

BULLETIN

Engineering Programs in English

ÓBUDA UNIVERSITY
2013/14



Editor:
Prof. Imre Rudas rector

Editorial board:
Prof. Mihaly Réger
Prof. Annamária Várkonyi-Kóczy
dr. Pál Rácz
dr. Dóra Maros
dr. Márta Kisfaludy
dr. Levente Kovács,
Gyöngyi Tamás

Design and layout:
Krisztina Nagy

Photos:
Gergely Kiss

Manuscript closed:
28 Aug. 2013



Óbuda University
2013



Óbuda University is a dynamic and thriving institution located in Central Europe, in Hungary. For 132 years of existence, the educational excellence has remained paramount. A comprehensive academic program has been implemented, with emphasis on competitive, flexible and high-level training, scientific research and development. A focused, technologically based education is offered on a wide range, from undergraduate to PhD programs, for around 12000 students in a stimulating environment at five faculties and two educational centers. We have 12 Bachelor-, 7 Master courses and 3 doctoral schools. The university's largest part can be found in Budapest, there is one educational centre in Székesfehérvár, 60 kilometres far from the capital.

Óbuda University and its predecessors occupy a place of high rank in the domestic and international technical/economic higher education. Several memberships, prizes, awards and acknowledgements prove its successes: the university is the member of the European University Association, owner of one of the highest Hungarian honours, Higher Education Quality Award. Several domestic and European acknowledgements surround the quality of its international quality.

Óbuda University ascribes emphasized significance to internationalization, it has nearly 200 international contacts in Europe and overseas countries. The contacts serve student- and tutorial mobility, as well as common researches.

Several students study or are partly involved in professional practice at our foreign partners annually; besides, the institution receives numerous foreign students for full- or part-time education. Our students have reached a victory or finished among the top ones in several national and international competitions.

The scientific workshops with considerable national and international base, regularly organized international scientific conferences at the institution and the publication of Óbuda University, Acta Polytechnica, published in several international databases greatly constitute the university's scientific life.

BSC/MSC/PHD PROGRAMS IN ENGLISH FOR FOREIGN STUDENTS:

Undergraduate studies leading to BSc degree (duration: 7 semesters, enrollment in autumn semester):

- Engineering Information Technology
- Electrical Engineering
- Industrial Product Design Engineering
- Mechatronics Engineering

Graduate studies leading to MSc degree (duration: 4 semesters, enrollment in autumn semester):

- Applied Mathematics
- Engineering Information Technology
- Mechatronics Engineering

Postgraduate studies leading to PhD degree (duration: 6 semesters, enrollment in autumn & spring semester):

- Applied Informatics
- Information Security and Safety Sciences
- Material Science and Technology

BSc Programs

The duration of the programs is 7 semesters leading to BSc degree. The hours of education range from 20 to 28 hours per week except during the last semester when the students mainly work on their final projects. Students typically take 5 exams each semester. In addition, students are required and encouraged to participate in engineering practice and/or active research and design in the project laboratories to develop their abilities to do independent engineering work and research.

The final project consists of a practical project or a design with a thesis describing it. The projects are prepared under the guidance of a supervisor from one of the appointed departments. The theses must be defended in front of the Final Examination Board.

On successful completion of the curriculum, final exams and the final project, a student will be granted a bachelor degree (BSc), which certifies its holder's ability to be engaged in engineering work without limitations.

MSc Programs

Students with a BSc degree or its equivalent can pursue an MSc degree in the same field of study at Óbuda University. The duration of the programs is 4 semesters leading to MSc degree. The programs follow an approved curriculum, including also elective subjects which allow students' personal interests. The hours of education are around 26 hours per week. Students typically take 5 exams each semester. The courses usually run for small groups (5-15 members) and students are also expected to work individually under the supervision and direction of personal tutors. Students are also encouraged and supported in doing research work in the laboratories and they have a free access to the research facilities and computers of the university.

After the successful completion of the curriculum, the final thesis, and the final exams, a student will be granted a master degree (MSc) which enables its holder to do research and solve high level engineering tasks.

PhD Programs

Óbuda University is both a research and an application oriented university. The academic staff of Óbuda University is doing high quality, internationally recognized research work in almost all engineering disciplines and related applied sciences. All PhD candidates are welcome to take part in this research work. A PhD degree issued by Óbuda University proves the candidate's ability for self-standing scientific work.

Applicants for the PhD program must hold an MSc, M.Phil., or equivalent degree issued by an academic institution. During the entrance exam, they must prove the possessing of an overall understanding of the selected research field and also that they are familiar with most important disciplines, results, and research methodologies of the field.

The PhD programs last at least 6 semesters, but the candidates usually need an additional one (sometimes more) year to prepare their thesis works. PhD candidates carry out their studies and research on an individual basis under the guidance of a professor or a senior member of the academic staff at the doctoral school.

The research work of the candidates must contribute to the scientific knowledge and new results of the attached research field. Their efforts have to be recognized by the international scientific community. To prove this, candidates are expected to publish their new results in internationally referred professional journals.

The PhD procedure consists of writing and presenting a written thesis work including the already published results of the candidate. The dissertation must be prepared according to the formal requirements of the Doctoral School. Furthermore, the candidates have to pass a set of qualifying examinations in some basic and applied sciences related to the field of the submitted thesis.

Preparatory English Language Course

In case of insufficient language knowledge, prior to the course-study, an English preparatory language course is organized by Óbuda University. Its duration is: 3 months, 20 lessons/week.





[Bánki Donát Faculty of Mechanical and Safety Engineering]

Bánki Donát Faculty of Mechanical and Safety Engineering, Óbuda University, is intended to establish a creative atmosphere in training courses, where students experience the technical and economic challenges of the era and seek answers to everyday problems together with professors and industrial experts. In its current training profile, our institution amalgamates innovation with traditional education, ensuring the mastering of theoretical and practical knowledge at high standards.

The management of the institution makes every effort to enable students to participate in study trips and special courses abroad. In order to facilitate this, some special subject courses have been introduced in foreign languages (English, German) at the Faculty in addition to courses with language options prescribed in the curriculum. We are working on providing training opportunities for all those who intend to continue their studies, to enable them to find good jobs at the labor market in the future. The Faculty maintains a wide range of partnerships with European universities and colleges and international organizations. Students with the required language skills and study results can apply for study courses of one or two semesters abroad. Students are also provided opportunities to increase their knowledge by one-year industrial practice – as university students – in the framework of so-called cooperative training.

We do our best to make our training courses meet your expectations, to provide a promising future for you. After completing your studies, you can pursue further studies at our institution in the framework of Masters courses (MSc) or special development training, but you can also get a job right away. Whichever you choose, our training courses ensure your future success.

The profile of the Faculty includes Mechanical Engineering, Military and Safety Engineering, Mechatronics Engineering, Engineer-Teacher – and Machine Industry Engineer Assistant training with a strong IT basis, much demanded in a number of areas of the economy.

PROGRAMS IN ENGLISH LANGUAGE:

Name/academic level: Mechatronics Engineering, BSc

Course duration/ number of credits to attain: 7 semesters (2490 teaching hrs.)/ 210

Objectives: The aim of the program is the training of mechatronic engineers who, in possession of the acquired complex skills in natural sciences, electronic, mechanical and computer engineering as well as economics, will be capable of supervising and managing processes of manufacturing, assembly and quality regulation based on the use of mechatronics devices and equipment, constructing general mechatronic devices and operating as well as maintaining mechatronic systems, and who also possess well-founded theoretical knowledge to continue their studies in the second cycle of training (MSc). With regard to prospective specializations as well, those with a degree of BSc in Mechatronics Engineering will be able to: consider the management of technical, economic and human resources in a complex manner; assess and take the social impact of engineering activity into consideration; perform innovative thoughts and independently follow developments in science and technology; integrate skills in the respective fields of electronics, mechanical engineering and informatics; creatively apply devices such as sensors, actuators or controls in mechanisms; globally design complex systems.

Name/academic level: Mechatronics Engineering, MSc

Course duration/ number of credits to attain: 4 semesters (1380 teaching hrs.)/ 120

Objectives: The aim of the program is the training of mechatronic engineers who, in possession of the acquired complex skills in natural sciences, electronic, mechanical and computer engineering as well as economics, will be capable to design, construct, integrate, and develop mechatronic devices and equipment, and as well as able to solve research and development tasks of mechatronic systems, and who also possess well-founded theoretical knowledge to continue their studies in the next cycle of training (PhD). Students are invited to have one of the following BSc degrees: Mechatronics Engineer, Mechanical Engineer, Transportation Engineer, Electrical Engineer, Applied Informatics.

Name/academic level: Information Security and Safety Sciences, PhD

Course duration/ number of credits to attain: 6 semesters/ 180

Objectives: Graduates of doctoral programs in Information Security and Safety Sciences are prepared to respond to the growing need for electronic security. PhD candidates learn techniques to combat attacks on information systems and develop the skills to create new safety methods. Doctorate programs in Information Security and Safety Sciences focus on advanced research in data and system securities, which have become areas of concern for many corporations. The growing number of individuals capable of carrying out attacks against security systems demands a corresponding

increase in highly capable security professionals. PhD candidates learn to prevent security breaches by studying topics like risk management, compliance and information confidentiality, integrity and governance. Much of the work in these programs emphasizes research techniques, which are essential to stay up to date with the most recent types of electronic attacks. Students also learn to develop new technology to combat these attacks, integrating programming, systems analysis, networking and engineering. Doctorate programs in Information Security and Safety Sciences usually take 3 years to complete. The degree culminates in a dissertation, which is a work of original research that is overseen by an advisory committee. Most programs require that students complete a comprehensive exam at the end of their third year of study. With regard to prospective specializations as well, those with a degree of PhD in Information Security and Safety Sciences will be able to work as Security consultant, Senior security professional, Consultant, Professor, Senior government security professional, etc.

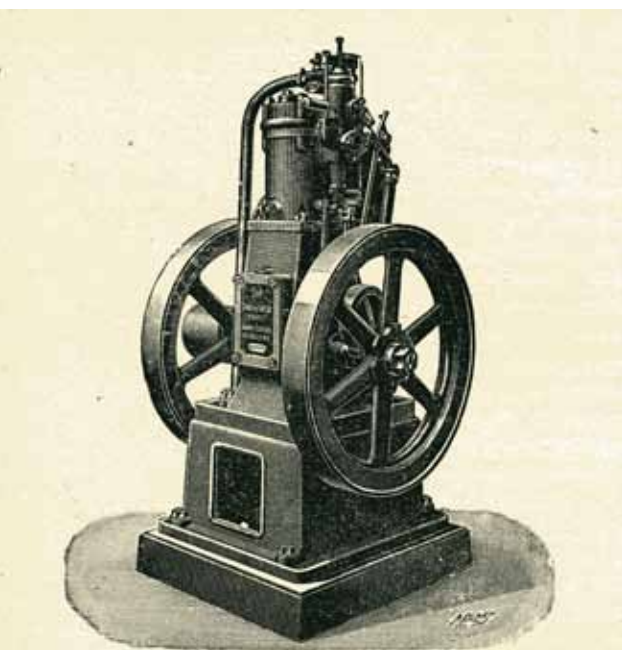
Institutions:

Institute of Materials Sciences and Technology
Institute of Mechanical Engineering and Safety Techniques
Institute of Mechatronics and Vehicle Engineering

Contacts:

Óbuda University
Bánki Donát Faculty of Mechanical and Safety Engineering
Faculty address: H-1081 Budapest, Népszínház u. 8.
Phone: (+36-1) 666-5419
Fax: (+36-1) 666-5485
Dean of the Faculty: Dr. Sándor Horváth
Vice-Dean for Research: Dr. Pál Rácz
Course Director: Dr. István Nagy, e-mail address: nagy.istvan@bgk.uni-obuda.hu





[Kandó Kálmán Faculty of Electrical Engineering]

The Kandó Kálmán Faculty of Electrical Engineering offers three different courses: full time, correspondent, e-learning. The students attend the same subjects in the first three semesters full time, and four semesters in correspondent and e-learning courses.

After successfully completing the first part of their studies (basic part) the students can choose one specialization: Automation, Info-Communication Technologies, Instrumentation and Automation, Microelectronics and Technology, Power Engineering.

BSc graduates are able to design electric devices, testing and controlling systems, manage electrical device production and installation projects in the field of their specialization.

Based on BSc training the students can also get an engineer-teacher diploma which is called MA. The faculty also offers master course in the specialization Industrial control and communication systems. The MSc graduates are able to control network surveillance processes as well as risk management, maintenance critical decisions, making disaster and recovery plans. They can design and develop industrial control and communication systems. Higher-grade vocational course is provided for electrical engineering assistants, in 4 semesters in full time courses and in 5 semesters for correspondent courses. These courses for assistants aim to train specialists able to perform tasks not yet requiring higher engineering knowledge.

