chemistry	2	E	30	15	45
9	Technical Mechanics	2	E	60	45	105
10	Physics - part I	2	E	45	45	90
11	Sports	2	-	0	30	30
12	Informatics - part II	2	CM	15	30	45

<b>TOTAL for the 2<sup>nd</sup> term - 405 hours</b>						
13	Analytical Chemistry	3	E	45	60	105
14	Inorganic Chemistry	3	E	45	45	90
15	Organic Chemistry	3	E	75	60	135
16	Techniques for Safety Measures	3	CM	30	15	45
17	Physics - part II	3	E	30	30	60
18	Sports	3	-	0	30	30
<b>TOTAL for the 3<sup>rd</sup> term - 435 hours</b>						
19	Genetics	4	E	30	30	60
20	Physical Chemistry	4	E	160	45	105
21	Biochemistry	4	E	60	45	105
22	Sports	4	-	0	30	30
23	Economics and Management of Industrial Manufacture	4	E	60	30	90
24	Organic Chemistry - Practical Training Course	4	CM	0	30	30
25	Microbiology I part	4	E	30	30	60
<b>TOTAL for the 4<sup>th</sup> term - 450 hours</b>						
26	Instrumental Tools in Analytical Chemistry	5	CM	30	15	45



27	Biotechnology Engineering - part I	5	E	45	45	90
28	Electrotechniques and Electronics	5	E	30	30	60
29	Molecular Biology	5	E	45	45	90
30	Microbiology - part II	5	E	45	30	75
31	Nutrient Media Chemistry	5	CM	30	30	60
32	Foreign Language - by choice	5				
32 a	- English	5	-	0	30	30
32 b	- Russian	5	-	0	30	30
32 c	- French	5	-	0	30	30
32 d	- German	5	-	0	30	30
<b>TOTAL for the 5<sup>th</sup> term - 450 hours</b>						
33	Automatization of Manufacture	6	E	45	30	75
34	Processes and Equipment - II part	6	E	30	30	60
35	Chemistry of Low Molecular Weight Biologically Active Substances	6	E	45	30	75
36	Chemistry and Physical Chemistry of Biopolymers	6	E	45	30	75
37	Fundamentals of Chemical Technologies	6	E	45	39	75



38	Course Project in Biotechnology Engineering	6	CM	0	30	30
39	Foreign Language - by choice	6				
39 a	English Language	6	CM	0	30	30
39 b	Russian Language	6	CM	0	30	30
39 c	French Language	6	CM	0	30	30
39 d	German Language	6	CM	0	30	30
<b>TOTAL for the 6<sup>th</sup> term - 420 hours</b>						
40	Bioproducts Separation and Analysis	7	E	45	45	90
41	Biotechnological Methods in Ecology	7	E	45	45	90
42	Enzymology	7	E	45	60	105
43	Heat Transfer Techniques	7	CM	30	15	45
44	Technological Fundamentals of Bioconversion	7	E	45	45	90
45	Foreign Language - by choice	7				
45a	- English	7	-	0	30	30
45b	- Russian	7	-	0	30	30
45c	- French	7	-	0	30	30



45d	- German	7	-	0	30	30
<b>TOTAL for the 7<sup>th</sup> term - 450 hours</b>						
46	Technology of Microbial Transformations	8	E	40	30	70
47	Genetic Engineering Technologies	8	E	40	30	70
48	Colloid Chemistry	8	CM	30	0	30
49	Technology of Wine and High-Alcohol Beverages	8	E	40	30	70
50	Foreign Language - by choice	8				
50a	- English	8	CM	0	30	30
50b	- Russian	8	CM	0	30	30
50c	- French	8	CM	0	30	30
50d	- German	8	CM	0	30	30
51	3 Courses by choice	8				
51a	- Fermentation Technology of Organic Acids	8	CM	30	30	60
51b	- Plant Biotechnologies	8	CM	30	30	60
51c	- Biosensors and Biosensor Techniques	8	CM	30	30	60
51d	- Fermentation Technology of Antibiotics	8	CM	30	30	60
51e	- Technology of Plant, Animal and	8	CM	30	30	60



	Microbial Enzymes					
51f	- Brewery Technology and Analysis	8	CM	30	30	60
51g	- Vaccines Technology	8	CM	30	30	60
51h	- Technology of Vitamins, Hormones and Plant Insecticides	8	CM	30	30	60
51i	- Biotechnology of Energy Production by Non-conventional Sources	8	CM	30	30	60
51j	- Mineral Biotechnologies	8	CM	30	30	60
51k	- Design of Biotechnological Objects	8	CM	30	30	60
51l	- Technology of Food and Fodder Proteins	8	CM	30	30	60
<b>TOTAL for the 8<sup>th</sup> term - 450 hours</b>						
<b>TOTAL FOR THE WHOLE PROGRAMME - 3035 HOURS</b>						

\* E - Exam; \* CM - Current Mark

### **Thracian University - Stara Zagora**

Thracian University is an autonomous state institution. It was founded in 1995 with a mutual decision by the Stara Zagora academic community and the National Assembly to merge the two already existing higher institutes: Higher Institute of Animal Science and Veterinary Medicine (it was established on 1921 as a part of The Sofia State University) and Higher Institute of Medicine (it was established on 1976). Later on by virtue of Governmental Decree the In-Service Teacher Training Institute and four semi-higher Institutes were transformed into colleges to join the Thracian University.

There are more than 5000 Bulgarian students, and 700 foreign students from 30 countries in Europe, Asia, Africa, and Latin America attending the Thracian University. The training of these students is realized through the use of curricula adapted to European educational standards. The academic staff represents 608 tutors at full-time position and 43 - with part time engagements.

Towards the end of 1997 the following units joined together to form the University with a statute of legal entities:

1. Faculty of Veterinary Medicine including clinics
2. Faculty of Medicine
3. University Hospital
4. Agricultural Faculty including experimental station
5. Training-Experimental Farm
6. In-service Teacher Training Institute
7. Bulgarian - German Agricultural College
8. Medical College, Stara Zagora
9. Medical College, Haskovo
10. Medical College, Sliven
11. Technical College, Yambol

The institutions of the Thracian University have activities in the field of the Biotechnology are: Agricultural Faculty; Faculty of Veterinary Medicine and Faculty of Medicine

The research work in the field of biotechnology is concentrated on biotechnology of milk and meat products; animal and food hygiene; medical ecology and human and animal health; fodder and pharmaceutical products - anticancer drugs, antioxidants, etc.



**Address:**

Thracian University - Stara Zagora

359 42 22002; 359 42 28012043

359 42 74112

[www.uni-sz.bg](http://www.uni-sz.bg) - soon available, at present - under reconstruction  
[kate@af.uni-sz.bg](mailto:kate@af.uni-sz.bg); [evgeny@mbox.digsys.bg](mailto:evgeny@mbox.digsys.bg); [g.petkov@sz.inetg.bg](mailto:g.petkov@sz.inetg.bg)



**✚ Selected examples of “bachelor” and/or “master of science”  
educational programmes in biotechnology in Thracian  
University - Stara Zagora**

**Masters of Science Degree Programs**

**Educational program**

Educational degree “Master of Science” in

- *Milk and Milk Products*
- *Meat and Meat Products*
- *Agricultural Ecology*
- *Genetics, Breeding and Reproduction*
- *Fodder Production*
- *Aquaculture*

Specialty 8.14.1. “**Biotechnology**”

Professional Trend 8.14. “**Biotechnology and Food Technology**”

**Previous qualification required and organization of the  
educational process:**

- Master of Science in Milk and Milk Products 2 terms; 1 year  
(after Bachelor Degree)
- Master of Science in Meat and Meat Products 2 terms; 1 year  
(after Bachelor Degree)
- Master of Science in Agricultural Ecology 2 terms;  
1 year (after Bachelor Degree)
- Master of Science in Genetics, Breeding and  
Reproduction 2 terms;  
1 year (after Bachelor Degree)
- Master of Science in Fodder Production 2 terms; 1 year  
(after Bachelor Degree)
- Master of Science in Aquaculture 2 terms;  
1 year (after Bachelor Degree)
- Master of Science in Milk and Milk Products

Courses	Credits	Winter term	Summer term	Hours
Microbiology of the milk and milk products	5	2*/2**	-	60
Technology of milk products	7,50	3/3	-	90
Biotechnological engineering in milk products manufacture	5	2/2	-	60
Seminars	2,50	1/1	-	30
Quality and standards of milk and milk products	3,75	-	1/2	45
Milk Products Management	5	-	2/2	60
Milk Products Marketing	5	-	2/2	60
Manufacture of ecologically clean milk products	5	-	0/4	60
Practice in milk products	5	-	0/3	45
Total	43,75	16	18	510

- - Lectures; \*\* - Practical training courses
- - Master of Science in Meat and Meat Products

Courses	Credits	Winter term	Summer term	Hours
Meat' morphology	10	4/4	-	120
Meat processing	10	4/4	-	120
Machines and apparatuses for meat products production	7,50	3/3	-	90
Quality and standards of the meat and meat products	3,75	-	1/2	45
Meat Products Management	5	-	2/2	60
Meat Products Marketing	5	-	2/2	60
Practice in meat products	2,50	-	0/2	30
Total	43,75	22	13	525

• **Master of Science in Agricultural Ecology**

Compulsory Courses	Credits	Winter term	Summer term	Hours
Ecological husbandry	10	4/4	-	120
Ecological plant production	6,25	2/3	-	75
Ecological toxicology	7,50	3/3	-	90
Plant protection methods	6,25	-	2/3	75
Ecological products production	10	-	4/4	120
Planning of the sustainable development in agriculture	7,50	-	3/3	90
Optional Courses (at least 2)				
Agromanagement	7,50	3/3	-	90
Statistics	6,25	-	2/3	75
Informatics	5	2/2	-	60
Agricultural sociology	6,25	-	3/2	75

• **Master of Science in Genetics, Breeding and Reproduction**

Courses	Credits	Winter term	Summer term	Hours
Qualitative and Population Genetics	2.50	1/1	-	30
Statistic in Genetics and Breeding	3.75	1/2	-	45
Animal Genetics	10.0	4/4	-	120
Theory of Animal Breeding	5.00	2/2	-	60
Genetically Improvement of Animals	5.00	-	2/2	60
Reproduction Technology	10.00	-	4/4	120
Computer Technology In Animal Breeding	5.00	-	2/2	60
Molecular Genetics	2.50	-	1/1	30
Total	43.75	17	18	525

• **Master of Science in Fodder Production**

Courses	Credits	Winter term	Summer term	Hours
Harvesting, storage and Utilization of the Fodder Cultures Technologies	5.00	2/2	-	60
Technologies of fodder compositions	10.00	4/4	-	120
Control and Analysis of fodder compositions	7.50	3/3	-	90
Fodder Marketing	5.00	2/2	-	60
Nutrition of Pets	7.50	-	3/3	90
Specialized Seminars of fodder compositions	7.50	-	3/3	90
Total	42.50	18	16	510

• **Master of Science in Aquaculture**

Courses	Credits	Winter term	Summer term	Hours
Aquaculture	7.50	3/3	-	90
Ecological Aquaculture	7.50	3/3	-	90
Fish Culture and Fish Products	7.50	3/3	-	90
Quality and Standards of the Aquaculture	5.00	-	2/2	60
Aquaculture Management	5.00	-	2/2	60
Aquaculture Marketing	5.00	-	2/2	60
Practice	5.00	-	0/4	60
<b>Total</b>	<b>42.50</b>	<b>18</b>	<b>16</b>	<b>510</b>

### **University “Prof. Assen Zlatarov” – Bourgas**

The University “Prof. Assen Zlatarov” - Bourgas is successor of the established in 1963 Higher Institute of Chemical Technology, which was developed and enlarged and since 1995 it is transformed into the present Higher School comprising five faculties, 3 colleges and several supporting organizations and centers as follows:

- Faculty of Organic Chemical Technologies
- Faculty of Inorganic Chemical Technologies
- Technical Faculty
- Economical Faculty
- Pedagogical Faculty
- College of Tourism
- Technical College
- Medical College

The University academic staff comprises 365 tutors among which 90 professors and Associate professors.

The Faculty of Organic Chemical Technologies, Department “Biotechnology” is responsible for the education in the field of Biotechnology.

The main research activities of the Bourgas University connected with Biotechnology are: biodegradation of polypropylene compounds; immobilization of enzymes (glucose oxidase, urease, holo-esterase) and their application in clinic diagnostics and ecology; biodegradation of aromatic hydrocarbons; biosorption of heavy metals by immobilized cells on polymer grains, two-phase catalysis; cultivation and immobilization of baker and wine yeasts.



**Address:**

8010 Bourgas  
1. “Prof. Y. Yakimov” St.,  
University “Prof. Assen Zlatarov”  
Tel: 359 56 66 01 19  
Fax: 359 2 56 68 61 41  
e-mail: [rector@btu.bg](mailto:rector@btu.bg)  
<http://btu2.btu.bg>



- Selected examples of “bachelor” and/or “master of science” educational programmes in biotechnology in University “Prof. Assen Zlatarov” – Bourgas

### **Educational programme**

*approved by: Assoc. Prof. Dr N. Ralev  
Rector*

Educational degree “Bachelor”  
Specialty 8.14.1. “**Biotechnology**”  
Professional **qualification: “Biotechnologist”**  
Type of education: **REGULAR**  
Educational period: **8 terms**





Term	Course	Hours per week			Type of control
		L*	PTC*	Total	
I	Mathematics	3	5	8	E**
	Inorganic Chemistry - part I	2	4	6	E
	Information Systems and Technologies-part I	2	2	4	CM**
	Russian Language	-	2	2	CM
	English, French or German Language (by choice)	-	4	4	-
	Philosophy, Ethics or History of Bulgaria (by choice)	2	1	3	CM
	Sports	-	4	4	-
<b>Total Hours per week</b>		<b>9</b>	<b>18</b>	<b>27</b>	
II	Inorganic Chemistry- part II	3	3	6	E
	Organic Chemistry - part I	4	3	7	E
	Physics	4	5	9	E
	Information Systems and Technologies - part II	2	2	4	E
	English, French or German Language (by choice)	-	3	3	CM
	Sports	-	2	2	-
<b>Total Hours per week</b>		<b>13</b>	<b>16</b>	<b>29</b>	
	Organic Chemistry - part II	4	3	7	E
	Analytical Chemistry	3	4	7	E
	Physical Chemistry with Colloidal Chemistry	3	3	6	E



III	Electrotechnique and Electronics	2	2	4	CM
	Cytology	2	2	4	CM
	Sports	-	2	2	-
	<b>Total Hours per week</b>	<b>14</b>	<b>14</b>	<b>28</b>	
Term	Course	Hours per week			Type of control
		L*	PTC*	Total	
IV	Physical Chemistry with Colloidal Chemistry - part II	3	3	6	E
	Biotechnology Engineering - part I	3	2	5	E
	Physical Methods for Analysis	2	3	5	E
	Biochemistry I part	4	5	9	E
	Genetics	2	2	4	CM
	Sports	-	2	2	-
	<b>Total Hours per week</b>	<b>14</b>	<b>15</b>	<b>29</b>	
V	Biotechnology Engineering I part	3	2	5	E
	Physical Chemistry with Colloidal Chemistry - -part III	2	2	4	CM
	Biochemistry - part II	3	3	6	E
	Microbiology	3	4	7	E
	Bioproducts Separation and Analysis	3	5	8	E
	<b>Total Hours per week</b>	<b>14</b>	<b>16</b>	<b>30</b>	
VI	Automatization of Manufacturing	2	3	5	E
	Industrial Microbiology	4	4	8	E
	Bioreactors	2	2	4	CM



	Enzymology	3	4	7	E
	Immunology	2	3	5	E
	<b>Total Hours per week</b>	<b>13</b>	<b>16</b>	<b>29</b>	
VII	Economics of Industry	2	2	4	E
	Modeling or Corrosion Processes and Corrosion Protection (by choice)	2	2	4	CM
	Isolation And Purification of Biotechnological Products	2	2	4	CM
	Applied Enzymology	2	2	4	E
	Manufacture of Alcohol Drinks	3	3	6	E
	Molecular Biology	3	3	6	E
	<b>Total Hours per week</b>	<b>14</b>	<b>14</b>	<b>28</b>	
VIII	Techniques for Safety Measures	2	2	4	CM
	Introduction in Ecology and Environment Protection	2	2	4	CM
	Biotechnological methods In Ecology	3	2	5	E
	Genetic Engineering	2	2	4	E
	Biotechnology and Pharmaceuticals and Agrobiological Compounds	2	3	5	E
	<b>Total Hours per week</b>	<b>11</b>	<b>11</b>	<b>22</b>	



**Educational Practices:** 1 month after 4<sup>th</sup> term  
1 month after 6<sup>th</sup> term

**Facultative Courses**

No	Course	Hours per week			Type of control
		L*	PTC*	Total	
2	Introduction in Specialty	2	2	4	CM
3	Foreign Language	0	2	2	CM
4	Russian Language	0	2	2	CM
5	Language Culture	2	1	3	CM
6	Botany	3	2	5	E
7	Zoology	3	2	5	E
8	Fundamental of Chemical Technologies	3	2	5	E
	General Economic Theory	2	2	4	CM

Diploma Thesis Preparation - 9 weeks.

The “**Bachelor**” Degree is awarded:

- after successful defence of the Public Diploma Thesis at State Examination Commission or
- after successful passing of State Exam in the Specialty.

\* L - lectures; PTC - Practical Training Courses\*\* E - Exam; CM - Current Mark

### **Higher Institute of Food and Flavour Industry – Plovdiv**

The Higher Institute of Food and Flavour Industry (HIFFI) is established as an independent Higher school in 1953, when it was separated from the Agricultural Academy. In 1992/93 academic year a new structure of the University specialities has been introduced in the Technological Faculty - the main one dealing with biotechnological education. At present in this faculty are educated students, distributed in 9 specialities with 16 specializations as follows:

- Food Technology
- Beverages Technology
- Technology of Flavored Food Products
- Biotechnology
- Tourism
- Economic Management
- Automatization, Information and Management Techniques
- Machinery
- Heat Transfer Techniques

The research activities of the Institute in the field of Biotechnology are as follows: industrial microorganisms - taxonomy and preservation; kinetics of fermentation processes; production of microbial biomass and obtaining of enzymes, and different biologically active substances: antibiotics, vitamins; biotechnology of food products, ecology, etc.

#### **Address:**

4002 Plovdiv  
26 “Taritza” Blvd.  
Tel: 359 32 440 005;  
359 32 44 90 37

## List of higher education institutions in the field of health care

### Medical University – Sofia

Medical University of Sofia is the oldest institution for higher medical education in Bulgaria. His Majesty King Ferdinand founded it by a decree at 1917 as a Medical Faculty of Sofia University. Special merits of it's foundation and worthy to be remembered are Dr. M.Russev, Dr. St. Vatev and Dr. P. Orahovatz who prepared Alexandrovska hospital's departments for the needs of future clinics and organized training of teaching stuff. In 1942 a Dentistry department opened the doors in Medical faculty.

In 1950 Medical Faculty was set apart from Sofia University and became independent structure as Medical Academy with two faculties - medicine and dentistry. Later on, at 1951 a Pharmaceutical faculty was associated. Next decades several administrative transformations took places - Higher Medical Institute (1954-1972), Medical Academy (1972-1990) and again Higher Medical Institute. Since 21 of May 1995 according to the decision taken by the National Assembly, the Higher Medical Institute became a Medical University.

Today Medical University has leading positions as educational, scientific and health care institution in Bulgaria and it's level corresponds to the world medical standards.

High level of theoretical and practical training of students, post-graduate students and specialists is organized according to the requirements of government standards of education and health care politics but with a sufficient academic independence.

### **Educational programme in Medicine:**

Education of students in Faculty of Medicine is with a duration of six years organized in three stages.

The first stage - pre clinical training gives the students the necessary biological and medical knowledge which is fundamental for the following clinical instruction.

The second stage - clinical training aims at acquiring knowledge of diagnostic and therapeutic process. The instruction is done in a cyclic way after the third academic year. Students are taking the examinations permanent during the academic year after finishing the course according to the curriculum of the corresponding subject.

Third stage - pre graduation internship is carried out in the university hospitals and aims at applying student's knowledge at the patient bedside and in outpatient office. After completing the internship students pass state examinations to be conferred "**Master**" degree and qualification "**Doctor in Medicine**" with the rights for general medical practice.

**Curriculum**

<b>I YEAR</b>	<b>II YEAR</b>	<b>III YEAR</b>
<input type="checkbox"/> Biology <input type="checkbox"/> Physics <input type="checkbox"/> Chemistry <input type="checkbox"/> Latin with medical terminology <input type="checkbox"/> Anatomy and histology <input type="checkbox"/> Cytology <input type="checkbox"/> Medical etiquette <input type="checkbox"/> Foreign language <input type="checkbox"/> Sports	<input type="checkbox"/> Anatomy and histology <input type="checkbox"/> Biophysics <input type="checkbox"/> Biochemistry <input type="checkbox"/> Physiology <input type="checkbox"/> Medical informatics and biostatistics <input type="checkbox"/> Foreign language <input type="checkbox"/> Sports	<input type="checkbox"/> Social medicine <input type="checkbox"/> Microbiology <input type="checkbox"/> Medicine in disaster situations <input type="checkbox"/> Medical genetics <input type="checkbox"/> Pathophysiology <input type="checkbox"/> Pharmacology <input type="checkbox"/> General pathology <input type="checkbox"/> Propedeutics of internal diseases <input type="checkbox"/> General and operative surgery
<b>Winter session Holiday</b>	<b>Winter session Holidays</b>	<b>Winter session Holidays</b>
<input type="checkbox"/> Biology <input type="checkbox"/> Physics <input type="checkbox"/> Chemistry <input type="checkbox"/> Latin with medical terminology <input type="checkbox"/> Anatomy and histology <input type="checkbox"/> Foreign language <input type="checkbox"/> Sports	<input type="checkbox"/> Anatomy and histology <input type="checkbox"/> Biochemistry <input type="checkbox"/> Physiology <input type="checkbox"/> Social medicine <input type="checkbox"/> Foreign language <input type="checkbox"/> Microbiology <input type="checkbox"/> General medicine <input type="checkbox"/> Medical psychology	<input type="checkbox"/> Pathophysiology <input type="checkbox"/> Pharmacology <input type="checkbox"/> General pathology <input type="checkbox"/> Propedeutics of internal diseases <input type="checkbox"/> General and operative surgery
<b>Summer session</b>	<b>Summer session</b>	<b>Summer session</b>

**CYCLES (IV – VI YEARS)**

<input type="checkbox"/> Roentgenology and radiology <input type="checkbox"/> Oto-rhino-laryngology <input type="checkbox"/> Hygiene, ecology and occupational diseases <input type="checkbox"/> Ophthalmology <input type="checkbox"/> Neurology <input type="checkbox"/> Clinical pathology <input type="checkbox"/> Obstetrics and gynecology <input type="checkbox"/> Dermatology and venerology <input type="checkbox"/> Clinical pharmacology <input type="checkbox"/> Internal disease and therapy: <input type="checkbox"/> Clinical laboratory <input type="checkbox"/> Clinical immunology	<input type="checkbox"/> Surgery <input type="checkbox"/> Orthopedy and traumatology <input type="checkbox"/> Pediatrics <input type="checkbox"/> Urology <input type="checkbox"/> Anaesthesiology and intensive care <input type="checkbox"/> Epidemiology <input type="checkbox"/> Infection disease <input type="checkbox"/> Medical parasitology and tropical diseases <input type="checkbox"/> Physiotherapy and rehabilitation <input type="checkbox"/> Forensic medicine and deontology <input type="checkbox"/> Psychiatry
Pre-graduation internship: <b>170 days</b> State examinations: <b>internal diseases, surgery, pediatric diseases, obstetrics and gynecology, hygiene and ecology</b>	

*Pre-clinical training*

№	Subject	Exam (semester)	Total acad. hours	Lectures	Practicals	Semesters			
						I	II	III	IV
1	Biology	II	180	90	90	3/3	3/3	-	-
2	Physics	II	120	60	60	2/2	2/2	-	-
3	Chemistry	II	120	60	60	2/2	2/2	-	-
4	Latin with medical terminology		60	-	60	0/2	0/2	-	-
5	Anatomy and histology	IV	375	165	210	2/2	3/6	3/5	3/3
6	Cytology	I	90	45	45	3/3	-	-	-
7	Biophysics	III	75	30	45	-	-	2/3	-
8	Biochemistry	IV	210	120	90	-	-	4/3	4/3
9	Physiology	IV	225	105	120	-	-	3/4	4/4
10	Medical informatics and biostatistics		45	15	30	-	-	1/2	-
11	Social medicine	-	45	30	15	-	-	-	2/1
12	Medical etiquette		30	15	15	1/1	-	-	-
13	Foreign language		120	-	120	0/2	0/2	0/2	0/2
14	Sports	-	90	-	90	0/2	0/2	0/2	-
15	Microbiology	-	75	30	45	-	-	-	2/3
Optional subjects 45 h									
	Medical psychology		30	15	15		-	-	1/1
	History of medicine		15	-	15		-	0/1	-
<b>Total pre-clinical load</b>			<b>1935</b>	<b>795</b>	<b>1140</b>				