For graduated engineers there is a possibility to participate in professional post graduate courses.

PROGRAMS IN ENGLISH LANGUAGE:

Name/academic level: Electrical Engineering, BSc

Course duration/number of credits to attain: 7 semesters (2490 teaching hrs.)/ 210

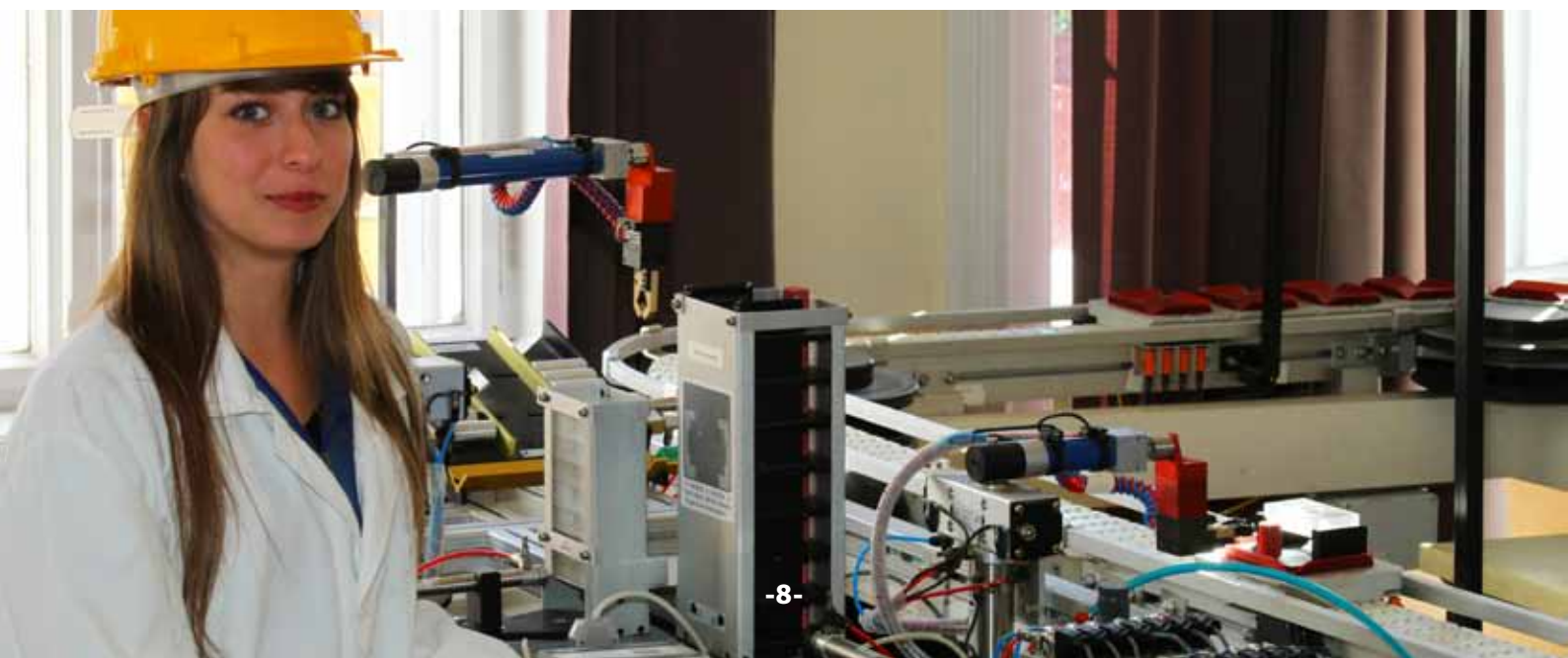
Objectives: Electrical engineers graduated from the Faculty specialized in the field of their studies will be able to solve engineering problems and in addition also inform the workshop saving acquired theoretical and practical knowledge; and they will be familiar with information technology as well. According to their studies - in the field of (micro)electronics, telecommunication engineering, instrumentation, automation, power engineering - and to their special interests, our students will be able to: design equipment and systems, do measuring, qualifying, controlling tasks in production, take part in installations and in operating the equipment and systems, and perform service-engineering, product-managing and other activities.

Institutions:

Institute of Infocommunication Techniques
Institute of Instrumentation and Automation

Contacts:

Óbuda University
Kandó Kálmán Faculty of Electrical Engineering
Faculty address: H-1081 Budapest, Tavaszmező u. 15.
Phone: (+36-1) 666-5131
Fax: (+36-1) 666-5132
Dean of the Faculty: Dr. Péter Turmezei
Vice-Dean for Education: Dr. Marianna Lendvay
Vice-Dean for Research: Dr. Dóra Maros
Course Director: Dr. György Schuster, e-mail address: schuster.gyorgy@kvk.uni-obuda.hu



[Keleti Károly Faculty of Business and Management]

„Provided we are in possession of fairly extensive knowledge, we can be competitive, productive and ethical in our duties”, as was stated 140 years ago by Károly Keleti, Economist-Statistician after whom the faculty was named. This quotation is still relevant today and we therefore regard it as our main responsibility to provide the best conditions for our students in order to enable them to succeed in life.

The majority of students are usually contracted by their future employers during their university education. Our faculty has a very good reputation in professional circles; it is no coincidence that more and more students are applying for admission. The key to our success is the continuous development of international co-operation, professors and lecturers of a high standard and a superb infrastructural background. More than one third of our professors have PhD qualifications as well as many years of experience. More and more students and professors of the faculty have the opportunity to study or give lectures abroad at partner institutions in Europe. The faculty also welcomes foreign students and guest professors lecturing and conducting workshops.

Besides an excellent professional background Keleti Faculty offers something additional: the opportunity for a lively community life and responsible way of living.

The Faculty of Business and Management offers the following undergraduate programs: BSc in Technical Management, BA in Business Administration and Management, and BA in Commerce and Marketing as well as postgraduate programs: MSc in Business Development and MA in Teacher of Engineering (Engineering Manager).

The objective of the BA in Business Administration and Management program is to train economic experts who are knowledgeable about economics, social sciences, applied economic sciences and methodology. Students are given the knowledge that will enable them to plan and analyze processes for economic organizations and institutions, as well as manage and organize entrepreneurial activities and processes. In possession of the required sound knowledge, the students can further their studies to a master program, if desired. Tracks: Marketing, Business Informatics, and Business Organizer.

The BA in Commerce and Marketing program aims to train economic experts who are knowledgeable about economics, commerce and marketing. The economic experts are competent in demand based acquisition and marketing of different products and services, organization and management of commercial activities of small and medium sized companies and organizations and also possess sound knowledge in order to continue their studies in the second phase of their training.

The BSc in Technical Management program trains Technical Managers who are equipped with appropriate knowledge in natural and technical science, economic and organizational skills which are needed for the integrated solutions in production and services regarding the material, financial and IT fields as well as human resources. The students are provided a good grounding for theoretical knowledge enabling them to further their studies by applying to enter a PhD program.

Graduates holding a basic degree in Management and Business Administration, in Commerce and Marketing and in Technical Management are eligible to further their studies on a Master's degree program in Business Development.

Objectives of the Business Development MSc program: Providing the students with an up-to-date, competitive and high-quality degree which is competitive even in the international labour market. Holders of such a degree are able to analyse the activities of an economic organisation and can tackle complex development programs; as a result of their mastery of innovation and economics, theoretical and methodical knowledge, consciously developed leadership skills and abilities they are capable of performing middle- and top-level managerial tasks.

Those holding a basic degree in Engineering Management can also carry on with their studies on a Master's degree program in Teacher of Engineering (Engineering Manager). The MA program is held in cooperation with the Centre for Teacher Training and Pedagogy for Engineers (TMPK).

Objectives of the Teacher of Engineering (Engineering Manager) program: preparation for instructing theoretical subjects based on advanced level technical training in technical schools as well as in any accredited institutions. This course means preparation for research, planning and development in Pedagogy and foundation for acquiring a higher degree.

English language subjects are provided for foreign and inland students in topics of business, management, organization and business informatics.

Institutions:

Institute of Economics and Social Sciences
Institute of Enterprise Management
Institute of Management and Organisation
Institute of Physical Education and Sport

Contacts:

Óbuda University

Keleti Károly Faculty of Business and Management

Faculty address: H-1084 Budapest, Tavaszmező u. 15-17.

Phone: (+36-1) 666-5201

Fax: (+36-1) 666-5209

Dean of the Faculty: Dr. András Medve

Vice-Dean for Education: Dr. Anna Francsovcics

Vice-Dean for Research: Dr. Pál Michelberger



[John von Neumann Faculty of Informatics]

The mission of the John von Neumann Faculty of Informatics is to manage the BSc and MSc Engineering Information Technology (CSE) programs (both in full time and part time trainings), which enable students to find a place for themselves in the labor market immediately after graduation whilst also preparing them for the second phase of education: the two-year MSc course in Engineering Information Technology or in Applied Mathematics. Graduates of MSc can further their studies in Applied Informatics Doctoral School.

Research and development (R&D) possibilities are supplemented by the Antal Bejczy Center for Intelligent Robotics, the TÜV Rheinland and the Biotechnology research centers of Óbuda University.

PROGRAMS IN ENGLISH LANGUAGE:

Name/academic level: Engineering Information Technology, BSc

Course duration/ number of credits to attain: 7 semesters (2445 teaching hrs.)/ 210

Objectives: At the beginning of their studies, our students receive comprehensive fundamental subjects in natural sciences, principles of engineering, economics and the humanities. The core subjects of Engineering Information Technology are provided subsequently in three main modules focusing on system technology, software technology and information systems technology.

Our students select a major field of specialization during the fifth semester of their studies, enabling them to delve deeper into a specific field of CSE. These majors are changed year by year according to the shifting demands of the job market and capacities of our faculty, and include embedded systems, software technology, business informatics, informatics security, robotics or computer networks. Our students supplement their knowledge through the study of elective subjects and participation in a five- or ten-month cooperative training program with CSE companies prior to writing their thesis work.

Name/academic level: Engineering Information Technology, MSc

Course duration/ number of credits to attain: 4 semesters (980 teaching hrs.)/ 120

Objectives: The objective of the program is the training of computer engineers who, in possession of the acquired complex skills in natural sciences, electronic and computer engineering, will be capable of development and managing information systems, integration of novel approaches in ICT applications. They also possess well-founded theoretical knowledge to continue their studies in the third cycle of training (PhD). With regard to prospective specializations as well, those with a degree of MSc in Engineering Information Technology will be able to consider the management of technical, economic and human resources in a complex manner, assess and take into consideration the social impact of engineering activity, perform innovative thought and independently follow developments in science and technology, integrate skills in the respective fields of embedded systems, info-communication services and integrated intelligent systems.

Name/academic level: Applied Mathematics, MSc

Course duration/ number of credits to attain: 4 semesters (980 teaching hrs.)/ 120

Objectives: Today's typical inter- and multidisciplinary work environment needs professionals with strong theoretical foundations being capable of solving mathematical problems encountered in the field of engineering. The applied mathematics MSc program with its engineering mathematics specialization gives a unique training in the country. The program focuses on modeling and algorithmization, and programming mathematics.

Name/academic level: Applied Informatics, PhD

Course duration/ number of credits to attain: 6 semesters/ 180

Objectives: The PhD education gives a coordinated and thoroughly supervised introduction to scientific research and development in various areas of engineering that are related to and strongly depend on information science and technologies. Each student is assigned to one or two supervisors responsible for the student's activity.

The students must take 8 classes above the MSc level, participate in various research activities, prepare and publish their own scientific publications that are necessary to get the PhD degree in a chosen topic, which is the final goal of the PhD course.

The Applied Informatics Doctoral School has two main programs: Intelligent Engineering Systems (optimal control, robotics, soft computing intelligent engineering design and production) and Computational Engineering (numerical methods, optimization and simulation techniques, parallel computing, material sciences) and students can take any related research topic.

Institutions:

Institute of Information Systems
Institute of Software Technology
Institute of Applied Mathematics

Contacts:

Óbuda University

John von Neumann Faculty of Informatics

Faculty address: H-1034 Budapest, Bécsi út 96/b

Phone: (+36-1) 666-5520

Fax: (+36-1) 666-5522

Dean of the Faculty: Dr. András Molnár

Vice-Dean for Education: Dr. Levente Kovács

Vice-Dean for Research: Dr. Imre Felde

Course Director: Dr. Krisztina Erdélyi, e-mail address: erdelyi.krisztina@nik.uni-obuda.hu





[Rejtő Sándor Faculty of Light Industry and Environmental Protection Engineering]

Rejtő Sándor Faculty of Light Industry Engineering and Environmental Protection Engineering, Óbuda University, is the only higher education institute in Hungary where students can receive engineer level qualification in the traditional light industry areas – e.g. clothing, textile, leather and printing industry. To meet the locally used global requirements the training offers convertible knowledge to the students, in which practical knowledge plays an important role supported mainly by the mandatory summer practices.