***Clinical training***

№	Subject	Exam (semester)	Total acad. hours	Lectures	Practicals	Semesters	
						V	VI
1	Social medicine	V	60	30	30	2/2	-
2	Microbiology	V	75	30	45	2/3	-
3	Medicine in disaster situations		45	15	30	1/2	-
4	Medical genetics	V	60	30	30	2/2	-
5	Pathophysiology	VI	120	60	60	2/2	2/2
6	Pharmacology	VI	165	75	90	3/3	2/3
7	General pathology y	VI	105	45	60	2/2	1/2
8	Propedeutics of internal diseases	VI	240	60	180	2/6	2/6
9	General and operative surgery	VI	165	60	105	2/3	2/4
<b><i>Cycles</i></b>							
№	Subject	Exam (year)	Total acad. hours	Lectures	Practicals	Training	
1	Roentgenology and radiology	IV	100	30	70	A cycle of training	
2	Oto-rhino-laryngology	IV	80	30	50	A cycle of training	
3	Hygiene, ecology and occupational diseases	IV	150	45	105	A cycle of training	
4	Ophthalmology	IV	70	30	40	A cycle of training	
5	Neurology	IV	120	60	60	A cycle of training	
6	Clinical pathology	IV	105	45	60	A cycle of training	
7	Clinical pharmacology	V	60	30	30	A cycle of training	

8	Obstetrics and gynecology	V	200	60	140	A cycle of training
9	Dermatology and venerology	V	90	45	45	A cycle of training
10	Psychiatry	VI	75	45	30	A cycle of training
11	Internal disease and therapy:	V	510	150	360	A cycle of training in IV and V year
	□ - Clinical laboratory	V	60	30	30	A cycle of training
	□ - Clinical immunology	V	30	15	15	A cycle of training
	Total		600	195	405	A cycle of training
12	Surgery	V	270	90	180	A cycle of training in IV and V year
13	Orthopedics and traumatology	V	90	30	60	A cycle of training
14	Pediatrics	V	210	90	120	A cycle of training
15	Urology	V	45	15	30	A cycle of training
16	Anaesthesiology and intensive care	VI	75	30	45	A cycle of training
17	Physiotherapy and rehabilitation	IV	45	15	30	A cycle of training
18	Epidemiology	VI	60	30	30	A cycle of training
19	Infection disease	VI	60	30	30	A cycle of training
20	Medical parasitology and tropical diseases	VI	30	15	15	A cycle of training
21	Forensic medicine and deontology	VI	75	30	45	A cycle of training
	<b>Total clinical load</b>		<b>3645</b>	<b>1395</b>	<b>2250</b>	

## ECTS

### *First year*

No	Subject	Lectures	Seminars/Practicals	Credits
Compulsory courses				
1	Biology	90	90	11.2
2	Physics	60	60	7.5
3	Chemistry	60	60	7.5
4	Latin with medical terminology	0	60	3.8
5	Anatomy and histology	75	135	13
6	Medical etiquette	15	15	1.9
7	Foreign language	0	60	3.8
8	Sports	0	60	3.8
9	Cytology	45	45	5.6
Optional/Facultative courses				
1	Roentgen anatomy	15	15	1.9

### *Second year*

No	Subject	Lectures	Seminars/Practicals	Credits
Compulsory courses				
1	Biophysics	30	45	3.8
2	Biochemistry	120	90	10.6
3	Physiology	105	120	11.4
4	Medical informatics and biostatistics	15	30	2.3
5	Social medicine	30	15	2.3
6	Anatomy and histology	90	135	11.4
7	Foreign language	0	60	3
8	Sports	0	30	1.5
9	Pathophysiology	30	30	3
10	Pharmacology	45	45	4.6
11	Microbiology	30	45	3.8
12	General medicine	0	15	0.8
Optional courses				
1	Medical psychology	15	15	1.5
2	History of medicine	0	15	0.8

### *Third year*

No	Subject	Lectures	Seminars/Practicals	Credits
Compulsory courses				
1	Social medicine	30	30	3.9
2	Microbiology	30	45	4.9
3	Medicine in disaster	15	30	3.0

	situations			
4	Medical genetics	30	30	3.9
5	Pathophysiology	30	30	3.9
6	Pharmacology	30	45	4.9
7	General pathology y	45	60	6.9
8	Propedeutics of internal diseases	60	180	15.8
9	General and operative surgery	60	105	10.8
Optional courses				
1	Molecular pathology	15	15	2

***Forth year***

№	Subject	Lectures	Seminars/Practicals	Credits
Compulsory courses				
1	Roentgenology and radiology	30	70	5.8
2	Oto-rhino-laryngology	30	50	4.9
3	Hygiene, ecology and occupational diseases	45	105	8.6
4	Ophthalmology	30	40	4.4
5	Neurology	60	60	7.3
6	Clinical pathology	45	60	6.4
7	Clinical pharmacology	18	60	4.8
8	Gastroenterology	18	12	4.3
9	Nephrology	24	28	4.6
10	Pulmology	30	60	5.4
11	Chest surgery	20	40	3.4

***Fifth year***

No	Subject	Lectures	Seminars/Practicals	Credits
<b>Compulsory courses</b>				
1	Clinical pharmacology	30	15	3.6
2	Obstetrics and gynecology	60	48	12
3	Dermatology and venerology	45	22.5	5.5
4	Endocrinology	12	30	3
5	Hematology:	12	20	2.5
6	Rheumatology	8	10	1.3
7	Allergology	6	4.5	0.8
8	Toxicology	6	4.5	0.8
9	Clinical laboratory	30	15	3.6
10	Clinical immunology	15	7.5	1.8
11	Abdomenal Surgery	46	40	5.3
12	Special Surgery	4	2	0.5
13	Neurosurgery	4	2	0.5
14	Children surgery	6	3	0.7
15	Orthopedics and Traumatology	30	22.5	5.5
16	Pediatrics	90	48	12.5

### **Clinical attachments and pre-graduation internship**

Clinical attachments for 4 <sup>th</sup> , 5 <sup>th</sup> and 6 <sup>th</sup> year of education	451 days x 2 h/day = 902 h
Pre-graduation internship after 4 <sup>th</sup> year of education	220 days x 8 h/day = 1760 h
Total clinical attachments and pre-graduation internship	2662 h

**Pre-graduation internship – distribution by subjects**

Subject	Days
Internal diseases	30
Surgery	30
Obstetrics and Gynecology	30
Pediatrics	30
Hygiene, Infectious diseases, epidemiology and social medicine	35
General medicine	15
Exam time	50
Total	220

**Optional pre-graduate internship**

Subjects	Days
Neurology, Roentgenology, Oto-rhino-laryngology, Ophthalmology, Dermatology, Venerology, Orthopedics, Traumatology, Anesthesiology, Urology, Psychiatry, Physiotherapy	10

### **Medical University - Plovdiv**

Medical University - Plovdiv was established in 1945. It includes Faculties of Medicine and Dentistry, a Medical College and a hospital of its own with 2000 beds. All departments considered indispensable for higher medical education according to modern standards are available- theoretical, pre-clinical and clinical, - as well as laboratories, clinics and other units with modern equipment for diagnostics, treatment, research activities and training of medical and dental students.

#### **Educational programme in Medicine:**

The process of education is based on the modular principle. The basic and special medical subjects are taught in their logical order and interrelationship. The subjects are compulsory, optional and elective. The latter give additional opportunities for deeper knowledge and better skills in the different fields of medical science. The students are taught by means of lectures, laboratory classes and clinical training in groups of 6-10 students, seminar classes, individual training, etc. The students may also have contacts with their teachers for additional educational information.

The didactic offer consists of 48 mandatory courses and 9 optional courses. The evaluation system includes oral (predominantly) and written exams. The ECTS introduction is in progress

The practice represents almost the 62% of the total hours and the clinical clerkship covers 329 days in the 6<sup>th</sup> year.

*Academic curriculum*

	Mandatory courses	Exams	Total Theory and practice Hours	Theory Hours	Practice Hours	Hours (per years and semesters)										
						1 <sup>st</sup>		2 <sup>nd</sup>		3 <sup>rd</sup>		4 <sup>th</sup>		5 <sup>th</sup>		
						I	II	I	II	I	II	I	II	I	II	
1	Physics	I	75	30	45	2/3										
2	Bioorganic chemistry	I	90	45	45	3/3										
3	Philosophical Anthropology	I	30	-	30	0/2										
4	Biology	II	105	60	45	2/1	2/2									
5	Latin and Medical Terminology	II	60	-	60	0/2	0/2									
6	Biophysics	II	60	30	30		2/2									
7	Sports		60	-	60	0/2	0/2									
8	Anatomy	I, IV	260	75	185	1/4	2/4	2/4	2/5							
9	Histology, Cytology & Embryology	I	60	30	30	3/2										
10	Physiology	IV	210	90	120			3/4								
11	Biochemistry	III	180	90	90		3/3	3/3								
12	Medical Ethics & Deontology	III	30	15	15			1/1								
13	Microbiology	V	135	60	75				2/3	2/2						
14	Foreign languages	IV	60	-	60			0/2	0/2							
15	Medical Psychology	IV	15	-	15				0/1							
16	Surgery-propaedeutics	VI	165	75	90					3/4	2/2					
17	Internal Medicine-propaedeutics	VI	240	60	180					2/6	2/6					
18	Pathophysiology	VI	105	45	60					2/2						
19	Pathological Anatomy	V, VII	210	90	120					2/4	2/2	2/2				
20	Hygiene & Ecomedicine	VI	120	60	60					2/2	2/2					
21	Roentgenology & Radiology	VI	105	45	60					1/2	2/2					
22	Occupational Diseases & Toxicology	VI	45	15	30						2/2					
23	Clinical laboratory	VI	60	30	30						2/2					



24	MBC	VI	45	15	30					1/2					
25	Pharmacology	VII	135	60	75						2/2	2/3			
26	Special surgery	VIII	180	60	120							2/4	2/4		
27	Medical Genetics	VII	45	15	30							1/2			
28	Clinical Immunology	VII	30	15	15							1/1			
29	Neurology	VIII	120	60	60							2/2	2/2		
30	Internal diseases I part	VIII	300	90	210							2/5	2/5		
	Internal diseases II part												2/4		
31	Otorhinolaryngology	VII/VII	75	30	45							2/3			
32	Ophtalmology		70	30	40							2/3			
33	Medical Informatics & Biostatistics	III	30	-	30				0/2						
34	Orthopedics	VIII/IX	90	30	60								2/4		
35	Surgery	VIII/IX	90	30	60									2/4	
36	Anesthesiology & Intensive care Medicine	VIII/IX	60	30	30									2/2	
37	Urology	VIII/IX	45	15	30								1/2		
38	Gynecology & Obstetrics	X	195	75	120								2/2	1/	2/3
39	Dermatology	IX	90	30	60								1/2	1/2	
40	Social Medicine	V	60	30	30					2/2					
41	Clinical Pharmacology	IX	45	30	15									2/1	
42	Infectious Diseases & Epidemiology	X	150	75	75									1/2	4/3
43	Pediatrics	X	210	90	120									2/4	4/6
44	Psychiatry	XX	60	30	30										2/2
45	Physical Therapy & Rehabilitation Medicine	IX	45	15	30									1/2	
46	Forensic medicine	X	75	45	30										3/2
47	Internal Medicine: Gastroenterology, Nephrology, Endocrinology	X	220	60	160									2/5	2/5
48	General medicine	IX	60	15	45								20h	20h	20h

TOTAL	5005	1920	3085											
	Semesters			I	II	III	IV	V	VI	VII	VIII	IX	X	
	Lectures(L)/Hours per week			10	9	9	7	16	17	16	14	14	17	
	Practicals (Pr)/ Hours per week			21	15	16	15	24	25	25	24	22	21	

**Optional courses:**

- Foreign languages
- Emergency medicine
- Topographic anatomy
- Sport medicine
- Phytotherapy
- Bulgarian for foreigners
- Toxicology and drug dependence
- Sport
- Philosophy anthropology

**Clinical Clerkships:**

Internal Medicine - 98 days  
 Surgery - 91 days  
 Pediatrics - 42 days  
 Hygiene, Epidemiology & Infectious Diseases-35 days  
 Gynecology & Obstetrics - 42 days  
 Elective Clerkship - 21 days

**Total - 329 days**

### **Thracian University – Stara Zagora**

Thracian University is an autonomous state institution. It was founded in 1995 with a mutual decision by the Stara Zagora academic community and the National Assembly to merge the two already existing higher institutes: Higher Institute of Animal Science and Veterinary Medicine (it was established on 1921 as a part of The Sofia State University) and Higher Institute of Medicine (it was established on 1976). Later on by virtue of Governmental Decree the In-Service Teacher Training Institute and four semi-higher Institutes were transformed into colleges to join the Thracian University.

There are more than 5000 Bulgarian students, and 700 foreign students from 30 countries in Europe, Asia, Africa, and Latin America attending the Thracian University. The training of these students is realized through the use of curricula adapted to European educational standards. The academic staff represents 608 tutors at full-time position and 43 - with part time engagements.

Towards the end of 1997 the following units joined together to form the University with a statute of legal entities:

1. Faculty of Veterinary Medicine including clinics
2. Faculty of Medicine
3. University Hospital
4. Agricultural Faculty including experimental station
5. Training-Experimental Farm
6. In-service Teacher Training Institute
7. Bulgarian - German Agricultural College
8. Medical College, Stara Zagora
9. Medical College, Haskovo
10. Medical College, Sliven
11. Technical College, Yambol

### **Educational programme in Medicine:**

Tuition in the Faculty of Medicine is carried out in accordance with the state requirements on higher education in medicine. The course of training lasts 6 years (10 semesters and a 10-month period of practical training). Medical students who graduate from the Faculty of medicine receive educational degree Master and after defending a thesis graduates become Doctors of medicine (Ph.D)

The curriculum includes 52 different disciplines with total of 5385 hours (the two extra optional subjects Computer & Informatics and History of Medicine - 30 hours - are not included). They are discussed and confirmed by the Academic council. The programme each year is prepared by the Office of education and is confirmed by Faculty council.

Curriculum and Program of Faculty of Medicine are controlled by University Self-Evaluation (Accreditation) Commission and Methodology-Education Commission. They are in charge of teaching quality policy.

The program and curriculum are renewed continuously by special Methodology-Education commission, which discusses what is new medical education in other universities and regularly proposes changes in the curriculum to the Faculty Council. Construction of the teaching programs and their cohesion between different departments is discussed on the departments meetings. Each

department proposes changes in program for his discipline on the basis of general tendencies and changes in other universities. Methodology-Education Commission discusses their suggestions, accepts and presents them to the Faculty Council for discussion.

The courses in all disciplines are updated to meet new needs of medical education. The head of department themselves do research work and keep abreast in the latest scientific developments.

All recommendations of internal (Internal Self-Evaluation Commission, Faculty Council, General Assembly) and external (National Accreditation Commission) are discussed and some of them are accepted.

The feed-back information about post-graduates obtained from questionnaires of medical services, as well as from information about successful passing of competitive examinations for vacancies in health services in our country and abroad shows good level of our Faculty of Medicine.

The didactic offer consists of 63 mandatory, and 2 extraoptional courses. The curriculum includes also 4 clinical attachments and 7 subjects for the State practice. As regards the evaluation system, oral examinations prevail over written tests and practicals. The theory represents almost 40% of the total hours and practice 60%.

The total credits are 360 and the criteria of assignment are on internal assignment basis.

*First year*

Course	C/O	Theory	P& S	Total h	Semester	Exam	Credits
Medical Biology	C	60	75	135	I <sup>st</sup> & II <sup>nd</sup>	O+W	12
Medical Physics	C	45	30	75	I <sup>st</sup>	W+P	6
Bioorganic Chemistry	C	60	60	120	I <sup>st</sup> & II <sup>nd</sup>	W+P	10
Latin language	C	0	60	60	I <sup>st</sup> & II <sup>nd</sup>	O+MCQ	4
Anatomy	C	30	120	150	I <sup>st</sup> & II <sup>nd</sup>	*	14
Cytology & Histology	C	60	30	90	I <sup>st</sup>	O+P	9
Foreign language	C	0	60	60	I <sup>st</sup> & II <sup>nd</sup>	O+MCQ	4
Student sport		0	60	60	I <sup>st</sup> & II <sup>nd</sup>	P	1
<b>Total</b>		<b>255</b>	<b>495</b>	<b>750</b>			<b>60</b>

*Second year*

Course	C/O	Theory	P& S	Total h	Semester	Exam	Credits
Anatomy	C	60	180	240	III <sup>rd</sup> & IV <sup>th</sup>	O+P	15
Biological Physics	C	30	30	60	III <sup>rd</sup>	W	4
Medical biochemistry and pathobiochemistry	C	105	90	195	III <sup>rd</sup> & IV <sup>th</sup>	O	12
Physiology	C	105	90	195	III <sup>rd</sup> & IV <sup>th</sup>	O+MCQ	12
Public health	C	0	15	15	IV <sup>th</sup>	*	3
Medical ethics	C	15	15	30	IV <sup>th</sup>	CE	1
Biostatistics	C	15	15	30	III <sup>rd</sup>	O+W	2
Computers & Informatics *	EO	0	15	15	IV <sup>th</sup>		2
History of medicine*	EO	15	0	15	IV <sup>th</sup>		1
Student sport		0	30	30	III <sup>rd</sup> & IV <sup>th</sup>	PE	1
General medicine	C	10	20	30	III <sup>rd</sup>	O+W	1
Medical microbiology	C	30	30	60	IV <sup>th</sup>	*	2
Medical psychology	C	15	15	30	IV <sup>th</sup>	CE	4
<b>Total</b>		<b>385</b>	<b>530</b>	<b>915</b>			<b>60</b>

\*These two extra optional subjects are not included

**Third year**

Course	C/O	Theory	P&S	Total h	Semester	Exam	Credits
Public health	C	30	30	60	V <sup>th</sup>	O+W	3
Medical microbiology	C	30	45	75	V <sup>th</sup>	O+MCQ	4
Medical genetics	C	30	30	60	V <sup>th</sup>	O	3
Pathophysiology	C	45	60	105	V <sup>th</sup> & VI <sup>th</sup>	O+MCQ	6
Pharmacology	C	45	45	90	VI <sup>th</sup>	*	4
General pathology	C	45	60	105	V <sup>th</sup> & VI <sup>th</sup>	O+P	6
Propaedeutics of internal diseases	C	60	180	240	V <sup>th</sup> & VI <sup>th</sup>	O+P+MCQ	12
General and operative surgery	C	60	105	165	V <sup>th</sup> & VI <sup>th</sup>	O+P	8
Radiology, nuclear medicine and radiotherapy	C	45	60	105	V <sup>th</sup> & VI <sup>th</sup>	O+P	5
Emergency medicine	C	15	15	30	VI <sup>th</sup>	CE	2
General medicine	C	10	20	30	VI <sup>th</sup>	O+W	2
Clinical microbiology	C	0	15	15	VI <sup>th</sup>	CE	1
Neurology	C	30	30	60	VI <sup>th</sup>	*	4
<b>Total</b>		<b>445</b>	<b>695</b>	<b>1140</b>			<b>60</b>

**Fourth year**

Course	C/O	Theory	P&S	Total h	Semester	Exam	Credits
Pharmacology	C	30	30	60	VII <sup>th</sup>	O+W	3
Clinical pathology	C	45	60	105	VII & VIII	O+P	5
Physical therapy and rehabilitation	C	15	30	45	VII <sup>th</sup>	O	2
Oto-rhino-laryngology	C	30	45	75	VII <sup>th</sup>	O+P	4
Hygiene, ecology and occupational diseases	C	45	105	150	VII & VIII	O+P	7
Ophthalmology	C	30	45	75	VIII <sup>th</sup>	O+W	4
Neurology	C	30	30	60	VII <sup>th</sup>	O+P	3
Obstetrics & gynecology	C	60	90	150	VII & VIII	*	7
Skin diseases & sexually transmitted diseases	C	15	15	30	VIII <sup>th</sup>	*	1

Internal diseases and therapy	C	75	180	255	VII & VIII	O+P	11
Surgical diseases	C	60	120	180	VII & VIII	O+P	9
Pediatrics	C	15	30	45	VIII <sup>th</sup>	*	2
Disaster medicine	C	30	15	45	VIII <sup>th</sup>	O+MCQ	1
Neurosurgery	C	14	16	30	VIII <sup>th</sup>	O+P	1
<b>Total</b>		<b>494</b>	<b>811</b>	<b>1305</b>			<b>60</b>

*Fifth year*

Course	C/O	Theory	P& S	Total h	Semester	Exam	Credits
Clinical pharmacology	C	15	15	30	IX <sup>th</sup>	O+W	2
Obstetrics & gynecology	C	15	45	60	IX <sup>th</sup>	O+P	4
Skin diseases & sexually transmitted diseases	C	30	30	60	IX <sup>th</sup>	O	3
Psychiatry	C	45	30	75	X <sup>th</sup>	O	3
Internal diseases and therapy	C	75	180	255	IX <sup>th</sup> & X <sup>th</sup>	O+P	12
Clinical laboratory	C	30	30	60	X <sup>th</sup>	CE	2
Clinical immunology	C	15	15	30	IX <sup>th</sup>	O+MCQ	1
Urology	C	15	30	45	IX <sup>th</sup>	O+P	2
Surgery	C	30	60	90	IX <sup>th</sup>	O+P	5
Orthopedics & traumatology	C	30	60	90	X <sup>th</sup>	O+P	5
Anesthesiology & Intensive medicine	C	30	30	60	IX <sup>th</sup>	O+W	2
Pediatrics	C	75	90	165	IX <sup>th</sup> & X <sup>th</sup>	O+MCQ	8
Epidemiology	C	30	30	60	IX <sup>th</sup> & X <sup>th</sup>	O+MCQ	2
Infectious diseases	C	30	30	60	IX <sup>th</sup> & X <sup>th</sup>	O+W	2
Tropical diseases & parasitology	C	15	15	30	X <sup>th</sup>	O+W	2
Forensic medicine & deontology	C	45	30	75	X <sup>th</sup>	O+P	3
General medicine	C	10	20	30	X <sup>th</sup>	O+MCQ	2
<b>Total</b>		<b>535</b>	<b>740</b>	<b>1275</b>			<b>60</b>

*Hospital practice*

course	Duration/hours	Term
Internal diseases	75 h	After the III year
Surgery	75 h	After the III year
Internal diseases	75 h	After the IV year
Surgery	75 h	After the IV year
<b>Total</b>	<b>300</b>	

*Internship during the 6<sup>th</sup> year before graduation*

course	Duration (weeks)	Duration (days)	Credits
Internal Diseases	13 weeks	91	17
Surgery	11 weeks	77	14
Obstetric & Gynecology	6 weeks	42	8
Pediatrics	6 weeks	42	8
Epidemiology & Infection diseases	5 weeks	14	7
Emergency and Intensive Medicine	2 weeks	35	3
Optional clinical attachments	2 weeks	14	3
<b>Total</b>	<b>45</b>	<b>315</b>	<b>60</b>

*Legend:*

<b>C</b> - Compulsory;	<b>O</b> - Optional;	<b>CE</b> - Current examination;
<b>EO</b> - extra optional;	<b>W</b> - Written examination;	<b>MC</b> - Multiple Choice Questions;
<b>O</b> - Oral examination;	<b>PE</b> - Preliminary examination;	<b>P</b> - Practical examination;
<b>P&amp;S</b> -Practicals and seminars	* - next year.	



### **Medical University - Varna**

Medical University-Varna was established in 1961 by a decree of the National Assembly of Republic of Bulgaria as a pursuant to Higher Medical Institute. In 1995 the latter was transformed to Medical University. This establishment is the third largest Medical University in the country and aims to provide adequate healthcare for people living in this Northeastern Bulgaria. For more than forty years the reality of Health becomes a part of students, researchers, instructors and specialists life thanks to this University. Plenty of incredible persons and specialists have left their unique presence in the Medical University of Varna. Although quoting would be difficult, the university staff keeps their decrees of professional work and persistence, ethics, mission and last but not least the excessive humanity. Since its establishment 8351 Bulgarians and 977 foreign students from 45 countries have graduated from Varna Medical University. However the numbers do not matter by themselves if every alumnus of the University doesn't bring in his heart the University's values which history is never going to change. The truth value called person in the cause of Medical University - Varna that everyone of us perceps in his own way.

The Mission of Medical University of Varna is to make the most of its qualities for a better health way in the future. Medical University - Varna is not only a fundamental, educational, scientific and medical center in Northeast part of Bulgaria and The Black Sea region but also a holder of basic and most important values of high quality of education namely providing an adequate environment for training; guaranteeing research and training opportunities for development; accessibility and equal rights for everyone; opportunities for personal and professional development and traditions. Moreover our mission centers on providing world-famous quality of higher education, post graduate education in the field of Medicine and healthcare management and gained therefore the recognition by the International Universe of Science and Practice. Everyday people from Northeast part of Bulgaria and the Black Sea region obtain adequate and professional medical help thanks namely to the Medical University of Varna. The support given to Healthcare Institutions in the region, results in an improvement of their officers` skills and the qualities of those supplying healthcare and administrative services especially.

### **Educational programme in Medicine:**

The full-time course in medicine for the qualification degree “Doctor of Medicine” lasts 6 years following the academic curriculum, presented below. The teaching process consists of 10 semesters, 16 academic weeks for each semester and a 13-month clinical practice before graduation. The theory represents almost 39% of the total hours and practice 61%.

The course of studies includes 40 mandatory courses and 6 out of 53 optional disciplines. Student’s education is provided through lectures, seminars, tutorials, laboratory practice and consultations in the theoretical disciplines. Evaluation: written and oral exams. ECTS application is in progress.