The bachelor's program in Light Industry Engineering prepares students for the control and supervision of manufacturing processes related to their specialisation. They can choose from the following specialisations: Creative Products and Technologies, Quality Control System Developer, Printing and Media, Packaging and Paper Technologies.

Environmental Engineers will possess the necessary up-to-date vocational and technological skills needed to reduce and prevent environmental damage and pollution. We offer the Light Industry specialisation.

The Industrial Product Design Engineering training integrates the design and engineering knowledge in the possession of which students can find jobs in studios, enterprises in the production and commerce sectors as well as in the media. Our faculty maintains active cooperation with international academic, industrial partners within and beyond the borders of the European Union in many ways: as a member and founder of international organisations, an organizer of international events, a participant in joint research, student/staff exchange programs.

Inside the institute there are small gymnasiums, a football pitch and fitness rooms for those who want to do sports. We organize local championships among the faculties every year in table tennis, floor-ball, football, handball, basketball, volleyball, chess and tennis events.

The profile of the Faculty includes Light Industry Engineering, Environmental Protection Engineering, Industrial Product Design Engineering, and a MSc program in Light Industry Engineering.

PROGRAMS IN ENGLISH LANGUAGE:

Name/academic level: Industrial Product Design Engineering, BSc

Course duration/ number of credits to attain: 7 semesters (2156 teaching hrs.)/ 210

Objectives: The goal of the program is to train industrial product design engineers who are capable of designing, producing and marketing industrial products as well as meeting the challenges of market economy with flexibility and efficiency, with their technical, aesthetic, human economic knowledge and skills, too.

They have the ability of independent, creative work in all the phases of product development and capable of managing the innovation process of product development as well as the material, organizational and human resources necessary for product development and also the different cycles of product life cycle. In addition they have enough theoretical knowledge to be able to continue their studies in the second cycle of the training or to work with a team within different company frames to develop the conceptual, preliminary and detailed design.

There are three areas within product design: Fashion and leather accessories design, Textile and interior design, and Packaging design. Students acquire up-to-date design insights and methods. They have to create and execute design solutions to problems of form, usability, ergonomics, marketing, brand development, and sales. The technological, economic and social relationships of product design are in the focus of purpose-oriented training. There is a great emphasis on the connections of design, ecology and environment conscious approach.

The professional knowledge gained through the 7 semesters provides secure basis for the future product design engineers so that they can work effectively and successfully in the areas of clothing and accessory design, textile and interior design as well as packaging design.

Name/academic level: Material Science and Technology, PhD

Course duration/ number of credits to attain: 6 semesters/ 180

Objectives: Graduates of doctoral programs in Material Science and Technology are prepared to have a general knowledge in material science with a specialized research interest within the field. They become to be able to contribute to the scientific knowledge and new results of the attached research field.

The Doctoral School focuses on the following areas: general material science, metals and ceramics, material analysis, materials used in light industry, macromolecular systems, micro- and nano-systems (metals, semiconductors, and dielectric materials), surface treatment, technologies, and any related research topic.

Doctorate programs in Material Science and Technology usually take 3 years to complete. The degree culminates in a dissertation, which is a work of original research that is overseen by an advisory committee.

Most programs require that students complete a comprehensive exam at the end of their third year of study.

Institutions

Institute of Product Design
Institute of Environmental Engineering
Institute of Media Technology and Light Industry
Special Group of Quality Management and Technology

Contacts:

Óbuda University
Sándor Rejtő Faculty of Light Industry Engineering and Environmental Protection Engineering
Faculty address: H-1034 Budapest, Doberdó utca 6.
Phone: (+36-1) 666-5503
Fax: (+36-1) 666-5909
Dean of the Faculty: Prof., Dr. István Patkó
Vice-Dean for Education: Dr. László Koltai
Vice-Dean for Research: Dr. Ákos Borbély
Course Director: Dr. Márta Kisfaludy, e-mail address: kisfaludy.marta@rkk.uni-obuda.hu





TERMÉK

[DRACO]
EAU DE PARFUM

Draco lat. (draco = sárkány)
Zárt üveg

Funkciók: elsősorban a benne lévő parfüm tárolása, megőzése, továbbá esztétika

Gyártási anyagok: öntött üveg különféle színekben, alumínium, műanyag (cső+pumpa)

Súly: anyagtól függően

Tartalom: 0,04 dm³ = 40 ml

Méretezés (mm):



The Students Union (Hungarian abbreviation: HÖK)

The Students Union is an independent organization of the students of the university. Members are all students who are in legal relation with the university.

The Students Union acts as a part of the university government, developing its scope of activity and structure independently according to the Union's own rules of organization and activity.

The Students Union exercises the collective rights resulting from the students' legal relation, it represents the students' subjective rights in decision making and preparative bodies. The Students Union performs its duties in co-operation with other organizational units of the university based on the necessary information obtained from the leaders of the units. The Students Union co-operates with other students unions both in Hungary and abroad. The Students Union can co-operate with any other organizations, whose aims agree with those of the university.

The material and substantial conditions necessary to work and perform the duties are provided by the management of the university, while the rightful use of them is supervised by the rector.

Duties of the Students Union

The Students Union manages both the representation and safeguarding of interests of the university students - according to provisions of law and other legal rules higher than those of the university as well as to university and faculty regulations. The Students Union exercises the collective rights of decision, agreement, proposal, control and expressing opinion, which derive from the students' legal relation and are delegated to the Union by the university and faculty decisions.

The Students Union helps to create and practise the university autonomy, increase the standard of training, realize the academic freedom of teachers and students, create and maintain a good relationship between teachers and students and intensify the public life at the university.

The Students Union organizes the student life at the university and contributes to the development of the students' knowledge and abilities beyond their professional fields; prepares them to take part in the public life. The Students Union promotes the traditions of the university, even creates traditions. Thus for instance, it's their task to organize, arrange, supervise the parade of graduating students, the 'days of youth' or field trips.

Office of the University Students Union:

1084 Budapest, Tavaszmező utca 17.
Tel: +36 (1) 666-5014







MECHATRONICS ENGINEERING

No.	Neptun Code	Subjects	Semesters																																			Prerequisites				
			1.					2.					3.					4.					5.					6.					7.									
			lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr					
Basics of Natural Science																																										
1	BGRMA1HNEC	Mathematics I.	3	2		ex	6																																			
2	BGRMA2HNEC	Mathematics II.						3	2		ce	6																													1	
3	BGRFM11NEC	Engineering Physics	2			ex	4																																			
4	BGRMF4NEC	Engineering Physics Measurements																	1	pm	2																			1		
5	BGRME11NEC	Introduction to the Mechatronics	3			pm	3																																			
6	BGBMN11NEC	Mechanics I.	2	1		ex	4																																			
7	BGBMN22NEC	Mechanics II.						3	1		pm	4																													6	
8	BGBMN33NEC	Mechanics III.												2	2		ce	6																							7	
9	BGRET12NEC	Electrical Engineering I.						2	2		ex	4																												3 sign		
10	BAGMN11NEC	Engineering Materials	3		2	pm	6																																			
Economical and Human Knowledge																																										
11	GGTKG1M5EC	Economics I.																		2			ex	2																		
12	GGTKG2M6EC	Economics II.																																			1	1	ex	2		11
13	BGRIO14NEC	Environmental Technology																																								
14	BGRLG15NEC	Logistic																																							11 p	
15	BAGMB15NEC	Quality Technology																																							2	
16	BGBO17NEC	Legal Knowledge																																						2	5 Sem.	
Basics of Profession																																										
20	BGRIA1HNEC	Informatics I	2			ex	3																																			
21	BGRIA2HNEC	Informatics II						2			ex	3																													20	
22	BGRIALHNEC	Informatics Laboratory								2	pm	2																													20 p	
23	BGBGG11NEC	Machine Design I	2		1	ex	4																																			
24	BGBGG22NEC	Machine Design II						2		1	pm	4																														23
25	BGBGG33NEC	Machine Design III												2		2	ex	5																							24	
26	BGBRST3NEC	Computer Systems for Product Engineering												1		3	pm	4																						25 p		
27	BAGAC12NEC	Materials Technology I						2		1	pm	4																														
Optional subjects																																										
50	BGRPV16NEC	Programable Circuits and Controls																																							31	
51	BGRPN16NEC	C ++ Programming																																							21	
52	BAGGM26NEC	Mechatronics of Manufacturing Systems																																							35	

No.	Neptun Code	Subjects	Semesters																									Prerequisites																		
			1.					2.					3.					4.					5.								6.					7.										
			lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr				lc	pr	lb	re	cr	lc	pr	lb	re	cr						
28	BAGAC23NEC	Materials Technology II											2			ex	3																										27			
29	BGRIR14NEC	Control Engineering																2					2		ex	4																2				
30	BGRAD14NEC	Analogue and Digital Circuits I																1					2		pm	4																9				
31	BGRAD25NEC	Analogue and Digital Circuits II																									2		1	ex	4											30				
32	BGRPH14NEC	Pneumatics and Hydraulics																2					2		ex	5																5				
33	BGRRHG5NEC	Thermo- and Fluid-dynamical Engines																									2	1	1	ex	4											3				
34	BAGGT12NEC	Manufacturing Engineering I						1		1	pm	3																														10				
35	BAGGT23NEC	Manufacturing Engineering II											2		2	pm	5																									34				
36	KMEEA13TEC	Electronics											2	1	1	ex	4																									9	p			
37	KMEFM15TEC	Precision Mechanics																									1		1	pm	3											36				
38	KMEIF16TEC	Interfaces																														1		1	pm	3						31				
39	BGBBER7NEC	Safety Engineering, Ergonomics																																			2			pm	3	8	sign			
Supplementary subjects																																														
80	GTSTESTNEV	Physical Education I						2		as																																				
81	GTSTESTNEV	Physical Education II											2			as																														
82	BAGGM12NEC	Mechanical Eng. practice I						2		as																																				
83	BAGGM23NEC	Mechanical Eng. practice II											2			as																										82				
Optional subjects																																														
18	BGBETK7NEC	Engineering Ethic																																												
19	GSVEU17NEC	EU Knowledge																																												
64	BGRMAFVNEC	Topics in Mathematics																														1			pm	2										
65	BGBAV10NEC	Aviatica I.																3																												
69	BGBBSA2NEC	Basics of Organising Safety																2																												
70	BGRGP1VNEC	GPGPU Programming																2			pm	3																								
Complex systems specialization																																														
44	BGRNT14NEC	Micro and Nanotechnologies I																3		2	ex	6																				36				
45	BGRNT25NEC	Micro and Nanotechnologies II																									2	2		ex	6											44				
46	KMEOA16TEC	Low Dimensional Self-Organising Systems																														3	2		ex	6						45				
47	BGRRR14NEC	Industrial Robot Systems I.																2	1		pm	5																				8	sign			
48	BGRRR25NEC	Industrial Robot Systems II.																									3	1	2	ex	7											47				

ex – examination, pm – practice mark, ce – course examination, as - assignment
p - both the subject and the prerequisite can be chosen in the same semester

BASICS OF NATURAL SCIENCE

1 Mathematics I. BGRMA1HNEC

Dr. Ágnes Bércesné Novák associate professor

The course gives an overall review of elementary functions. The major materials to study include inverse trigonometric functions, hyperbolic functions and their inverses, functional limits and rate of change. The course also covers derivatives, derivatives of elementary functions, rules of differentiation, chain rule, implicit differentiation and Mean Value Theorems. The students will acquire the knowledge of extrema: necessary and satisfactory conditions for finding local minima and maxima, equation of a tangent line, necessary and satisfactory conditions for finding points of inflexion, curve sketching, antiderivative and standard antiderivatives.

The subject also contains functions of a linear function, integration by part, integration by substitution, definite integral, Newton-Leibniz theorem, partial fractions, integrating trigonometrical functions, area, volumes, surfaces of solids of revolution. Other main guidelines are the following: centre of gravity, improper integrals, complex numbers: addition, multiplication, nth root in different forms: algebraic, trigonometrical and exponential forms, solving quadratic equations and Gaussian plane.

2 Mathematics II. BGRMA2HNEC

Dr. Ágnes Bércesné Novák associate professor

Goals: Having completed this course, students must have developed a clear understanding of the fundamental concepts of single and multivariable calculus, complex numbers and probability theory. Students will have a range of skills allowing them to work effectively with the concepts. The basic concepts are the following: numbers: integers, rational, real, imaginary, complex, improper integrals, partial and total derivatives, global and local extrema, classical notion of probability, random variables and their distributions, basic statistics notion of differential equations, solving methods, solving linear system of equations, notion and application of matrices.