*Academic curriculum*

No	Subject	Hours			Hours (per years and semesters)										
		Total	L	Pr	I		II		III		IV		V		
					I	II	I	II	I	II	I	II	I	II	
1	Medical Physics	75	30	45	2/3										
2	Medical chemistry	90	45	45	3/3										
3	Biology	135	60	75	2/3	2/2									
4	Biophysics	60	30	30		2/2									
5	Latin language	60	-	60	0/2	0/2									
6	Foreign language - specialized	60	-	60			0/4								
7	Biochemistry	210	120	90		2/0	4/3	2/3							
8	Anatomy and histology	420	135	285	1/3	3/5	2/6	3/6							
9	Cytology	90	45	45	3/3										
10	Physiology	240	120	120			4/4	4/4							
11	Medical psychology	30	15	15			1/1								
12	MBS	60	30	30					2/2						
13	Microbiology	150	60	90				2/3	2/3						
14	Social medicine	90	45	45		1/1	2/2								
15	Medical ethics	30	15	15					1/1						
16	Clinical laboratory	60	30	30						2/2					
17	Medical genetics	50	20	30							1/2				

18	Pathophysiology	150	60	90					2/3	2/3					
19	Internal medicine - Propaedeutics	240	60	180					2/6	2/6					
20	General and operative surgery	165	60	105					2/3	2/4					
21	General pathology	90	45	45					3/3						
22	Clinical pathology	135	60	75						1/1	1/2	2/2			
23	Hygiene and ecology	120	60	60				2/2	2/2						
24	Occupational diseases	30	15	15								1/1			
25	Roentgenology and radiology	105	45	60						1/1	2/3				
26	Pharmacology	150	60	90						2/3	2/3				
27	Otorhinolaryngology	80	35	45							2/3				
28	Ophthalmology	75	30	45								2/3			
29	Reanimation and intensive care	60	30	30									2/2		
30	Surgery diseases	255	105	150							2/4	2/2	1/2	2/2	
31	Neuro surgery	30	15	15								1/1			
32	Urology	45	15	30									1/2		
33	Orthopedics and traumatology	80	35	45									2/3		
34	Gynecology & Obstetrics	200	80	120							1/2	2/3	2/3		
35	Forensic medicine	75	45	30									1/0	2/2	
36	Neurology	120	60	60							2/2	2/2			
37	Physical Therapy	45	15	30								1/2			
38	Internal diseases and toxicology	580	160	420								3/6	3/6	3/6	3/8
		15	15	-											1/0
39	Psychiatry	75	45	30											3/2

40	Pediatrics	210	90	120								3/4	3/4
41	Dermatology	90	30	60								1/2	1/2
42	Infectious Diseases, Epidemiology, Parasitology and Medicine of tropical diseases	150	60	90								2/2	2/4
43	Clinical pharmacology	45	15	30									1/2
44	Sports	60	-	60	0/2	0/2							
45	General medicine	60	-	60			0/1			0/1		0/1	0/1
	<b>TOTAL</b>	<b>5445</b>	<b>2145</b>	<b>3300</b>									

### **Higher Institute of Medicine - Pleven**

The Pleven Medical University, one of the five medical Universities in Bulgaria, was established in 1974, expanding the horizons, size and reputation of the City Hospital, founded in 1865. Today, combining traditions of the past with the present possibilities, it incorporates educational and therapeutic facilities, contemporary pre-clinical base, Institute Hospital with 1694 beds with clinics in all major medical fields, as well as a large number of specialized clinics and research units with modern diagnostic and therapeutic equipment. These are efficiently used to treat patients, train students, trainee doctors, post-graduates and for research work.

The University has all theoretic, pre-clinical and clinical departments required for the higher medical education. Up to date, over than 4081 Bulgarian and 582 international students from 29 countries have graduated from the Institute. The current number of students is 756, 232 of them are international students , including 137 of Indian nationality . Over a hundred young doctors, including sixty-one students from all over the world , are taking postgraduate courses at specialized clinics of the University Hospital. Highly qualified lecturers are employed, with comprehensive academic experience. The course of instruction is carried out in 24 departments by 62 professors and associate professors and 279 assistant professors. Most of them are members of national and international scientific and medical societies and authors of many research studies.

The academic year traditionally begins i n September 15 and ends on June 30 next year. It has two semesters of 15 weeks each, including 1-week holidays for Christmas and Easter. Various modern teaching methods are applied in the academic process. These include theoretical lectures, small group practical tutorials and seminars. Additionally, the students may join extracurricular teaching courses and scientific circles functioning at the departments. Training groups are composed of maximum 6 students.

Current monitoring and assessment of the students ' knowledge in each subject is done by assistant professors, who are responsible for the students ' group instruction during the semester. Examinations are conducted in all required subjects of instruction after each semester within the examination session, which last s 45 days. Final assessment of knowledge acquired by the students after accomplishment of their full course of study is given by the State Examination Board at a comprehensive theoretical and practical examination.

The students can freely join students' unions and societies. The foreign students can establish their own national, ethnic and religious communities which have to be in compliance with Bulgarian laws. According to their interests and individual capabilities, students can become members of different scientific circles, culture and sports clubs.

### **Educational programme in Medicine:**

The full-time course in medicine for the qualification degree "Doctor of Medicine" lasts 6 years after the completion of 41 examinations and the State examination. The curriculum is realized in three consequent modules: pre-clinical training - 2 years, clinical training - 3 years, and pre-graduation clinical practice - 1 year. The didactic offer consists of 45 mandatory courses, 9 optional courses to be chosen from the 1<sup>st</sup> to the 3<sup>rd</sup> year, except for

Acupuncture that is a facultative subject of the 5<sup>th</sup> year. The curriculum includes also 4 clinical attachments and 7 subjects for the State practice. As regards the evaluation system, oral examinations prevail over written tests and practicals. The theory represents almost the 40% of the total load against the 60% of practice.

The total credits are 362. The criteria of assignment are on internal assignment basis

Academic Curriculum Of The Specialty "Medicine"

№	Mandatory courses	State requir. (in hours)	28 acad. weeks		total	C/O/F	Exam.	Total credits	Loading per week during semesters (lectures/pract. exercises)																			
			Theory	Practice					I		II		III		IV		V		VI		VII		VIII		IX		X	
									L	E	L	E	L	E	L	E	L	E	L	E	L	E	L	E	L	E	L	E
									1st year				2nd year				3rd year				4th year				5th year			
1	Cytology, histology	90	56	42	98	C	O+P	7	4	3																		
2	Physics	75	42	42	84	C	W	6	3	3																		
3	Chemistry	90	56	42	98	C	O+W+T	7	4	3																		
4	Biology	100	56	56	112	C	O+T	8	2	2	2	2																
5	Latin lang. with med. terminology	60	0	70	70	C	W	3	0	2	0	3																
6	Anatomy	320	84	238	322	C	O+P*	11	0	5	3	8	3	4														
7	Biophysics	56	28	28	56	C	W	4			2	2																
8	Physiology	190	84	112	196	C	O+T+P	14			3	4	3	4														
9	Biochemistry	180	84	98	182	C	O+W+T	13			3	3	3	4														
10	Social Medicine	120	42	56	98	C	W+T	6					2	2	1	2												
1	Medical		14	14	28	C	W+T	2							1	1												











### CLINICAL ATTACHMENTS

<u>No</u>	<u>Practice on:</u>	<u>Duration</u>	<u>Term</u>	<u>Credits</u>
1	<u>General practice</u>	<u>4 weeks</u>	<u>after 1st year</u>	-
2	<u>General practice</u>	<u>4 weeks</u>	<u>after 2nd year</u>	-
3	<u>Internal Diseases and Surgery</u>	<u>4 weeks</u>	<u>after 3rd year</u>	-
4	<u>Pediatrics and Intensive cares</u>	<u>4 weeks</u>	<u>after 4th year</u>	-

### STATE PRACTICE - after 5th year

<u>No</u>	<u>Practice on:</u>	<u>Duration</u>	<u>Credits</u>
1	<u>Internal Diseases</u>	<u>12 weeks</u>	<u>15</u>
2	<u>Obstetrics and Gynecology</u>	<u>7 weeks</u>	<u>9</u>
3	<u>Surgical Diseases</u>	<u>10 weeks</u>	<u>12</u>
4	<u>Pediatrics</u>	<u>6 weeks</u>	<u>7</u>
5	<u>Emergency medicine</u>	<u>3 weeks</u>	<u>4</u>
6	<u>Epidemiology, Inf. dis., Hygiene, Social medicine</u>	<u>7 weeks</u>	<u>9</u>
7	<u>Optional clinical attachment</u>	<u>2 weeks</u>	<u>4</u>
			<u>60</u>

### Legend

\* examination next semester

exam. is held during the marked semester

\*\* ID exam. including : Clin. Labor., Pulmology, Endocrinology, Cardiology

\*\*\* ID exam. including: Gastroenterology, Nephrology, Hematology and Gen. and clin.

immunology

C = Compulsory

F = Facultative;

EP = Extraoptional;

W = written exam;

T = Test;

O = Oral exam.;

Pr. = Practical exam.

### Medical colleges:

### **List of medical colleges in Bulgaria:**

*Medical College - Sofia*  
*Medical College - Blagoevgrad*  
*Medical College - Vratza*  
*Medical College - Plovdiv*  
*Medical College - Pleven*  
*Medical College - Haskovo*  
*Medical College - V.Tarnovo*  
*Medical College - Burgas*  
*Medical College - Varna*  
*Medical College - Stara Zagora*  
*Medical College - Dobrich*  
*Medical College - Ruse*

### **Educational program description:**

The term of education in the colleges is three years following a graduated secondary education. The graduates receive higher education with educational - qualification degrees "specialists" : nurses, midwives, X-ray technicians, medical laboratory technicians, assistant-pharmacists, social workers, dental technicians, rehabilitation technicians, sanitary inspectors, and masseurs.

The processes of education as well as the curriculum are common for all colleges, there for here below an example for the Medical Colleges – Sofia, Blagoevgrad and Vratza is included.

The graduates from these colleges can apply to study for a bachelor degree at the Faculty of Nursing. Those who have the qualification assistant-pharmacist can apply for the part-time programme at the Faculty of Pharmacy for Master degree.

**MEDICAL COLLEGES – Sofia, Blagoevgrad, Vtarza  
Medical University, Sofia, Bulgaria**

*Academic Courses*

*for*  
**Specialist qualification in Nursery Studies, term of education – 3 academic years**

No	Courses	Lectures	Practicals	I (15 weeks) h/week	II (15 weeks) h/week	III (15 weeks) h/week	IV (15 weeks) h/week	V (15 weeks) h/week	VI (15 weeks) h/week	Current	Exam
A	<b>Compulsory courses</b>										
I.	<i>Special subjects</i>										
1.	<b>Nursing care</b>	160	290	7	7	6	6	4	-	-	1,2,3,4,5 semesters
II	<i>Medical – Biological subjects</i>										
1	<b>Human Anatomy</b>	40	5	3	-	-	-	-	-	-1	
2.	<b>Pathoanatomy</b>	12	3	-	1	-	-	-	-	2	-
3.	<b>Physiology</b>	40	5	-	3	-	-	-	-	-	2
4.	<b>Pathophysiology</b>	15	-	-	-	1	-	-	-	3	-
5.	<b>Microbiology</b>	24	6	2	-	-	-	-	-	-	1
6.	<b>Hygiene and Ecology</b>	28	2	2	-	-	-	-	-	1	-
7.	<b>Pharmacology</b>	52	8	-	2	2	-	-	-	2	3
8.	<b>Medical Physics and Equipment</b>	24	6	-	-	-	2	-	-	4	-
9.	<b>Physiotherapy</b>	26	4	-	-	-	-	2	-	5	-

10.	Latin language	14	16	2	-	-	-	-	-	1	-
11.	Biochemistry	15	-	-	1	-	-	-	-	2	-
12.	Clinical laboratory practice	10	5	-	1	-	-	-	-	2	-
13.	Genetics	15	-	-	--	--	-	1	-	5	-
14.	Diagnostic Imaging	14	1	-	-	-	1	-	-	4	-
15.	Dietetics	15	-	-	-	-	1	-	-	4	-
16.	Internal diseases	143	22	-	4	4	3	-	-	-	2,3,4
17.	Surgery diseases and Traumatology	98	22	-	2	3	3	-	-	-	2,3,4
18.	Anesthesia and Intensive Care	29	16	-	-	-	3	-	-	-	4
19.	Children diseases and Neonatology	64	11	-	-	-	2	3	-	4	5
20.	Infectious diseases and Epidemiology	38	7	-	-	3	-	-	-	-	3
21.	Obstetrics and Gynecology	26	4	-	-	2	-	-	-	3	-
22.	Nervous disorders	26	4	-	-	-	-	2	-	-	5
23.	Psychiatrics	15	15	-	-	-	-	2	-	-	5
24.	Geriatrics	30	-	-	-	-	-	2	-	5	-
25.	Ophthalmology	10	5	-	-	-	-	1	-	5	-
26.	Otolaryngology	10	5	-	-	-	-	1	-	5	-
27.	Dermal and Venereal diseases	14	1	-	-	-	1	-	-	4	-
28.	Disaster Medicine	30	-	-	-	-	-	2	-	5	-