3 Engineering Physics BGRFM11NEC

Dr. Endre Ruzinkó associate professor

The students will get a deep insight into fluids at rest: pressure, pressure gauges, surface tension, Archimedean principle, fluid sin motion: Bernoulli's equation and its applications, laminar flow and turbulent flow and viscosity. The course also covers the working fluid, heat, work and the system, state equations, The First Law, Reversible and irreversible processes. Other major materials to study include Carnot's cycle, the heat engine and the heat pump, the Second Law and entropy.

4 Engineering Physics Measurements BGRMFM4NEC

Dr. Endre Ruzinkó associate professor

The aim of the measurements is to provide the students with basic measuring skills as well as to illustrate the lectures on physics. Labs involve the following projects: Thermal Expansion, Efficiency of Heat Engines, Microwave Optics, Optical Spectroscopy, Radioactivity, Gamma-Spectroscopy, Fundamental constants.

5 Introduction to the Mechatronics BGRME11NEC

Dr. István Nagy associate professor

The students will acquire the knowledge of the subject and concept of mechatronics. The main guidelines are the following: characteristics and the components of mechatronics systems, mechanical parts of the systems: transmission of the power, energy and moving mechanisms, electrical parts of the system: sensors, transducers, electric circuits, metrology: measuring systems, principle of measuring, electronic and non-electronic measuring.

The course also covers signal processing, distribution of the signals, information technology: the phases of the information processing, typically used in mechatronics, and even control strategies: software-based control strategies.

6 Mechanics I. BGBMN11NEC

Dr. Árpád Czifra associate professor

The aim of this subject is to introduce the principles of statics and their practical application. To reach this goal, the subject is divided into themes as follows: fundamentals of vector and matrix algebra, principles and fundamental laws

of statics, description of forces, ideal supports, systems of forces in 2-D and 3-D, distributed forces, equilibrium of rigid structures, internal forces (axial force, shear force, bending moment), cantilever beams and two-supported beams. Statically determinate multi-supported beams, pin-jointed trusses and frames, friction related problems, gravitational load, centre of gravity, second moment of area, Mohr's circle of second moment of area and parallel axis theorem are studied as well.

7 Mechanics II. BGBMN22NEC

Dr. Árpád Czifra associate professor

The aim of this subject is to introduce the principles of strength of materials and their practical application. To reach this goal, the subject deals with the themes as follows: fundamentals of strength of materials, introduction to the theory of elasticity, general state of stress, stress tensor, principal stresses and principal directions and representation of stress states by Mohr's circles of stresses. The subject also contains normal and shear strains, strain tensor, principal strains and principal axes, stress-strain relation of linear elastic materials (Hooke's law), strain energy, tension and compression, shearing and bending, deformation of a bended beam and its stress state and strain energy.

Other major materials to study are torsion, elastic and plastic buckling, combined static load, dimensioning on strength, distortion energy theory, maximum shear stress theory and energy theorems of structural mechanics.

8 Mechanics III. BGBMN33NEC

Dr. Árpád Czifra associate professor

The aim of this subject is to introduce the principles of both kinematics and dynamics and their practical application. To reach this goal, the subject deals with the themes as follows: fundamental conceptions of kinematics and kinetics, velocity and acceleration, throwing, circular motion, harmonic vibration and kinematics of rigid bodies. Other main guidelines are the following: state of velocity, state of acceleration, plane kinematics of rigid bodies, relative motion, kinematics of simple plane mechanisms, kinetics of a particle, Newton's laws, momentum principles and kinetic energy. The students will also acquire the knowledge of work and power theorems, constrained motion of a particle, undamped and damped vibration, plane kinetics of rigid bodies, mass moment of inertia, parallel axis theorem and fundamental conception of dynamics.

9 Electrical Engineering I. BGRET12NEC

Dr. István Nagy associate professor

In the framework of this subject the students are introduced to the basic elements of the electrical circuits. The course also contains structure and characteristics of the active and passive circuit elements, the basic laws, relations of electrical engineering, and the basic principles of electrical machines operations as well as DC machines, AC machines, transformers and 3ph machines.

10 Engineering Materials BAGMN11NEC

Dr. Pál Rácz associate professor

The students will get a deep insight into the fundamentals of materials testing, mechanical, physical metallurgical and non-destructive testing methods, atomic and higher structures of metals, polymers, ceramics and composites, solidification and crystalline structure of metals.

The subject also covers interpretation of the equilibrium diagram and its information content, the process of cold forming and recrystallisation and the consequences in practice and the role of heat treatments in modification of properties of metals.

ECONOMICAL AND HUMAN KNOWLEDGE

11 Economics I. GGTKG1M5EC

Dr. András Medve associate professor

Main guidelines of the subject are the following: an introduction to economics, scarcity and efficiency, the three main concepts of economics organization, consumer behaviour, the optimal choice of the consumers and price elasticity of demand. In the framework of this subject the students are also presented consumer surplus, manufacturers' behaviour, company and enterprise, production function, production costs, short and long-term cost functions.

The course covers the profit, market structures, offer of companies in perfect competition, long-term supply. Profit

maximization of monopoly and oligopolies. The students will examine market of input factors, labour market, capital market, stock market, property market and externalities.

12 Economics II. GGTKG2M6EC

Dr. András Medve associate professor

In the focal points of the subject there are topics such as macroeconomics and its interrelations, actors, output and income, measurement of the macroeconomics performance, macroeconomics cycle, consumption and saving function, demand on the capital market and multiplier effect. The students will also have the chance to study equilibrium income, macro demand, labour market and employment, macro supply, economic equilibrium, the modern money and banking system. Other major materials contain economic growth, conjuncture, inflation and unemployment, the role of the state in economy, fiscal and monetary policy and international trade policy.

13 Environmental Technology BGRKO14NEC

Dr. Annamária Várkonyi-Kóczy professor

The outline of the subject is the following: ecology, classification of industrial vast, environmental management, renewable energy sources, noise protection technology, water purification technology, air cleaning technology, soil protection technology, and health protection technology. Students are supposed to develop understanding of the main fields of environmental technology and its methods.

14 Logistic BGRLG15NEC

Dr. Gabriella Orbán senior lecturer

The purpose of this course is to inspire logistical thinking of students. The basic logistical principles will be presented, including the main logistical activities within companies (purchasing, production, distribution, and waste management), between companies (supply chain management), and problem solving in logistical tasks. We will deal with storage, material handling, packaging, warehousing, loading, and transportation of freight as well as using the latest logistical examples, both in theory and in practice.

15 Quality Technology BAGMB15NEC

Dr. Ágota Drégelyi-Kiss associate professor

The themes of the subject are basics of metrology, calibration of measuring instruments, statistics of measurement results, determination of uncertainty, requirements of accredited calibration and test laboratories. Other major materials to study include standards and demands of quality systems, main segments of quality systems, working of quality systems and case studies. Students are supposed to be familiar with questions and processes of quality assurance, and understand its meaning.

16 Legal Knowledge BGBJO17NEC

Dr. Ádám Guttengéber associate professor

The students will get a deep insight into the history, development and social role of the law, state and law, the concept of law, the legal system and the types of law, hierarchy of sources of law, the concept, validity and effect of the legislation, the legal capacity and certain groups of entities. In the focal point of the subject there are topics like the place and role of the Constitution in the Hungarian legal system, the social relationships governed by the Constitution, the fundamental citizens' rights and obligations, groupings of public bodies and their main task and authority, the national and local bodies of legislation and enforcement.

The subject also deals with the task and authority of the Parliament, the government and the local governments, the judicial authorities, the courts and the prosecutors.

BASICS OF PROFESSION

20 Informatics I. BGRIA1HNEC

Dr. Annamária Várkonyi-Kóczy professor

The topics of the subject are the following: history of information technology, fields of information technology,

hardware architecture, software classification, entropy and information theory, coding theory, security, operating systems, internet, intranet, WiFi, cloud computing, malware, firewall. Students are required to be familiar with the main issues of information technology, they have to understand and handle its tools and phenomenon.

21 Informatics II. BGRIA2HNEC
Dr. Annamária Várkonyi-Kóczy professor

Students are required to learn a high level programming language: Delphi. The topics of the subject are the following: history of Delphi language, syntactical elements, variables, operators, instructions, functions, structures, arrays, unions, standard I/O, modules, low and high level file handling, I/O handling, Object Oriented Programming and structured Query Language.

22 Informatics Laboratory BGRIALHNEC
Dr. Annamária Várkonyi-Kóczy professor

Students are expected to acquire experience in the field of information technology and programming. This subject supports the theoretical subject of Information Technology II. Topics of the subject: basic practice of Delphi language, standard I/O practice, file practice, I/O handling, usage of programming languages in industrial environment.

23 Machine Design I. BGBGG11NEC
Dr. Erzsébet Ancza associate professor

The aim of this course is to provide an introduction to drawing fundamentals and to develop drawing skills of the students. The first part of the course covers such topics as: layout of Technical Drawing, line styles, lettering, scale, geometric construction, transformation, projection (orthographic projection, central or perspective projection, oblique projection), axonometric view (isometric, diametric, Cavalier etc.).

The second part of the course focuses on topics as follows sketching, dimensioning, sectioning, fits and tolerances, surface roughness, symbolical representation, detail and assembly drawing.

24 Machine Design II. BGBGG22NEC
Dr. Endre Korondi associate professor

The aim of this course is to provide an overview of repeatedly used simple machine components, their tasks and models applied at dimensioning. This course covers the topics as follows: types of load, friction and rolling resistance, material models, methods of dimensioning on simple and combined static loads and on repeated loads (harmonically varying loads, random varying loads), and threaded connection.

Other main guidelines are the following riveted joint, welded joints (butt seam, fillet seam), soldering, brazing, glued connections, press fitted joints, key joint, pins, shaped joints, dimensioning of shafts, sliding bearings (hydrostatic and hydrodynamic sliding bearings), rolling bearings, couplings (rigid couplings, elastic couplings) and clutches.

25 Machine Design III. BGBGG33NEC
Dr. Endre Korondi associate professor

The aim of this course is to provide an overview of drives by friction force and drives by shape. Their tasks, models applied at dimensioning and operation will also be presented. This course covers the topics as follows: friction drives, belt drives (flat belt drives, Vee-belt drives, multiple Vee-belt drives), chain drive, worm gear drive, gear drives, dimensioning of gears on strength, types of teething (spur teething, helical teething, spiral teething, hypoid teething etc.), teething with profile displacement, undercutting, tooth sharpening and failure mechanisms of gears.

26 Computer Systems for Product Engineering BGBRST3NEC
György Gyurecz senior lecturer

The course covers concept and basics of integrated modeling in product lifecycle management, shape centered models for mechanical units and their construction, primary shape adding and reverse engineering. Simulations for loads on parts, part placing, kinematics, shape adding, and appearance. Interoperability of modeling systems in inhomogeneous environments is studied as well.

27 Materials Technology I. BAGAC12NEC *Dr. Pál Rácz associate professor*

The course gives an overview of basic materials processing methods, like casting, rolling, forging, bulk and sheet metal forming, polymer processing, powder metallurgy, etc. The students will get a deep insight into material properties and their effect on castability and formability, joining of metals, soldering, brazing, welding, surface coating, materials and forming technology. Other main guidelines include engineering materials and forming processes, functions, loads, materials and shapes of parts, metals and their alloys, heat treatments and tests.

28 Materials Technology II. BAGAC23NEC *Dr. Pál Rácz associate professor*

The students will acquire the knowledge of fundamentals of heat treating technologies, equilibrium and non-equilibrium, structures, properties, process parameters and technologies of quenching, tempering, annealing and normalising. Other major materials to study include thermochemical and thermomechanical heat treatment processes and their basic parameters, case hardening, nitriding of steels, surface heat treatment technologies, evaluation and optimising of technologies. Heat treating furnaces, cooling media, atmospheres, and testing of heat treated parts are studied as well.

29 Control Engineering BGRIR14NEC *Dr. Róbert Szabolcsi professor*

The course covers the basics of automatic control theory, modern control theory, mathematical models of dynamical systems, Laplace-transformation used in control theory and state-space representation of dynamical systems. The students will get a deep insight into block diagrams, signal flow charts, basic terms and their analysis, time domain responses, frequency domain responses, open loop system analysis and closed loop system analysis. Other main guidelines include reference signal tracking problems, disturbance rejection and sensor noise attenuation problems, and their solution in control engineering, stability problems of the closed loop control systems, main elements of the control engineering, and their dynamical description. Other major materials to study include dynamic performances used in control engineering, control system preliminary design: pole placement, LQ-based design methods, solution to control problems of control engineering using MATLAB, analogue and digital devices used in control engineering. Basics of PLC-technology and PLC compact controllers used in control engineering.

30 Analogue and Digital Circuits I. BGRAD14NEC *Dr. István Nagy associate professor*

The students will acquire the knowledge of main electronic parts of semiconductors: diodes, transistors, FETs and their basic circuits, amplifiers, operational amplifiers and their basic circuits, application samples, integrated stabilizer, multiplier, and other non-linear circuits. The course also shows application examples. Students are supposed to be familiar with the basics of analogue and digital technology, they have to analyse, establish and repair analogue circuits.

31 Analogue and Digital Circuits II. BGRAD25NEC *Dr. István Nagy associate professor*

The students will get a deep insight into logical circuit creation from analogue one, logical circuit families (RTL, DTL, DCTL, TTL), basics of logical functions and their descriptions, usage and handling, sequential circuits, flip-flops, counters, shift registers, memories, working and technology of digital circuits classes, SSI, MSI, LSI circuits, VLSI circuits. Other major materials to study include microprocessors and their auxiliary circuits, buses, micro-controllers and their usage and FPGAs. Students are expected to be familiar with the basics of digital technology, they have to analyse, establish and repair digital circuits.

32 Pneumatics and Hydraulics BGRPH14NEC *Dr. Endre Ruszinkó associate professor*

The principles, functions, terminology and uses of fluid power components are studied in this course. Control techniques are examined by interpreting hydraulic and pneumatic drawings and symbols. The course provides a survey of actuation

and fluid power transmission devices, as well as the properties of fluids. System-technical introduction of the control and auxiliary components of the energy converter of hydraulic and pneumatic power transmitters. Construction and planning methods of hydraulic and pneumatic systems

33 Thermo- and Fluid-dynamical Engines BGRRHG5NEC *Dr. Endre Ruzinkó associate professor*

The course covers axiomatic presentation and the fundamental mathematical methods of Classical Thermostatistics: the 0th, 1st, and 2nd Main Postulates: statistical and mechanical formulation of the approximate independence of sub-systems; Boltzmann's Entropy and the fundamental entropy function. Other main guidelines are the following: optimum under constraints, Lagrange Multipliers, the Energy Minimum Principle, Legendre transformation, reservoirs and Thermodynamic Potentials; the necessary condition for the stability of the thermal equilibrium, phase transitions and the 3rd Postulate. The students will deal with applications: quasi-stationary process, refrigerators systems, heat pumps, and gas and steam power plants, industrial cooling towers. They will also study about the basics in Fluid Dynamics: tensor fields, densities and current densities, Continuity Equation, Euler Equation, viscosity, applications: Dimensional Analysis, scaling rules, friction factor, flow of fluid in pipes, surface heat transfer coefficient, forced convection, rotodynamic pumps and motors, specific speed, cavitations, Bernoulli's Theorem, NPSH. Numerical laboratory consists of the use of MS EXCEL & Visual Basic for function fitting to evade the use of tabulated data.

34 Manufacturing Engineering I. BAGGT12NEC *Dr. Viktor Gonda associate professor*

The course focuses on definition of technology, scope and relationships, manufacturing of specific materials for mechatronic applications, types of materials, metals. The students will be able to examine inorganic non-metal materials, attributes and manufacturing of semiconductors, production technologies, material impairment and protection (break, ageing, corrosion, biological impairment, Tribology), surface treatment methods and their technologies, joining technologies (mechanical, chemical, electronical) and even PC board technologies and mounting.

35 Manufacturing Engineering II. BAGGT23NEC *Dr. Balázs Mikó associate professor*

The course covers principles of cutting, energetic process of cutting, tool wear and tool life, basic figures of planning of economic cutting, cutting methods, types of tools, tool angles, exercises and types of machine tools. The students will study general structure of machine tools, main components, structure of NC, CNC machine tools, locating features, tooling process and manufacturing methods of characteristic surfaces (inner cylindrical surface, hole, and plane).

36 Electronics KMEEA13TEC *Dr. Péter Turmezei associate professor*

This subject provides an insight into physical working of semiconductor devices and their features. The topics of the subject are divided into semiconductor materials, alloying semiconductors, PN boundary, diodes and their characteristics, bipolar transistors and their characteristics. The students will also get an insight into J FETs and MOS FETs, basic circuits of discrete elements, operational amplifier, features and inside structures of OP A, and their basic circuits.

37 Precision Mechanics KMEFM15TEC *Dr. Marianna Lendvay associate professor*

Main features of precision mechanics are examined. The subject contains concepts, parts and devices, typical precision mechanics solutions, measurement instruments of precision mechanics, mechanical, optical and electrical devices. Other main materials are special field of precision mechanics usage, i. e. Winchester and effect of precision mechanics on present technology. Students are required to be familiar with the main field of precision mechanics, such as parts, tools and measurements technology.

38 Interfaces KMEIF16TEC *Márk Horváth assistant lecturer*

The course involves basics in the field of interface circuits, students are supposed to be able to design various interface circuits for various goals. The topics of the subject are the following: interface problems, level interfaces, simple binary

input interfaces, simple binary output interfaces, converters, circuit families, special interface circuits in industrial circumstances. Interface buses, special interface devices are also studied.

39 Safety Engineering, Ergonomics BGBBER7NEC
Dr. Csaba Kósa associate professor

Introduction to the structural, personal and real conditions of healthy and safe working conditions. Students have to master the principles of safe operation of different working systems, principles of safety of work, ergonomics of working systems.

Other major materials include real working circumstances (air conditioning, acoustic and vibration protection, lighting, radiations), safety engineering of electricity and safety engineering of labour instruments' operation and evaluation.

SUPPLEMENTARY SUBJECTS

80 Physical Education I. GTSTESTNEV
Györgyné Fehér trainer

The aim of the subject is to provide the conditions of regular sports activities for the students, to advertize the healthy way of living and to draw attention to the preventive values of physical training. Students can choose freely from the branches and courses offered by the Physical Education and Sports Institute.

81 Physical Education II. GTSTESTNEV
Györgyné Fehér trainer

The aim of the subject is to provide the conditions of regular sports activities for the students, to advertize the healthy way of living and to draw attention to the preventive values of physical training. Students can choose freely from the branches and courses offered by the Physical Education and Sports Institute.

82 Mechanical Eng. Practice I. BAGGM12NEC
Tamás Nikitscher training engineer

The course includes orientation (information about the subject, team arrangement, and exemption), preface of cutting, basics of cutting, specificity of turning, safety education, main measurement equipment of a workshop. The students will acquire the knowledge of build-up-, operation and parts of lathe, workpiece chucks and positioning equipment, preparation of workpiece (sawing), basic operations on lathe.

Other major issues include intermission, machining of special geometries, machining practice (lathe) I – „First tool path”, movement of slides, machining practice (lathe) II – Type of operation: longitudinal, facing, drilling, machining practice (lathe) III – Internal operation, machining practice (lathe) IV – Thread turning and machining practice (lathe) V – Thread turning.

83 Mechanical Eng. Practice II. BAGGM23NEC
István Burai training engineer

Safety education is examined. The subject contains basics of milling: initial considerations, the component, basics of milling: the machine, basics of milling: tools, tool holders. Topics are divided into workpiece fixtures and positioning equipment, basic operations on machine tool: face milling, shoulder milling, slot milling, machining of special geometries. Other main materials to study include machining practice I –milling, machining practice II –milling, basics of drilling, initial considerations: machine tool, tools, tool holders, machining practice III –drilling basic of grinding, initial considerations: machine tool, machining practice IV – grinding And machining practice V – grinding.

OPTIONAL SUBJECTS

18 Engineering Ethic BGBETK7NEC
Dr. Sándor Horváth associate professor

The future of mankind is not a technological question, but an ethical one. The technology to destroy the whole

humanity is already in our hand, that is why the technical intelligentsia assume specially high responsibility. Engineering knowledge is power to live with responsibly that is the reason why engineers need their own moral laws and engineering ethics. This subject focuses on the questions of general ethics, more important ethic tendencies from the ancient times to the twentieth century as well as the ethical norms of the big world religions. It analyses the specific questions of engineering ethics in detail, environment protection, use of energy, the borders of engineering risks and the ethic questions of undertaking and taking responsibility.

19 EU Knowledge GSVEU17NEC
Dr. Valéria Szekeres associate professor

The students will get a deep insight into the introduction to integration theory, types and levels of economic cooperation in theory and practice, preconditions of successful cooperations, historical, economic and political reasons for the European integration and the Idea of Europe. Other main guidelines include history of the European integration, the Three Communities (ECSC, EEC, and EAEC).

The course also deals with integrating countries with different economic and social development, reforms in the European Union, Constitution or Treaty?, renewal of the cooperation and EU's role in the World Economy. The main topics related to this subject contain contribution to global GDP, main export and import relations, distribution of goods and services exported and imported by the EU member states, free trade agreements between the EU and other countries/integrations. The core material also examines internationalisation of European companies, Hungary's economic connections with the EU member states, Hungary as an EU member state: process of the integration into the economic and monetary union.

64 Topics in Mathematics BGRMAFVNEC
Dr. László Hanka senior lecturer

The main guidelines of the subject are the following: theory of ordinary differential equations, first order and second order differential equations, systems of linear differential equations, theory of oscillations and theory of series. The students will also deal with numerical series, tests for convergence, function series, power series, Cauchy-Hadamard's theorem, Taylor-series and applications of Taylor-series.

The course also covers real and complex Fourier-series and its applications, Parseval's theorem, discrete and continuous Fourier-transform, Laplace transform and its applications. Linear algebra and theory of matrices, vector spaces, subspaces, theory of linear equation systems, linear transformations, eigenvalues, eigenvectors, orthogonality, theory of graphs, and its applications are studied as well.

65 Aviatica I. BGBAV10NEC
Dr. András Jancsó associate professor

The theoretical material gives introduction into the theoretical physics questions of flying, studies the general conceptual viewpoints of forming an aeroplane, the connections between the functions and structural construction of the separate structural elements and at the same time it deals with questions of mechanics, sizing, materials, and confronts with practical applications and their morals of these theoretical considerations.

As for the airport project, the students have to put what they theoretically acquired about flying during the course into practice with flying their own models.

69 Basics of Organising Safety BGBBSA2NEC
Dr. Sándor Horváth associate professor

The students will get a deep insight into the concept of safety organising, its content, aim, safety measures, methods in history and the development of the safety activity. The subject examines risks, events, extraordinary events, risk-analysis, view points of property protection, data protection, disaster recovery, fire protection, and labour protection as opposed to the economic risks.

The course also covers the basic principles of object protection, opportunities of forming defensive circles, devices and procedures applied there. The core materials also examines the specialities of person protection activity – guard – and the differences from the solutions applied to date, safety of private, corporate, social, religious and cultural events.

70 GPGPU Programming BGRGP1VNEC
Ákos Tóth senior lecturer

The students will get a deep insight into the history of GPU programming, data parallelism, CUDA program structure,

introduction to CUDA C. Device memories and data transfer, Kernel functions and threading and thread cooperation. Other major materials to study include atomics, streams, performance considerations, floating point considerations, application case studies, parallel programming and computational thinking and brief introduction to OpenCL. Complex systems specialization

44 Micro and Nanotechnologies I. BGRNT14NEC

Dr. Péter Pál Bakucz associate professor

Students are required to be familiar with the main fields of micro and nanotechnologies and their usage. The main topics of the subject are the following: development of micro- and nanotechnology, historical perspective, characteristics and results, review of micro- and nanotechnologies, physical and chemical fundamentals, the place and role of micro- and nanotechnologies among the advanced technologies, specific properties of micro- and nanodimensional structures, mechanical, electrical, optical, etc., characteristics and effects.

45 Micro and Nanotechnologies II. BGRNT25NEC

Dr. Péter Pál Bakucz associate professor

Topics of the subject are the following: nanoelectronics and nano-optoelectronics, operational principles and devices, reduced dimensional (two- and one-dimensional) electron system semiconductor devices, nanodimensional devices, mechanical, electromechanical, electronic, optical, optoelectronic and magnetic devices. The students will acquire the knowledge of quantum effect of semiconductor devices, characterization and measurement techniques and apparatuses of micro- and nanometric technologies, nanometric resolution in depth and on the surface, atomic resolution electron microscopy, atomic force microscopy (AFM) and scanning tunneling microscopy (STM).

46 Low Dimensional Self-Organising Systems KMEOA16TEC

Dr. Ákos Nemcsics professor

The course covers the concept of the low-dimensional system, quantum confinement, electronic band structure, density of states; examples for low-dimensional systems (quantum film, quantum wire, quantum dot, super lattice), concept of the self-assembled system; cases for self-assembled system (from living nature, from lifeless nature, from material science), driving forces, pattern formation, fractals, adaptive dynamics, transformation via non equilibrium way, role of fluctuation, entropy and cases in material science (instabilities in laser effect, Gunn-instability). The topics are divided into the crystal growth (Frank van der Merve, Stanski-Krastanov, Vollmer-Weber), linear and non linear theory; in-situ investigation of the growth (by optical methods, by electron beam, by X-ray etc.); ex-situ investigation (by scanning tunneling microscopy, by electron microscopy etc.) growth technology of the low-dimensional crystal structures (Molecular Beam Epitaxy and other epitaxial technologies, laser ablation etc.) The growth process, the surface coverage, the lattice mismatch and the critical layer thickness are also studied.