<b>III Humanity and Social Sciences</b>											
1.	<b>Health Promotion</b>	15	-	1	-	-	-	-	-	1	-
2.	<b>Medical Psychology</b>	8	7	1	-	-	-	-	-	1	-
3.	<b>Medical Sociology</b>	15	-	1	-	-	-	-	-	1	-
4.	<b>Medical Ethics and Deontology</b>	22	8	2	-	-	-	-	-	1	-
5.	<b>Children Psychology and Pedagogy</b>	51	9	4	-	-	-	-	-	-	1
6.	<b>Social and Health Legislation</b>	30	-	-	2	-	-	-	-	2	-
7.	<b>Social Medicine</b>	30	-	-	-	-	-	2	-	5	-
8.	<b>Computing in Medicine</b>	10	20	-	-	-	-	2	-	5	-
9.	<b>Sport</b>	4	56	2	2	-	-	-	-	1,2	-
<b>IV Practical Training</b>											
1.	Practical studies	-	1170	180	180	270	270	270	-	1,2,3,4,5	-
2.	<b>Pre-graduation clinical practice</b>	-	600	-	-	-	-	-	600	6	-



B	Optional courses										
1	<b>Charity as leading trend in history of nursing</b>	12	3	1						1	1
2	<b>Behavior of the nurse wit patients of different cultures</b>	15	-5		1					2	2
3	<b>Up to date treatment and nursing care of oncology diseases</b>	10	5				1			4	4
4.	<b>Up to date means and types of wounds treatment in nursing practice</b>	10	5				1			4	4

C	Facultative courses										
1.	Language competence of the nurse in professional documentation preparation	-	15		1					2	2
2.	Philosophy anthropology	15	-			1				3	3
3.	Healthcare economics	15	-				1			4	4
4.	Specialized medical terminology in English, German and French languages on nursing care, pharmacy, dentistry and sanitary control	30	-			2	2	2		3,4,5	3,4,5

**STATE EXAMS:**

1. **NURSING CARE:**  
- **PRACTICE;**  
- **THEORY.**
2. **INTERNAL DISEASES AND PHARMACOLOGY.**
3. **SURGERY DISEASES, ANAESTHESIA AND INTENSIVE CARE.**
4. **CHILDREN DISEASES.**

**Distribution of clinical practice in hours per semester and clinical departments**

Departments	I semester /hours/	II semester /hours/	III semester /hours/	IV semester /hours/	V semester /hours/	VI semester /hours/	TOTAL /hours/
<b>1. Internal diseases</b>	48	96	108	90	-	200	542
<b>2. Neurology</b>	-	-	-	-	54	80	134
<b>3. Surgery</b>	48	84	108	90	-	200	530
<b>4. Otolaryngology</b>	-	-	-	-	36	-	36
<b>5. Ophthalmology</b>	-	-	-	-	36	-	36
<b>6. Pediatrics</b>	-	-	-	54	54	120	228
<b>7. Children's Medical Center</b>	36	-	-	-	-	-	36
<b>8. Kindergarten for children up to 3 years old</b>	24	-	-	-	-	-	24
<b>9. Practice in Orphanage Care Homes</b>	24	-	-	-	-	-	24
<b>10. Mother - Newborn Infant Center</b>	-	-	-	36	-	-	36
<b>11. Psychiatric Diseases Center</b>	-	-	-	-	54	-	54
<b>12. Geriatrics</b>	-	-	-	-	36	-	36
<b>13. Home care agencies</b>	-	-	54	-	-	-	54
<b>TOTAL:</b>	<b>180</b>	<b>180</b>	<b>270</b>	<b>270</b>	<b>270</b>	<b>600</b>	<b>1770</b>

#### **IV. Research organizations other than universities**

The research in the field of Biotechnology in Bulgaria is performed in partially overlapping with biotechnology education organizations. Major part of this activity takes place in different Institutes, belonging to Bulgarian Academy of Sciences (BAS), Agricultural Academy, Medical Universities. There are also different institutions with an independent statute. All these organizations dealing with Biotechnology are listed below:

##### **1. Research Institutes - BAS**

The Bulgarian Academy of Sciences (BAS) is a national autonomous association for scientific research, which includes academic institutes, laboratories and other independent research entities.

The Bulgarian Academy of Sciences unifies the academicians and corresponding members from the country, recognized Professors, researchers from scientific institutes in Bulgaria, as well as foreign members. The Bulgarian Academy of Sciences is a legal entity.

The Bulgarian Academy of Sciences participates in scientific research, in accordance with human values and national interests and works for the multiplication of the spiritual and material treasures of the Bulgarian people.

The Bulgarian Academy of Sciences:

- Performs fundamental experiments and preparation of highly trained specialists independently and together with universities.
- Investigates the history, language and literature of the Bulgarian people and their contribution to world culture.
- Develops prognosis analysis and long-term programs for social, economical, scientific, technical, ecological and cultural development of the country.
- Provides statements and assessments of projects and programs with national importance.
- Publishes scientific works and scientific studies for the general public.
- Deals with manufacturing, trading and other activities, related to scientific experiments and application of scientific results.



*Address:*

1, 15 Noemvri Str., 1040 Sofia, Bulgaria

Tel. exchange:(+359 2) 989-84-46

Fax (+359 2) 981-66-29; 986-25-23; 988-04-48

Telex:( 067) 224-24

Web- site: <http://www.bas.bg>

### **1.1. Institute of Molecular Biology**

The Institute of Molecular Biology (IMB) at the Bulgarian Academy of Sciences has been founded in 1960 as Central Biochemical Laboratory. Since 1977 the Institute was renamed with its present name, the Institute of Molecular Biology. It is situated in the eastern part of Sofia, at the heart of a large constellation of academic institutes that forms the major campus of the Bulgarian Academy of Sciences.

IMB is the leading national institution in the field of molecular biology, molecular genetics, cell biology, biochemistry and bioorganic chemistry.

Since 1990 IMB is a member of the Global Network for Molecular and Cell Biology (MCBN) at UNESCO.

*Address:*

Acad.G.Bonchev Street, bl. 21,  
Sofia 1113, Bulgaria  
Phone/Fax: (359 2) 72 35 07;  
E-mail: [grs@obzor.bio21.bas.bg](mailto:grs@obzor.bio21.bas.bg)

### **1.2. Institute of Microbiology**

The Institute of Microbiology is one of the first structures of the Bulgarian Academy of Sciences. The Institute of Microbiology is a leading Bulgarian research organization in the field of general, applied and infectious microbiology, virology and immunology. It offers specialized knowledge, practical skills as well as professional expertise in different branches of fundamental and applied microbiology and biotechnology as investigation of different products of microbial origin like organic acids, amino acids, enzymes and enzyme-inhibitors, antibiotics, etc. Another main trend of research of the institute is connected with microbial pathogenicity and virulence, fundamentals of immunology and host- parasitic interactions.

*Address:*

Acad.G.Bonchev Street, bl. 26,  
Sofia 1113, Bulgaria  
Phone/Fax: (359 2) 979 700 109

### **1.3. Institute of plant physiology Acad. M. Popov**

Acad. M. Popov Institute of Plant Physiology of the Bulgarian Academy of Sciences (IPP) is a leading research centrum of plant physiology and biochemistry in Bulgaria. The main directions of scientific research in the Institute are plant growth and development, physiological and biochemical base and mechanisms of regulation of photosynthesis, plant mineral nutrition and plant water relation, regulation of plant metabolism and gene expression, and physiology, biochemistry and biotechnology of algae. All of them are directly connected with the main foreign and national priorities of plant physiology- ecology and safe environment, food supply and bioresources.

*Address:*

Acad. G. Bonchev str., bldg. 21,  
Sofia 1113, Bulgaria  
Telephone: +359-(2) 72 84 80  
Fax: +359-(2) 73-99-52  
E-mail: [ifr@obzor.bio21.bas.bg](mailto:ifr@obzor.bio21.bas.bg)

#### 1.4. Institute of Organic Chemistry with Centre of Phytochemistry

The Institute of Organic Chemistry with Centre of Phytochemistry is founded in 1960. Its main topics or research, connected with biotechnology are: investigation of basic classes of secondary metabolites (alkaloids, terpenes, phenolic compounds) in medical and flavor plants with Bulgarian and foreign origin, their structure, biological activity and importance as hemotaxonomic markers.

Elucidation of the mechanism of oxidation and oxidation stability of lipids and lipid-containing foods and cosmetic products; accomplishment of enzymatic synthesis of peptides and oligonucleotides, isolation and characterization of new proteolytic enzymes, their inhibitors, peptide antibiotics and oxygen-transfer proteins; products of importance for food industry, medicine, etc.

*Address:*

"Acad. G. Bonchev" Str., Bl .9,  
1113 Sofia, BULGARIA,  
Phone: (+359) (2) 724 817;  
Fax: (0359) (2) 700 225  
E-mail: [iochem@orgchm.bas.bg](mailto:iochem@orgchm.bas.bg)



### 1.5. The Institute of Biophysics

The Institute of Biophysics is a leading research institute in the fields of biophysics, biochemistry, cellular biology, motor control and muscle electrophysiology. Main topics of research include the molecular structure, metabolism and functions of biological membranes, excitable and photoexcitable membranes, ion channels, biopotentials and extracellular electric fields, conformation and function of proteins. The basic research is closely associated with various biomedical problems such as material biocompatibility, disorders in the motor control and lung surfactant systems, pharmacological methods, etc

*Address*

Acad. G. Bonchev Str., bl. 21,  
1113 Sofia, Bulgaria  
Phone/Fax: (359 2) 9712493;  
e-mail: [biophys@obzor.bio21.bas.bg](mailto:biophys@obzor.bio21.bas.bg)

### 1.6. Institute of Botany

The Institute of Botany was founded in 1947 (on the base of the Royal Natural Science Museum, Department of Botany, founded in 1889). The Institute is engaged mainly in fundamental and applied research work in various fields of botany, such as: protection of natural flora, plant vegetation and fungi; ecology and law-governed regulations of distribution of plants and plant communities; biological characteristics, productivity, energy and elements turn-over in the communities and their role in biogeocoenoses; genetic potential, mechanisms and trends of speciation processes; search for new useful plants and natural plant resources; rational utilization of plants and fungi as natural resources; the changes in the generative sphere and embryology of plants as a result of the environmental impact

*Address*

Acad. Georgi Bonchev Street, Bl. 23  
1113 Sofia, Bulgaria  
phone: (+359 2) 718259  
fax: (+359 2) 719032  
e-mail: [botinst@iph.bio.bas.bg](mailto:botinst@iph.bio.bas.bg)

### **1.7. The Central Laboratory for General Ecology**

The Central Laboratory for General Ecology was established on January 01, 1996, as a successor of the Institute of Ecology (1989-1995) and the National Coordination Center for Ecology and Environmental Protection (1974-1989) at the Bulgarian Academy of Sciences. The main scope of its scientific work is in the field of

Bio-Cenology and Ecological Modeling, Bio-Diversity Conservation and Bio-Monitoring. The activities cover large scale of natural and artificial ecosystems and habitats of all kinds (marine, freshwater, terrestrial, forest, agrosystems, etc.).

*Address:*

Acad. G. Bonchev street, block 1.  
SOFIA 1113, BULGARIA  
Phone: +359-2-722572  
Fax: +359-2-722577  
E-Mail: santur@bgcict.acad.bg

### **1.8. The Institute of Chemical Engineering (IChE)**

The Institute of Chemical Engineering is a permanent scientific organisation for chemical engineering at the Bulgarian Academy of Sciences (BAS) and a principal national research centre for chemical engineering and bioengineering science. The IChE is involved both in fundamental and applied research in the priority fields like "new technologies", "economy of energy", "environmental protection".

*Address:*

Acad. G. Bonchev str., block 103  
SOFIA 1113, BULGARIA  
Phone: +359-2-70 42 49  
Fax: +359-2-70 75 23  
E-Mail: ichemeng@bbas.bg

## **2. Other Main Research Institutes, Laboratories and Services**

### **2.1. Institute of Genetic Engineering**

Bulgaria  
2232 Costinbrod  
phone: 359 721 2552  
fax: 359 721 4985  
e-mail: geneg@mtel.net

### **2.2. Institute of Wheat and Sunflower**

Bulgaria  
9520 General Tosheva  
phone: 359 58 2 74 54; 359 58 87 91 / 377  
fax: 359 58 87 91 /222  
e-mail: ips@dobrich.netpus.bg

### **2.3. Institute of Barley**

Bulgaria  
8400 Karnobat  
phone: 359 559 27 31; 359 559 27 02  
fax: 359 559 27 91  
e-mail: niie@unacs.bg

### **2.4. Institute of Corn**

Bulgaria  
3230 Knezha  
phone: 359 9132 27 11; 359 9132 21 63  
fax: 359 9132 25 07  
e-mail: mri@ain.infotel.bg

### **2.5. Institutes of Fruit Cultures**

Bulgaria  
4004 Plovdiv,  
phone: 359 32 76 00 15; 359 32 77 08 11  
fax: 359 32 76 08 08  
e-mail: instov@evro.net

Bulgaria  
2500 Kiustendil  
phone: 359 78 2 75 32; 359 78 2 26 12  
fax: 359 78 2 40 39

**2.6. Institute of Fodder**

Bulgaria  
5800 Pleven  
89, “General Vl. Vazov” St.  
phone: 359 64 2 34 74; 359 64 2 24 74  
fax: 359 64 3 85 28  
e-mail forage@mbox.infotel.bg

**2.7. Institute of farming “Obrazcov Chiflik”**

Bulgaria  
7007 Rousse  
phone: 359 82 22 26 60 / 253  
fax: 359 82 22 58 98  
e-mail: stivanov@rousse.bitex.com

**2.8. Institute of Cotton and Hard Wheat**

6200 Tchirpan  
phone: 359 416 23 45  
fax: 359 416 31 33

**2.9. Institute of Sugar Beat**

9700 Shoumen  
phone: 359 54 6 35 38; 359 54 5 00 21  
fax: 359 54 5 69 06  
e-mail izec@main.infotel.bg

**2.10. Institute of Animal Breeding**

**2232 Costinbrod**  
phone: 359 721 23 87  
fax: 359 721 22 96  
e-mail: breeding@agro.bg

**2.11. Institute of Mountain Farming and Breeding**

5600 Trojan  
phone; 359 670 2 42 71  
fax: 359 670 2 28 73  
e-mail: [isuba@main.infotel.bg](mailto:isuba@main.infotel.bg)

**2.12. National Wines Control and Research Institute**

Bulgaria  
1618 Sofia; 134, Tzar Boris III” Blvd.  
Phone; 359 2 55 40 21  
fax: 359 2 955 52 24  
e.mail; [nwrci@mbox.digsys.bg](mailto:nwrci@mbox.digsys.bg)

**2.13. Laboratory of Reproductive Immunology**

Bulgaria  
1618 Sofia; 15, Dimitar Nestorov Blvd.,  
Phone: (+359 2) 593-044  
Fax:(+359 2) 595-110,  
Email: [root@Sun.medun.acad.bg](mailto:root@Sun.medun.acad.bg)

**2.14. More than fifteen Complex Test Stations and Services.**

#### **IV. List of private organization and science & technology parks involved in biotech-related fields**

AgroBioTech Park - joint venture between the AgroBioInstitute and the Biological Faculty, Sofia State University

AKTIV 2006 Ltd  
Plovdiv 4003, 6 Sider Voivoda, Str tel. 032640723

ALARA 2000 Ltd  
Sofia 1505, 6 Ilarion Dragostinov Str. tel. 9713668

BEP KOSKOR Ltd  
Sofia 1000, 187a Rakovski Bld. tel. 9888147

BIC SIME-98 AD  
Sofia 1592, 12 Asen Jordanov Bld., tel. 791573

VDM – Jolovski & Sons SD  
Sofia 1000, 12 narodno sabranie Sq., tel. 9862226; 880635; 801618

Gamakonsult Ltd  
Sofia 1000, 43 Iskar Str. tel. 9832846; 9831762

GITAVA Ltd.  
Sofia, tel. 779279

DNK – METAL AD



Plovdiv 4009, 9 Asenovgradsko Shose Str., tel. 0361222651; 032265449

EVROTEST – KONTROL AD  
Sofia 16 G. M. Dimitrov bld., tel. 029651600; 028700583

EGUIT – PLOVDIV Ltd.  
Plovdiv 4000, 9 Trajcho Kitanchev Str., tel. 032641942; 032641944

EKOTECHNIKA Ltd.  
Sofia 1000, 11 Kokiche Str., tel. 9630760

EKOTECH KONSULT Ltd.  
Sofia 1111, j. k. Yavorov, tel. 722538

ELGEN ENGINEERING Ltd.  
Sofia 1271, 30 Iliensko Shose Str., tel. 267541; 382718

ЕЛЕКТРОИНВЕНТ ООД  
София 1407, бул. Черни Врѝх 43, тел. 8687065; 621406

ELKONTROL Ltd.  
Sofia 1510, j.k. Hadji Dimitar 16 Ivan Jovchev Str., tel. 8474080; 474080;  
9455734; 9454839

EMIS Ltd.  
Sofia 1000, 72 Carigradsko Shose Bld., tel. 9753221; 758191

EMSIEN Lts.



Sofia 1784, j.k. Mladost tel. 763372; 771328

ZEOREKS-INTRNATIONL Ltd.  
Sofia tel. 8319013

ZOND Ltd.  
Sofia 1324, j.k. Lulin tel. 262452; 264524; 263450

IEHIT AD  
Plovdiv 4023, j.k. Trakia tel. 03428408; 03428394

IMLT AD  
Sofia 1592, 10 Asen Jordanov Bld., tel. 9521783; 9523278; 9522159; 9522360;  
9522373

Inovation Center in Black Metallurgy IC-ICM AD  
Sofia 1780, j.k. Botunec tel. 9943662; 74021690; 892138

INPLAST Ltd.  
Sofia 1172, 170 Dragan Tsankov Bld., tel. 624063; 622940; 685255

Institut for spacecraft research  
Sofia 1000, 6 Moskovsak Str., tel. 9872873; 9883503; 9872887;  
885115

Institute for space and time Ltd.  
Sliven 8800, d-r Konstantin Stoilov Str. тел. 04424404

Institute for woodworking Ltd.





Pazardjik 4400, 2 Ljuben Bojanov, tel. 03456290; 03456218

Institute for energetic Ltd.  
Sofia 1000, 34 Patriarh Evtimii Bld., tel. 9634576

Institute for agriculture  
Karnobat 8400, 1 Industrialna Str., tel. 05594809; 05592703; 055948; 05592702

Institute for agriculture - Kjustendil  
Kjustendil 2500, Sofiiski Shose Str., tel. 07822612

KOMEKSPERT – STANCHEV & SONS SD  
Sofia 1404, Nikola kamenov str. tel. 685755

LEMNA EKOINVEST O BULGARIA AD  
Burgas 8000, 5 Kont Androvanti Str., tel. 05648747; 056841403

MATTEEM Ltd.  
Sofia 1343, j.k. Lulin tel. 9805118

Medico-diagnostic laboratory Lipogard Ltd.  
Sofia tel. 9461138

MILVEK Ltd.  
Sofia 1000, Okolchica Str., tel. 737050; 732582

MINENERGO Ltd.  
Sofia 1164, 19 Yanko Sofiiski Voivoda Str. tel. 8669831



MULTI-NIK ET  
Burgas 8001, 1 Vardar Str, tel. 056858365

National astronomy observatory and planetarium  
Smolian 4700, 20 Bulgaria Bld., tel. 030123074; 030122953

PSI FARMA SUPPORT Ltd.  
Sofia 1407, 87 Djeims baucher Bld., tel. 9625187; 9625957;  
9504200; 9179970; 9504195

SILTEK INGENERING Ltd.  
Sofia 1407, 14a Srebarna Str., tel. 9624949; 628157; 9694820; 8624884; 628057

STS PAK AD  
Gabrovo 5300, 14 Stacionna Str., tel. 06621071

TEMA Ltd.  
Sofia 1000, Akad. Evgeni Pavlovski Str. tel. 9751030

TERMATEST – FLOROV & Son SD  
Sofia 1407, 5 Filip Kutev str., tel. 9914054

TIMPANO Ltd.  
Sofia 1606, 99 Vladajska Str. tel. 9867358; 9532570; 9807361



*Biotechnology and Public Health Transnational Network – HealthBioTech*  
BG/04/B/F/T-166032

TMA FARMA Ltd.  
Sofia 1618, 6-8 Pencho Slavejkov Bld., tel. 9521980

## **V. Additional information**

### **1. The system of training on biotechnology in Bulgaria –features and problems**

(Information is based on the survey performed by Z. Alecieva and R. Dimkov, published in *Biotech. & Biotech. Equip.* No4, 2007)

The commencement of Biotechnological education in Bulgaria emerged in the early 1980's when traditional industries – food, beverage and pharmaceutical – were strongly influenced by the ideas of the “new Biotechnology”. An ambitious National program for development of this kind of education has been created and approved in 1983. A year later, in 1984, a leading unit for its government was created – the Inter-University Council of Biotechnology, consisting of representatives from Bulgarian Universities, research and economic organizations in the field of Biotechnology and aiming adaptation, upgrading and coordination of biotechnological education in accordance with the world trends. The Inter-University Council was also a consulting body of Ministry of Education and in this way it was playing the role of a major Coordinator of higher education in Biotechnology which started in the academic year 1984/85. An original plan for organization of this education was accepted. In order to established basic knowledge (“common language for communication”) during the first and the second years, the students learned Biotechnology according to a unified for all divisions program. This part of the educational process was performed in the Sofia University – the oldest Bulgarian higher school, where at that time a new Center of Biotechnology was established.

Having in mind the complex core of modern Biotechnology, after successful completing second year of their education, the students were distributed into three specialties: “Biotechnological processes” – dealing with the molecular biology aspects of Biotechnology (Faculty of Biology in Sofia University “St. Kliment Ohridski”); “Biotechnology manufactures” – providing knowledge for technological application of Biotechnology (The University of Chemical Technology and Metallurgy and The University of Food Technology); “Biotechnics” – providing engineering aspects of Biotechnology (The Technical University, Sofia). In fact, the Biotechnological network created in Bulgaria comprised the above mentioned four Universities and an Inter- University Council, coordinating their activities and curricula in Biotechnology. This combined organization operated until 1992. Several hundred students were taught through this complex scheme.

In view of the fact that Bulgaria was the first country in the region of Balkans and among the former East-European countries who organized education of Biotechnology there were students from Greece, East Germany, Czechoslovakia and other countries who graduated this specialization. This powerful start in the development of biotechnological education in Bulgaria assured serious base for continuation and recent advance of this education after approval of the Law for University Autonomy and Degree System.

### **Common and Diverse Features**

As a consequence of the mass reorganization in the frameworks of the Law for University Autonomy a number of technological Higher Educational Structures established itself as Universities. Nevertheless, they have kept more or less their originally set characteristics of educational network. As a result there are six Bulgarian Universities which educate students and award diplomas (Bachelor of Science and Master of Science) in the specialty of Biotechnology. Respectively the biotechnological training carries the distinctive features of the different Universities in Bulgaria. According to Bulgarian State Regulations the Universities have adopted the three level structure of training – Bachelor, Master and Doctor (PhD). To enter in university for the educational degree “Bachelor of Science” written concourse exams in Biology and Chemistry must be gained. The conditions and rules determined by the Universities in accordance with National practice are decisive for the educational degree “Master of Science”. The duration of educational degrees “Bachelor of Science” and “Master of Science” is respectively 4 academic years (8 terms) and a minimum of 1 academic year, after previous awarding of Bachelor Degree in the same specialty. The graduation of both educational degrees is completed with a final exam – State exam or Diploma Thesis work. The execution of the State exam or Diploma Thesis public defense is realized under supervision of State Examination Commission. Regardless of different universities specificity during the first two years of education the students are given with similar basis of knowledge in the area of natural science subjects.

Thus the students are ensured with the needed minimum of information for their further thorough education in the different and specific trends of Biotechnology. Chemical Technology and Metallurgy gives the students opportunities to specialize in conversion of various substrates, biosensor’s techniques.

The typical obligatory courses are listed below.

- Inorganic Chemistry
- Analytical Chemistry
- Organic Chemistry
- Mathematics
- Physics
- Biochemistry
- Microbiology
- Molecular biology
- Genetics
- Enzymology
- Separation and Analysis of Bioproducts
- Physicochemistry with Colloidal Chemistry
- Biotechnology Engineering
- Information Systems and Technologies
- Environmental Biotechnology

The divergences find its objective reflection in curricula enlisted in the second two years of the bachelor's educational programs. For example, in the Faculty of Biology (Sofia University) the emphasis is on the role and function of microorganisms in industrial biotechnological processes. The engineer-biotechnologists in the University of Food Technology are trained in organization, management and control of biotechnological processes. Naturally, the Technical University in Sofia affords wider opportunities for education in the area of design, construction and using of biotechnological equipment and mathematical modeling as well. The specificity of biotechnological education reveal mainly in the set of optional courses. On the one hand these differences are demonstrated in the Network of master programs, but on the other hand the main body of the particular programs itself is highly varied in all kinds of Bulgarian universities. These occurrences can be observed even in cases of practically the same in a meaning Master's programs. For instance, in Sofia University in the last 10 years the students, successfully graduated three- (four-) terms Master of Science program in Environmental Biotechnology upgrading their knowledge and skills with most recent achievements in the field of technical, economic and legal sciences, concerning the problems of environment protection. The educational program for the Biotechnology Master of Science program in the University of

A significant part of Diploma Thesis works is dedicated to scale up problems – i.e. to transmission between lab scale to pilot and industrial scale.