47 Industrial Robot Systems I. BGRRR14NEC

Dr. János Somló professor emeritus

The main guidelines are the following: manufacturing automation, robotics, and mechatronics: history, systems and subsystems, tasks and definitions, robot kinematics, motion planning, robot types: cylindrical, humanoid, SCARA, etc., direct and inverse kinematics for those and time optimal motion planning.

48 Industrial Robot Systems II. BGRRR25NEC

Dr. János Somló professor emeritus

The major materials to study include general methods of robotics, the homogeneous transformations and generalized vectors, the Denavith- Hartenberg generalization, the parametric method of motion planning, general method of time optimal motion determination, robot dynamics, robot control, realization of robot motions and the model of drive systems.

OPTIONAL SUBJECTS

50 Programable Circuits And Controls BGRPV16NEC

Dr. István Nagy associate professor

This subject is intended to use the basic relations in programmable logical devices (PLDs) and PLC programming. The students are introduced to the programming of: PLA, PAL, GAL, FPGA circuits and its inner structure. In the second part of the semester the students will be introduced to the PLC technology, more specifically the structure of the bit/byte controlled PLCs and PLC programming, FPGA technology, FPGA options, advantages (and disadvantages) of creating high-integrity embedded systems using FPGAs. FPGA vs. ASIC And FPGAs as a prototyping platform. Other main materials include working with "soft" processor cores, basics of HDL and digital logic, concurrent statements (AND, OR gates etc), sequential statements (flip-flops). The students will get an insight into the introduction to HDL tools (synthesis, fit & route). Why use VHDL? Other major guidelines cover packages, components and architecture, top level modules, libraries (IEEE), port map, signals / variables, process & sensitivity lists, modelism & test benches.

51 C ++ Programming BGRPN16NEC

Ákos Tóth senior lecturer

The subject contains introduction to C++, structure of a program, variables, operators, control flow, if statements, for statements, while statements, do while statements, break and continue, arrays, strings, pointers and references. The course also deals with functions, OOP, classes and class members, constructors, destructors, operator overloading, inheritance, input and output (I/O), templates, STL and exceptions.

52 Mechatronics of Manufacturing Systems BAGGM26NEC

Dr. Balázs Mikó associate professor

The course examines the principles of CNC machine tools and CNC programming, basics of manufacturing process planning, methods and techniques, and application of CAD/CAM systems as well.

53 Mechatronics of vehicles BGRJM14NEC

Sándor Kerekes senior lecturer

The course focuses on the vehicle as a complex mechatronics system, vehicle dynamics - dynamics of linear and lateral motion, elements of automotive drivetrain, internal combustion engine management (spark-ignition engines, diesel engines) and starting systems. The students will get an overview of automotive sensors, electrical systems and power supply of vehicles, alternators, electric and hybrid drive line, integrated starter alternator (ISG) and the basics of electromagnetic compability (EMC). Other main guidelines include bus systems of vehicles, diagnoses of Automotive Engines, vehicle modelling, braking systems, ABS antilock braking systems for vehicles, adaptive cruise control and vehicle chassis systems: suspension system, wheels, tires, power assisted steering. The students will also acquire the knowledge of safety systems: air bag, tire-pressure monitoring system, comfort and convenience systems and lighting.

54 CAD KMESG17TEC

Dr. Zsolt Horváth professor

The subject teaches about computer aided design and manufacturing (CAD, CAM) in creating printed circuit boards. The topics are the following: connection between CAD/CAM systems – how different professions use them, the history of PCB manufacturing and procedure of design: schematics, positioning the footprints, wiring. The students will also get a deep insight into creating the schematics and nets, use of buses, types of footprints, checking of design, creating netlist, handling footprints, the function of layers, problems of wiring, automated wiring, setting parameters, creating, over viewing and checking CAM data. In the laboratory session, students must complete an exercise using computer. They receive a precise designing objective which must be completed within the given time limit.

55 Networks of Informatics BGRIH16NEC

Dr. Péter Pál Bakucz associate professor

Introduction to Neural Networks. The students will get an answer to: What is a neural network? Topics are divided into Neuron Model, Network Architectures and Learning neuron model, activation functions, network architectures, learning algorithms, learning paradigms, learning tasks, knowledge representation, and neural networks vs. statistical methods.

The course also covers Perceptrons and Linear Filters perceptron neuron, perceptron learning rule, adaline, LMS learning rule, adaptive filtering, XOR problem backpropagation multilayer feedforward networks, backpropagation algorithm and working with backpropagation. Other major materials to study include advanced algorithms, performance of multilayer perceptrons, dynamic networks, historical dynamic networks, focused time-delay neural network, distributed time-delay neural network, NARX network, layer recurrent network and computational power of dynamic networks. The subject focuses on learning algorithms, system identification, model reference adaptive control, Radial Basis Function Networks RBFN structure, exact interpolation, radial basis functions, radial basis function networks, RBFN training, RBFN for pattern recognition, comparison with multilayer perceptron, probabilistic networks and generalized regression networks, as well. Other main guidelines contain Self-Organizing Maps self-organization, self-organizing maps, SOM algorithm, and properties of the feature map and learning vector quantization.

56 Diploma Work BGRSD1MNEC
Ingrid Langer senior lecturer

The aim of the diploma work is that at the end of the course the student individually solves a complex task according to the requirements of the professional knowledge, demonstrating that he or she acquired competent knowledge and is familiar with the technical literature. The general rules of the subject "Diploma Work" is contained in § 32 of TVSZ. The requirement of the subject "Diploma Work" is a signature. The diploma work must be defended at the Final Examination. To fulfill the requirements of the subject the student has to attend consultations at least four times and the "Consultation Diary" has to be signed by the assigned supervisor.

57 Integrated Practice (specialised) BGRGY17NEC
Dr. István Nagy associate professor

Inside this subject the students are sent to firms for a 14 weeks' practice. The firms are evaluating the students' work, and at the end of the course, are giving verification to the professors about their performance. The selected firms have contracts with the institute.





ELECTRICAL ENGINEERING

No.	Neptun Code	Subjects	Semesters																								Prerequisites											
			1.				2.				3.				4.				5.				6.						7.									
			lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re			cr	lc	pr	lb	re	cr	lc	pr	lb	re
35	KMEEL21ANC	Electronics II.										2																							34			
36	KMEEL22ANC	Electronics II. Laboratory										2		as	2																				35			
37	KMAAT11ANC	Automation I.										2																					1	21				
38	KMAAT12ANC	Automation I. Laboratory										2		as	2																				37			
39	KHTHI11ANC	Communication Technics I.										2																						1	21			
40	KHTHI2ANC	Communication Technics I. Laboratory															2		as	2																39		
41	KVEEE11ANC	Electrical Energetics I.										2																					1	21				
42	KVEEE12ANC	Electrical Energetics I. Laboratory (2)															2		as	2																41		
43	KMEET11ANC	Electronic Technology														2																				8		
44	KMEET12ANC	Electronic Technology Laboratory															2		as	2																	43	
45	KMEAM11ANC	General Engineering Studies																					2	1						ex	3					25		
Supplementary Subjects																																						
73	(BTOSMA1NEC)	Physycal Education I.						2		ex																												
74	BGRMAFVNEC	Physycal Education II.										2		ex																								
Optional Subjects																																						
80	GGTUK11ANC	Business Communication																					2											as	3			
81	GGTSZ11ANC	Sociology																					2												as	3		
Communication Engineering Specialization																																						
46	KHTAT11ANC	Circuit Design														4		2	ex	8																	36	
47	KHTHI21ANC	Communication Technics II. (Communication)														4		2	ex	8																	37	40
48	KHTHI31ANC	Communication Technics III. (Signal Processing)																					3		3		ex	7									47	
49	KHTT11ANC	Telecommunication																					3		2		ex	7									47	
55	KHTIH11ANC	Infocommunication Networks I.																					4		3		ex	8									48	49
56	KHTIH21ANC	Infocommunication Networks II.																					4		3		ex	8									55	
58	KHTIR11ANC	Operating and Safety of Informatic Systems																												4					ex	6	56	
Optional Subjects																																						
82	KHTSV53ANC	Data and Information Security																					2												as	4		
83	KHTSV71ANC	Mobile Communication																											2						as	3		
Instrumentation and Automation Specialization																																						
46	KMAAZ11TNC	Automatics														4		2	ex	8																	36	
47	KMABR11TNC	Embedded Systems														4		2	ex	8																	30	
48	KMAJK11TANC	Signal and Image Processing																					3		3		ex	7									27	
49	KMAME11TNC	Engineering Design																					3		2		ex	7									42	

No.	Neptun Code	Subjects	Semesters															Prerequisites														
			1.			2.			3.			4.			5.						6.			7.								
			lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr					
65	KMAGY11ANC	Automatic Manufacturing Systems I.																4			3	ex	9									46
66	KMAGY21ANC	Automatic Manufacturing Systems II.																						4			3	ex	9			64
67	KMAGP12ANC	Automatic Manufacturing Systems Project I.																							2	ex	4			64		
68	KMAIN11ANC	Information Systems																									4		ex	6		66
69	KMAPR22ANC	Automatic Manufacturing Systems Project II.																										2	ex	3		5
Optional subjects																																
84	KMAIR11ANC	Intelligent Robotic Systems																2					as	4								
85	KMAOR11ANC	Object Oriented Methodology																2					as	4								
86	KMARO11ANC	Real-time Operating Systems																									2		as	3		

ex – examination, pm – practice mark, ce – course examination, as - assignment

p - both the subject and the prerequisite can be chosen in the same semester

(1) Sign of course makes necessary to fulfill prerequisites

(2) Semester of the course is determined by the institute responsible for the speciality, according to the amount of students.

Courses signed by character # can be started paralelly, if necessary.

*List of obligatory optional courses is included on last page of the table

BASICS OF NATURAL SCIENCE

1 Mathematics I. KMEMA11ANC Dr. Aurél Galántai professor

The course covers matrixes, determinants, systems of linear equations, the linear space and its applications, the three forms of a complex number and the rules of operations in these forms, vectors, and operations on vectors, the coordinates of a vector and applications of the vectors. The students will get a deep insight into infinite sequences, boundedness and monotony, the limit point and the limit of a sequences, fundamental theorems for sequences, the concept of a function and its principal properties. Other main guidelines contain elementary functions, the derivative of a function and its physical and geometrical meaning, differentiation rules, mean value theorems, application of the derivative to the investigation of the behaviour of functions and to the miscellaneous problems, the concept of a function of two (and more) independent variables and its partial derivatives.

The subject also examines the differential of a function and its applications, the indefinite integral, basic integration formulas, integration by parts, integration of rational functions and the method of a change of variables, Riemann integral and its principal properties.

2 Mathematics II. KMEMA21ANC Dr. Aurél Galántai professor

During the semester the students will learn about several applications of the definite integral (calculating areas, length of the arc of a curve, volume of a solid of revolution etc.), improper integrals, approximate calculation of integrals, Laplace transformation and its principal properties. Other major materials to study include double integral, its principal properties, calculation of the double integral over the normal regions, differential equations, principal first- and second-order differential equations, infinite series and its principal properties.

The students will deal with convergence tests, power series, its principal properties, Taylor and Fourier series, algebra of events, the concept of probability, its principal properties, field of classical probability, the conditional probability, independent events and random variables. Other main topics to be examined are the distribution and the density function, their principal properties, expectation and the variance of a random variable, main discrete and continuous distributions, their characteristics and the central limit theorem.

3 Informatics I. KMAIA11ANC*Dr. György Schuster associate professor*

The students will acquire the knowledge of the history of informatics, hardware basics, structure of computers, parts of their functions, classification, working, software basics, software as a critical part of success and software classification. The course also covers number systems and calculation with them, operating system, office systems, database basics, data models (relational, hierarchical, network like ...), CAE systems and their categories, CAD, CAM, CASE. During the semester the students master life cycles models (seven step model) of software waterfall, cyclic, evolutionary and their features, measuring of software quality ISO 9126, special systems, embedded systems and integrated information systems. They will also learn about networking, topology, ISO - OSI TCP/IP models, parts of information systems, servers, system organizing, special parts of information systems, DMZ and firewalls.

4 Informatics Laboratory KMAIA12ANC*Dr. György Schuster associate professor*

Main materials to examine are C development environment, functions of IDE, editing, compiling, debugging, start file editing, most often used include files, type of variables and their features, operators, categories and their features, instructions, run time instructions (selection and cycles head-tested - tail tested) and other structures. Other major guidelines to study include one dimensional and more dimensional arrays, simple algorithms bubble sorting, linear searching, logarithmic searching, minimum-maximum searching, functions, recursive functions and complex algorithms. The students will also get a deep insight into structures and unions, classical list structures and bidirectional list structures, character handling of display, complex project in C, modular programming, mathematical algorithms, matrix - vector algorithms, usage of mathematical library and their functions.

5 Informatics II. KHTIA21ANC*Dr. György Schuster associate professor*

During the course the students will meet classification of operating systems, structure and handling of POSIX compatible operating systems, typical script language, history of script language, PERL evolution, data types of PERL, operators of PERL and instruction of PERL. The course also covers subroutines and competence of variables, modules, blocks, OOP in PERL, TK basics, Basic widgets Main Window, Entry, Label, Button, Check button, IPC basics in Perl, processes, threads and sockets. Other major topics to deal with contain matrix of information, entropy, channel capacity, redundancy, code theory, fit codes, BCD codes, one-step codes, error corrector codes, Hamming codes, cyclic codes, CRC, CRC generation via hardware and software, RSA basics, key generating, key changes, mathematical background of RSA, prime testing and prime searching.

6 Physics I. KMEFI11ANC*Dr. János Orosz associate professor*

The students will get a deep insight into mechanics, kinematics, dynamics, mechanical work, kinetic energy, power, systems of particles, motion of rigid body, observational frames of reference, oscillation, wave motion, physics of sound, fluid mechanics, the kinetic theory of gases, optics, Fermat's principle and wave optics (diffraction, holography). Other main guidelines include thermodynamics, thermodynamic laws, thermodynamic cycle, principles of statistical physics and thermodynamics, theory of relativity (Galilean invariance, relativity of length, Lorentz contraction, time dilation, and special relativity). During the semester the students will study electromagnetic theory (electric charge, electric field, Gauss' law, potential, elementary vector analysis, magnetic force, magnetic field, cyclotron, synchrotron, Faraday's law, and Maxwell's equations).

7 Physics II. KMEFI21ANC*Dr. János Orosz associate professor*

In the focal point of the subject there are topics such as black body radiation, photo effect, Compton effect, wave-particle duality, atomic structure (atom models, quantum numbers, Pauli exclusion principle) quantum mechanics, Hilbert space, Heisenberg's uncertainty relation, Schrödinger equation and solution to Schrödinger's wave equation. The students will also get a thorough notion of quantum confinement, quantum entanglement, quantum information, condensed matter physics, types of bonds, electronic band structure, Hall effect, semiconductors, Fermi-Dirac statistics and band gap engineering. Other major materials to study include thermoelectric effects, magnetic properties, Ferro electricity, piezoelectricity, liquid crystals, supra-conductivity, luminescence, lasers, nuclear physics, organizing the nuclides, nuclear force and elementary particle physics.

8 Materials Science KMEVR11ANC *Dr. Sándor Csiszár senior lecturer*

EE

Topics are divided into the following categories: physical and chemical background of materials properties; structure of atoms, chemical bonds, some principles of thermodynamics; energy, equilibrium, Gibbs/Helmholtz potentials and basics of solid state physics. The students will also get a deep insight into crystal structure of solids, imperfections in crystals and their impacts on the properties, phase transitions; formation of solids, manipulations of crystal texture, non-crystalline materials and phase diagrams. Other main guidelines to examine contain structure and properties of materials; mechanical-, electrical-, magnetic-, thermal- and optical properties based on solid state physics and quantum mechanics, description of main groups of engineering materials: metals, ceramics, polymers and composites and main aspects of materials selection.

9 Materials Science Laboratory KMEVR12ANC *Dr. Sándor Csiszár senior lecturer*

Objectives of the course are the following: introduction to the main methods of investigations used in the electrical industry, as well as to the evaluation methods, and to the preparation of laboratory reports, measurements: mechanical properties: Tensile test, Rockwell and Brinell hardness test on metals. The students will also deal with microscopy: examination of metallurgical and microelectronic samples, distance measurement on microscopic specimens, stress optical examinations; polarized light, optical anisotropy, birefringence, stress in glasses and plastics. The course also covers insulating materials: measuring volumetric and surface resistance, dielectric properties, and spectrophotometry: measurement of absorption spectra of solutions and evaluations of concentration.

10 Basics of Safety Technology, Environment Protection and Quality Assurance KMEMI11ANC *Dr. Marianna Lendvay associate professor*

During the semester the students will learn about the basics of employee's safety, terminology, goals and objectives of employee's safety, requirements and treatments of employee's safety, Importance of work environment, human-machine-environment frame, impairing progression and the basics of risk theory. Other major materials to examine contain electrical safety, the electrically safe work conditions, working on or near live circuits, the effects of electric shock on a human body, the effects depending on type of current, amperage, duration of exposure, pathway of current, body resistance, rescue from electrical contact, first aid for electric shock, direct and indirect contact protection and safety requirements. The course also covers concept of environment protection, principles of environmental politics and decision-maker organizations of EU, means of environmental protection regulation, terminology of energy-efficiency, ways and means for saving energy and water and environmental management systems. The students will also get a thorough notion of the concept of quality assurance, quality systems and standards (ISO 9000), principles of quality control, product reliability, problems of reliability tests and practical applications, reliability calculations of apparatus and systems, the concept of TQM (Total Quality Management) and phases of introducing its application and means of continuous quality improvement.

ECONOMICAL AND HUMAN KNOWLEDGE

11 Economics I. GGTKG11ANC *Dr. András Medve associate professor*

Main guidelines of the subject are the following: an introduction to economics, scarcity and efficiency, the three main concepts of economics organization, consumer behaviour, the optimal choice of the consumers and price elasticity of demand. In the framework of this subject the students are also presented consumer surplus, manufacturers' behaviour, company and enterprise, production function, production costs, short and long-term cost functions. The course covers the profit, market structures, offer of companies in perfect competition, long-term supply. Profit maximization of monopoly and oligopolies. The students will examine market of input factors, labour market, capital market, stock market, property market and externalities.

12 Economics II. GGTKG21ANC *Dr. András Medve associate professor*

In the focal points of the subject there are topics such as macroeconomics and its interrelations, actors, output and

income, measurement of the macroeconomics performance, macroeconomics cycle, consumption and saving function, demand on the capital market and multiplier effect. The students will also have the chance to study equilibrium income, macro demand, labour market and employment, macro supply, economic equilibrium, the modern money and banking system. Other major materials contain economic growth, conjuncture, inflation and unemployment, the role of the state in economy, fiscal and monetary policy and international trade policy.

13 Enterprise Economics I. GSVVG11ANC
Dr. György Kadocsa associate professor

The students will get a thorough notion of the introduction to integration theory, types and levels of economic cooperation in theory and practice, preconditions of successful cooperations, historical, economic and political reasons for the European integration and the Idea of Europe. Other main guidelines include history of the European integration, the Three Communities (ECSC, EEC, and EAEC), treaties of Rome: vision and objectives, the development periods of the European integration from Rome to Lisbon and establishing the European Union. In the framework of the subject the students are presented free trade agreements between the EU and other countries/integrations, internationalisation of European companies, Hungary's economic connections with the EU member states, Hungary as an EU member state: Process of the integration into the economic and monetary union.

14 Enterprise Economics II. GSVVG21ANC
Dr. György Kadocsa associate professor

The course covers circulation of the resources of the enterprise, management of tangible assets, management of current assets, management of human resources and basics of marketing. The students will have the chance to study about the 4P approach, the process of marketing planning, application of market research methods, and penetration into the markets with new products and existing products. In the framework of this subject the students are presented pricing of products and product life cycles, types of costs, calculation methods used in the enterprises, investment models and calculation methods of the return of investment.

During the semester the following issues will also be examined: net present value, future value of the investment, production management methods, the question of financial balance of the company, classification of the assets and liabilities, the profit and loss account and the balance sheet and reports for the stakeholders.

15 Management GVMME11ANC
Dr. István Szűts associate professor

The students will get an overview of acquiring management theory and practice, self-management, development of leaders' personality characteristics, managerial-organizational knowledge, learning methods and techniques for applying these. The subject also includes development of interpersonal communication skills necessary for managerial activity, mechanisms of decision, problem –solving techniques and their correct application.

16 Law GGTJ11ANC
Dr. István Csillag associate professor

The students will get a deep insight into the history, development and social role of the law, state and law, the concept of law, the legal system and the types of law, hierarchy of sources of law, the concept, validity and effect of the legislation, the legal capacity and certain groups of entities.

In the focal point of the subject there are topics like the place and role of the Constitution in the Hungarian legal system, the social relationships governed by the Constitution, the fundamental citizens' rights and obligations, groupings of public bodies and their main task and authority, the national and local bodies of legislation and enforcement. The subject also deals with the task and authority of the Parliament, the government and the local governments, the judicial authorities, the courts and the prosecutors.

BASICS OF PROFESSION

18 Electricity I. KHTVL11ANC
Dr. Sándor Bognár professor

In the focal point of the subject there are topics like the summary of the basic concepts of vector algebra, scalar and

vector quantity, the law of electrostatic field, Coulomb's law and superposition, the potential, capacity, energy equation and the dielectric constants and the laws of DC network analysis. The students will also learn about Kirchhoff equations and systems of analysis, loop current method, nodal potential method, the theorems of Thevenin and Norton, principle of reciprocity, dividers and Star-Delta transformation. Other major issues to examine contain magnetic field of the electric current, fundamental phenomenon, calculation of the magnetic field intensity, Biot- Savart law, calculation of the induced voltage and magnetic energy. The course also covers the whole system of The Maxwell equations, a description of the AC sine wave time domain, introduction to complex numbers, simple calculation of alternating current networks, power calculation and mean value.

19 Electricity I. Practice KHTVL12ANC *Dr. Sándor Bognár professor*

During the semester the students will deal with the summary of the basic concepts of vector algebra, scalar and vector quantity, the law of electrostatic field, Coulomb's law and superposition, the potential, capacity, energy equation and the dielectric constants, DC network analysis. Other main issues to study include Kirchhoff equations and systems of analysis, loop current method, nodal potential method, The theorems of Thevenin and Norton, principle of reciprocity, dividers and Star-Delta transformation.

The students will also get a thorough notion of magnetic field of the electric current, fundamental phenomenon, calculation of the magnetic field intensity, Biot- Savart law, calculation of the induced voltage and magnetic energy. The subject also examines the whole system of The Maxwell equations, problems and solutions, a description of the AC sine wave time domain, introduction to complex numbers, simple calculation of alternating current networks, power calculation and mean value. The students will also have to give presentations of tasks and complete exercises.

20 Electricity II. KHTVL21ANC *Dr. Sándor Bognár professor*

The students will get a deep insight into networks with sinusoidal time variation, network analysis using the law of complex algebra, three-phase networks, analysis for the purpose of synthesis, Nyquist representation chart, logarithmical representation and logarithmical units.

The course also covers Bode diagrams- the method due to Bode, four terminal networks, matrix description of four terminal networks, characteristics, parameter, symmetry and reciprocity. Other major issues to study include operating property, reflexes, transmission line, characteristic impedance, periodic flow networks, the Fourier series examples and transient phenomena. The students will also get a thorough notion of the application of Laplace transformation to simple circuits, integrating and differential connections and calculating simple circuits and switch-off phenomenon.

21 Electricity II. Practice KHTVL22ANC *Dr. Sándor Bognár professor*

The course deals with networks with sinusoidal time variation, network analysis using the law of complex algebra, three-phase networks, analysis for the purpose of synthesis, Nyquist representation chart logarithmical representation and logarithmical units. Other major guidelines to follow are Bode diagrams- the method due to Bode, four terminal networks, matrix description of four terminal networks, characteristics, parameter, symmetry and reciprocity. During the course the students will learn about operating property, reflexes, transmission line, characteristic impedance, periodic flow networks, the Fourier series examples and transient phenomena.

Other main topics to examine contain the application of Laplace transformation to simple circuits, integrating and differential connections, calculating simple circuits and switch-off phenomenon. Problems, solutions and exercise.

22 Programming I. KMAPR11ANC *Dr. György Schuster associate professor*

During the semester the students will learn about the history of programming, phenomenon of algorithm, generation of programming languages, their features, and task solution with the help of computers, algorithm descriptor tools and their usability. In the focal point of the subject there are topics such as basic algorithms, sorting, seeking and mathematical algorithms, methodologies and their features, general programming language and its features, history of C and its structure, variables and their prefixes, types, operators, runtime and precompiled instructions, functions. Other major issues to study include pointers, arrays, structures, unions, modules and modular programming, visibility questions, standard function, standard input and output handling printf and scanf, algorithms in C language, mathematical algorithms, Euclidean algorithm, prime algorithms, recursive algorithms and practical viewpoints of implementation.