Some interesting and original subjects as: Instrumental methods for foodstuff analysis, Microbiological Control of Food products, Standardization and Legalization of Bioproducts and so forth give the specificity of the educational program of biotechnology for Masters of Science in the University of Food Technology. The students in the University “Prof. Dr. Assen Zlatarov” – Burgas have the opportunity to practice in equipped industrial laboratory for diagnostic tests and in a semi-industrial experimental laboratory for examination of the alternative energy sources obtaining.

Regardless of the existed objective difficulties it should be emphasized that for many consecutive years there is no decrease of the young people’s interest in applying for the specialty Biotechnology in the Universities in Bulgaria. For example, the applicants in order to be admitted for training on Biotechnology or Molecular biology in Sofia University have to show the highest grades comparable with the grades for the attractive nowadays specialty Informatics. Meanwhile the first graduated biotechnologists in Bulgaria have 17 years practice already and a large part of them as well as the following those graduates find a realization in Bulgaria and in the world as well. It can be claimed that the real sector of economy (food industry, pharmaceutical production, purification and protection of the environment etc.) take an interest already in looking for young specialists with biotechnological education. A sustainable trend towards elaborating of PhD Thesis works in the field of biotechnology during the last decade. The diversity of topics at this highest educational degree is logically highly expressed. The fact that PhD Thesis works in the area of biotechnology are elaborated even in the universities and institutes without a definitive biotechnological profile is a proof for that statement. Nevertheless there is no created Specialized Scientific Council for biotechnology at The High Attestation Commission in Bulgaria. This fact seems to be paradoxal to some extent. Because of that reason the defenses of PhD Thesis works in the area of biotechnology are performed in different but not always the most appropriate scientific councils.

### **Some Actual Problems**

Some essential problems and disputable topics can be formulated in the area of biotechnological education in our country:

1. Some organizational problems in implementing of the training on some of the obligatory biological courses as genetics, microbiology, molecular biology, recombinant DNA technology etc. are still presented. The shortage of previous experience in this respect as well as the serious difficulties concomitant the providing of appropriate background and equipment may be indicated as valid reasons for these problems. With the same intensity such conclusion is valid contrariwise in the sense that the training on technological subjects in the natural sciences faculties meets with the same problems. Theoretical training is on a good level in most cases because the lack of own specialists is usually compensate by inviting competent scientists from other universities and academic institutes as part-time lecturers. However, the most serious is the problem with the necessity of modern equipment for the practical laboratory training of the students.

2. In parallel with the transition to market economy and privatization of the production capacities raised the problem with ensuring of opportunities to carry out the so called production practice for students - biotechnologists. Due to the lack of regulated conditions for implementation of this obligatory component of biotechnological training usually there is no opportunities for students to acquire a qualitative production experience in particular biotechnological processes. This problem has found its solution in other countries by creation of Centers of Biotechnology or ThechnoParks working in close collaboration with the universities. It becomes clear that we in Bulgaria have to choice and adapt the most appropriate approach to overcome this obstacle.

3. The relative part of the knowledge in the field of economics and management in the total training scheme on Biotechnology is not sufficient yet. Certainly it could be observed a development in such direction at some places. However as a whole in our country these subjects are less covered in comparison with similar curricula in West European and American universities.

4. The development of contemporary biotechnological productions raises requirements relating to the training of relevantly prepared specialists with secondary



school education. They should be able to work qualitatively and effectively in the various

biotechnological plants. In this connection it would be useful a definitive volume of adapted knowledge to take place in the informational main bodies of Biology and Chemistry taught in the secondary schools.

5. The students studying Biotechnology in the high schools as a rule have to work with diverse biological material in the laboratories. So, the problem of biosafety is arising. The introduction of rules and standards for biosafety starting from first year-students is a prevention and guarantee for: the health of students (and instructors) themselves, the sanitary state of university building, avoidance of accidents and the environment protection. For realization of such elements of biotechnological education there is a necessity of legislation's requirements to incorporate these safety rules into University regulatory documentation. It is necessary as well to include special lecturing courses on Biosafety in the curricula of suitable Master's Degree programs (e.g. in the field of Genetics, Microbiology, Ecology, Biotechnology, Biochemistry, Biomedicine, Plant Physiology, Cell Biology etc.).

6. It is generally known that one of the worlds and in particular one of the European scientific priorities is the development of the modern biotechnology. Bulgaria as a member of EU follows the developed European countries' scientific strategy and priorities. To have a chance not only to reach the contemporary achievements but for further development of biotechnology in Bulgaria the unavoidable problem for targeted financing of education should be solved. The state participation is important both for providing of finance recourses and for creating of legislation to motivate the private business to join in the cadres training and upgrading.

7. The question if educational diversification of biotechnology in Bulgarian universities corresponds to modern priorities of world's biotechnology development stays open for discussion. Are the specializations in the areas of plant, medical, food and environmental biotechnologies as well as the most novel and prospective molecular and nanobiotechnologies covered in a sufficient level? Is it obligatory to limit the choice for educational upgrading in these fields and would we leave the solution to be done by accidental and transitive circumstances subordinating ourselves to situational considerations?

8. The use of part-time lecturers in the process of the students' education including the biotechnological training has been an object of criticism in the last years. Some

restrictive requirements in this area are posed by Commissions for accreditation of the universities. Nevertheless such a practice gives some advantages at the same time. At the first place there is an opportunity for the Higher Schools to make their choice and to utilize the experience and qualification of the most outstanding professionals. In this case the universities are not obliged to provide full year salaries and insurances which leads as well to remarkable financial savings. It should be mentioned but not at the last place the possibility of facilitate and flexible reaction in the case of changes and/or actualization of curricula. 9. In relation with the above presented various problems it is necessary to put the question as well about availability of synchrony between the development rate of biotechnological education and of the biotechnological science.

### **Academic and International Collaboration**

The traditional and developing inter-academic collaboration in the country brings an important impact on overcoming and resolution of the part of already listed as well some other real problems in the teaching on Biotechnology. A clear example of this kind is the Agreement for mutual research and training activities signed between AgroBioInstitute in the frame of National Centre of Agricultural Sciences and Faculty of Biology of Sofia University. As a result the so called AgroBioTechPark was established as a specific form of joint venture in the area of research and development. The new opportunities for better education and practice of the masters and PhD students were obtained in this way. A significant part of such activities take place in different institutes, belonging to Bulgarian Academy of Sciences where is a common practice of collaboration in preparing Diploma Thesis as well as PhD Thesis works. The Medical Universities as well as different institutions with an independent statute also participate in the higher education of Biotechnology. On the basis of performed fundamental and applied scientific research all above-mentioned institutes take an active part in preparation of highly trained specialists independently and/or in association with universities.

In parallel with collaboration between academic institutes in Bulgaria and partly because of their joint efforts the international co-operation in the area of biotechnological education becomes more intensive. A positive example in this sense is the forthcoming establishment of a new non profitable society which reveals an opportunity for application a project for financing by structural EU funds. On this way a high technological AGRI-BIO GENOME CENTRE for education, research and diagnostics in system biology (genomics, proteomics, metabolomics, nutrygenomics, bioinformatics, etc.) will be created in Bulgaria.

The international collaboration problem takes extraordinary important place in the present situation in Bulgaria, in particular for its science and education. It contributes the biotechnological education quality development and optimization and has a positive effect on the advance of university research activities. In conformity with these two aspects which are closely connected the universities including biotechnological specialties participate very actively in the international projects. The mainly used programs for educational research projects financed by the EC are TEMPUS, ERASMUS and Leonardo da Vinci as well as a numerous bilateral collaborations and active international exchange programs. Bulgarian students and lecturers bound up in biotechnological education visit different European universities in order to be able to take training abroad or to prepare new or to improve their lecture courses. A number of students work out their Master's thesis under the common scientific supervision of foreign and our scientists. Furthermore, Bulgarian students elaborate and defend PhD Thesis in these countries. The collaboration with the Universities in Nanty and Strasburg (France) is a very good example in this respect. In the frame of this international exchange our universities on their turn also adopt foreign lecturers and students. The collaboration intensity in scientific research has a significant impact on the quality of biotechnological training. The Fifth, the Sixth and the Seventh Frame programs of EU, Copernicus, NATO-projects and so on are the main forms for including of our university scientists in elaboration of international research projects. In this area there are many bilateral agreements with several of European Universities, as well.

In addition we can point out the multitude of research projects financed by The National Found of Bulgarian Ministry of Education and Science, in which as a rule along with Bulgarian scientists from Universities and Other Academic Institutes many foreign partners participate.

### **Conclusions**

The biotechnological training emerged at the time of centrally planed and state regulated economy in Bulgaria makes successful efforts and adapts itself to the recent conditions of market economy. The presence of competitions naturally leads to optimization and selection of the bachelor's and master's set of programs relating the Biotechnology in the different universities and faculties. It is obvious that the processes of globalization in economy and science can not pass by the sphere of biotechnology. Since Bulgaria is already a member of the EU, we should take the opportunity to obtain all profits and positive consequences for further development of our education in the Biotechnology.

## 2. AgroBio Science & Technology (S&T) Park

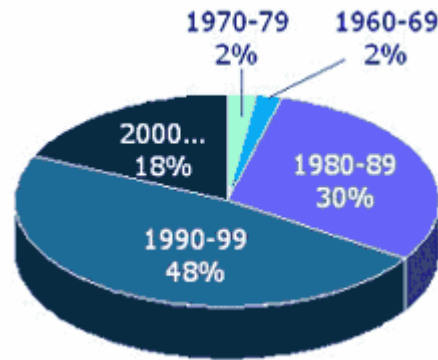
The application of modern biotechnology is an area which is believed to hold great promise for farmers, entrepreneurs and also for consumers and society in general. This tool can not only be used to improve agricultural productivity, but also to contribute towards reductions in the environmental impact of farming. There are a large number of other beneficial applications still in development which would be difficult to achieve using available conventional breeding techniques.

It is recognized, however, that the introduction of modern biotechnology in agriculture and the use of these crops in foods have raised some concerns in Europe, and that future introduction can only be made once society has sufficient information on Crop Biotechnology and Biosafety to make an informed choice. During the last 10 years in Bulgaria **Bulgarian Biotechnology Information Center** was created and its main activities are:

- information processing and packaging;
- workshops and conferences;
- training courses;
- stakeholder's networking.

It aims to promote an open and informed debate with **all stakeholders - scientists, policy makers, public officials, journalists, farmers, entrepreneurs, consumers, NGOs, etc.**

With close links to the academic community in **AgroBio Science & Technology (S&T) Park** was established, which facilitates commercial access to academic expertise and assists with the commercialization of academic research. The majority of the currently existing Technology Parks in the world were created during the 90's. However, it is interesting to notice that a significant 18% of the existing S&T Parks have been launched in the first 2 years of the new century, which confirms that this type of organization is a growing phenomenon.



When were S&T Parks created, IASP

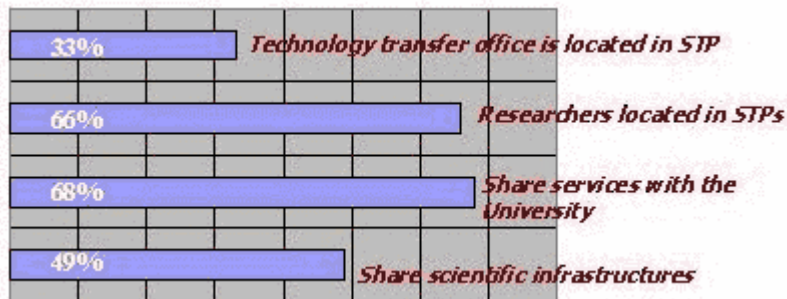
**Agrobio Science & Technology (S&T) Park** is an organization managed by specialized professionals whose main aim is to increase the wealth of the community in the region by

promoting the culture of **innovation** and the competitiveness of its associated businesses and knowledge-based institutions (Universities, Research institutes).

To enable these goals to be met, the Park:

- stimulates and manages the flow of knowledge and technology ([technology transfer](#)) amongst universities, R&D institutions, companies and markets;
- facilitates the creation and growth of innovation-based companies through *incubation* and [spin-off processes](#);
- and provides other value-added services together with high quality space and facilities.

**Agrobio Science & Technology (S&T) Park** is established inside the area of Sofia University, Biological Faculty in order to utilize the existing scientific expertise and excellent facilities. The link is mutually beneficial: S&T Park hosts researchers from the Universities in their facilities as well as their technology transfer office thus providing opportunity for the academia to get closer to the customers.



What do S&T Park share with Academic Organizations