23 Programming II. Laboratory KMAPR12ANC
Dr. György Schuster associate professor

The students will be given the opportunity to familiarize themselves with low and high level file handling, complex programming project in C language on PC, AVR studio IDE usage, compiling, debugging and other possibilities and preparing start file often used in included files.

Other topics are divided into the following topics: port handling in assembly, LED and button handling, port initialization, various types of assembly instructions and their features, status register, programming structure in assembly, C programmes under AVR8, Functions in AVR8 C, special features of AVR8 C and practical considerations. The course also covers I/O handling and configuration, interrupt handling and main features, time base in C with interrupt, USART handling in C and practical consideration of interfaces, final state machines in AVR 8 under C, trivial threads in AVR8 C, practical considerations and thumb rules and debugging of parallel programmes.

24 Programming II. KMAPR22ANC
Dr. György Schuster associate professor

The main guidelines of the course containing phenomenon of file, low level file handling and their functions, sample programmes, high level file handling and their functions, sample programmes, interfaces between the different levels, dynamic memory handling and its functions, thumb rules and usage, AVR8 microcontrollers' architecture and basics. The students will get a deep insight into memory and IO structure, interrupt handling, special peripherals, assembly instruction set, assembly row format, compiling procedure, simple algorithms in assembly, IT handling in assembly and C programming in assembly.

Other main topics to discuss including comparison the developing procedure between assembly and C environment, development of various modules, IT handling in C, UART handling and interface writing, time base in C, debug and testing and finite state machines in AVR8.

25 Technical Documentation (2) KMEMD11ANC
Dr. Marianna Lendvay associate professor

Goals of technical documentation are the following: seeing in space (2D, 3D), sketching, reading of drawings, and making of tech. drawings by hand/ CAD, making: technical drawing and documentation engineering drawing/ drafting, engineering graphics, technical communication, technical documentation, technical design, picture reading (perception) picture interpretation (apperception) Types of drawing are grouped: 1. Detail drawing 2. Assembly drawing. Documentations are needed for production and control.

The students will meet projection type: perspective and orthographic, representation for plane of projection (no axis) simple elements, drawing description geometry, Making line types: wide/ thick / narrow / thin / dashed / chain / dash and dot, makes sections, and cutting planes section in two parallel planes, local section and revolved section.

Other major issues including crossing hatching of materials, geometric dimensioning and tolerancing, symbol presentations: screws, gear representation, standard drawing scales: full-size, half full-size, five times full size, etc.

26 Measurements KMAMT11ANC
Dr. Elek Horváth professor

The aim of the course is to attain the measuring principles, necessary for measuring basic electrical quantities. The students will acquire the knowledge of construction and handling of most important electrical measuring instruments, interpretation of their technical specification, knowledge necessary to select optimal measuring methods and instruments, basic concepts of measurements, errors in measurements, analogue and digital methods to measure direct current and voltage.

The course also covers measuring alternating voltage, operating principle and specification of mechanical measuring instruments for alternating voltage, classification and parameters of analogue electronic instruments for measuring alternating voltage, AC/DC converters and their specification, digital instruments for measuring alternating voltage and the most important specification.

The students will get a deep insight into current converters, methods to measure electrical resistance, multimeters, generators, sine-wave generators, construction, operation and specification of sound-frequency generators operating principle, setup and handling of waveform generators. Other major topics to examine are principle and specification of synthesizing generators, operating principle, specification, setup and handling of pulse generators, measuring current by converters and oscilloscope. (10 % depart is permitted in thematic for the lecturer.)

27 Measurements I. Laboratory KMAMT12ANC Dr. Elek Horváth professor

The students will be given the opportunity to attain measuring methods, get basic skill in electrical measurements, practicing handling measuring instruments, evaluation of results of measurements, calculating errors, documenting measurements, get skill in selection of optimal measuring methods and instruments.

The following topics will be discussed: basics of measurements, handling instruments (relation between parameters of the instruments and the errors in measured results), measuring direct voltage and current (analogue and digital instruments), evaluation of results of measurements (cycle of measurements, characteristics), exercising to handle generators (sound frequency and waveform types) and oscilloscope.

During the semester there are guidelines including studying measuring arrangements (capacitive and galvanic disturbances), measuring alternating voltage and current (evaluation of passive and active rectifiers, spectral analysis, measuring distortion) and self-contained measurement (statement of the knowledge got during the semester).

28 Measurements II. KMAMT21ANC Dr. Elek Horváth professor

The purpose of the course is to attain the measuring principles necessary to measure basic electrical quantities, knowledge of construction and handling of most important electrical measuring instruments, interpretation of their technical specification, knowledge, necessary to select optimal measuring methods and instruments.

The students will get a deep insight into measuring non-electrical quantities, automation of measurements, measurement and simulation of instruments, software in measurements, principle of data acquisition, measuring frequency and time. In the focal point of the subject there are topics like oscilloscopes II, sampling theory, application of real-time and equivalent sampling theory in sampling oscilloscopes, principle of their operation, specification, application, analyzers, DC power supplies, methods of measuring impedances.

The course also covers bridge methods for measuring impedances, active measurement of impedances, digital method to measure impedances, measuring of electrical power, directions of development of measuring methods and instruments, task of transducers, requirements and specification and application fields of electrically measuring non-electrical quantities.

29 Measurements II. Laboratory KMAMT22ANC Dr. Elek Horváth professor

During the semester the students will be able to attain measuring methods, to get basic skill in electrical measurements, practicing handling measuring instruments, develop knowledge from the previous semester in field of measuring methods and instruments.

The students will also get a thorough notion of measurement of electrical and non-electrical quantities, special measuring methods and instruments, topics, measuring frequency and time, measuring impedances (voltage and current method, comparative method, two-wire and four-wire method, impedance measurement with active amplifier and measuring electrical power (voltage and current meter, electro-dynamical power meter).

The course covers measurements with oscilloscope, measuring non-electrical quantities (strain-gauge, displacement, temperature, revolution), special measurements and even self-contained measurement (statement of the knowledge got during the semester).

30 Digital Technics I. KMEDG11ANC Dr. Rita Lovassy associate professor

The students will learn about fundamental principles of digital logic, basic logic operators and logic expressions, Boolean algebra and Boolean functions, definition of logic functions: text description, algebraic form, truth table, logic and graphic representation, logic of identity and logic functions with two or more variables.

Other main topics to discuss include the concept of minterm and maxterm, disjunctive (Sum-of-Products) and conjunctive (Product-of-Sums) canonical forms, logic gates and circuit diagrams, algebraic and graphical minimization, Karnaugh map and applications, analysis of combinational logic circuits using a truth table and using Boolean function. The students will also acquire the knowledge of synthesis of combinational circuits, combinational circuit design: case studies, numeral systems, binary operations, half and full adder, binary arithmetic: addition, subtraction and multiplication.

Other main materials contain codes, code conversion: case studies, decimal, character and error detection codes, standard combinational components: encoders, decoders, multiplexers, demultiplexers, comparators, etc.

31 Digital Technics II. KMEDG21ANC *Dr. Rita Lovassy associate professor*

In the focal point of the course there are issues such as logic circuit generation and families, implementation technologies like TTL and CMOS, general comparison and evaluation of different logic circuits and technologies, latches and flip-flops, synchronous and asynchronous operations, registers, counters, etc., sequential circuits and general concepts. Main topics are divided into the following categories: analysis and synthesis of sequential circuits, simple examples, case studies: 4-bit parity indicator, Gray-code counter, sequential arithmetic circuits, microprocessor basics. The students will also examine datapaths, instruction sets, interrupt handling, interfaces and driver circuits, semiconductor memories and their properties, memory addressing methods, address decoding and interface circuits, analogue-digital, digital-analogue converters and Programmable Logic Devices.

32 Digital Technics II. Laboratory KMEDG31ANC *Dr. Rita Lovassy associate professor*

The course covers parameter measurement of different logic families, the way how to use a documentation suite and catalogue, combinational circuit design: case studies, half and full adder, standard combinational components: encoders, decoders, multiplexers, demultiplexers, comparators, etc.

The students will be given the opportunity to familiarise themselves with binary arithmetic: addition, subtraction and multiplication, codes, code conversion: case studies, analysis and synthesis of sequential circuits, simple examples, case studies: 4-bit parity indicator, techniques for measuring synchronous and asynchronous sequential circuits. During the semester the students will study some typical counters like: frequency divider, counter with shortened cycle, arithmetic circuits (full adder, comparator, multiplier, and arithmetic logic unit), design and test of programmable logic units and special measurements.

33 Electronics I. KMEEL11ANC *Dr. Péter Turmezei associate professor*

The students will get a thorough understanding of the theory of semiconductors and PN junctions, properties, types and uses of diodes, theory of bipolar junction transistors; DC analysis; CE, CB and CC topologies, current generator circuit, principle of amplification in the transistor circuit; model circuit of transistor; AC analysis. The course also deals with field effect transistors (JFET, MOSFET), FET amplifiers, DC and AC analysis, frequency dependence of transistor circuits, basic theory of analogue amplifiers; properties of feedback and frequency dependency.

Other major topics to study include differential amplifiers, integrated operational amplifiers; inverting and non-inverting amplifier circuits, frequency dependency, current-voltage converter, AC amplifier, basic current and voltage sources, comparators, Schmitt-triggers and waveform generators.

34 Electronics I. Practice KMEEL12ANC *Dr. Péter Turmezei associate professor*

The students will meet practice: rectifier diode data sheet, half-wave and full-wave rectifier circuits, voltage reference with Zener diode, uses of varicap diode, DC calculations of basic BJT amplifier and current generator circuits. Other main materials to discuss contain AC calculation of CE and CC BJT amplifier, DC calculations of basic JFET and MOSFET amplifier and current generator circuits, AC calculation of CS JFET and MOSFET amplifier and frequency dependency of BJT and FET circuits. During the semester the students will have the chance to study operational amplifier circuits: inverting and non-inverting amplifier; null-comparator; hysteresis comparator, laboratory practice: computer simulations of diode, transistor and pump circuits, practical measurement of diodes, BJTs and pumps.

35 Electronics II. KMEEL21ANC *Dr. Péter Turmezei associate professor*

In the focal point of the subject there are topics such as applications and design considerations of operational amplifiers, differentiator and integrator circuits, inner components of operational amplifiers, common mode rejection ratio, precision rectifiers and full wave rectifiers with opamps.

The students will also learn about instrument amplifiers with several opamps, multi-stage amplifiers, end-stage amplifiers, amplifier classes, LC and RC oscillators, discrete and integrated analogue and switched-mode voltage regulators and power supplies; parallel and serial voltage regulation. Other main topics belong here are current protection of regulators, analogue multipliers, typical parameters and applications of integrated multipliers: division, root and square circuits, modulators, pulsed circuits and basics of power electronics.

36 Electronics II. Laboratory KMEEL22ANC
Dr. Péter Turmezei associate professor

The main topics related to this subject include this laboratory's supplements: the Electronics II theoretical course, laboratory measurements: time and frequency domain analysis of R - L - C two-ports, pulse technology circuits, tuned analogue circuits, FET amplifier and current generator, symmetric amplifiers and linear application of operational amplifiers.

37 Automation I. KMAAT11ANC
Dr. Péter Kucsera assistant professor

The students will acquire the knowledge of the description of basic concepts of automation, open and closed loop control connection methods and comparison, linear and invariant basic block concept, type of block descriptions in operator and frequency domain, general equations, complex block deduction, process transfer functions and typical process types.

Topics are also divided into categories of process order concept, closed loop control steady state behaviour for setpoint holder and follower control, concept of stability examination methods in operator and frequency domain, control quality examination methods and description. During the semester the students will study build-up and working principle of transmitter, controller and actuator elements, logical description methods of process control, possible controller structure, programmable logic controller types, hardware build-up and programming methods.

38 Automation I. Laboratory KMAAT12ANC
Dr. Péter Kucsera assistant professor

The course covers simple PLC programming experiments (Digital logic, Timers, Counters), using Schneider Zelio intelligent relay, solving textural form simple and complex controlling tasks using the same PLC, simple and complex process block analysis in time and frequency domain using MATLAB. Other main issues to examine contain control loop stability analysis, compensation and quality check, controller tuning for different type of processes, error detection using MATLAB SIMULINK, PT3 loop and P controller simulation and analysis.

39 Communication Technics I. KHTHI11ANC
Dr. Tibor Wüthrl associate professor

The students will be given the opportunity to familiarise themselves with differential form of Maxwell equations, its significance in telecommunication, basic concepts of signal transmissions, baseband signals, coding, modulation procedures, handling signals in time- and frequency domain and spectrum of signals.

The students will get a deep insight into converting analogue signals to digital, sampling and quantizing, audio and video converters, telecommunication basics: physical layers and its properties, theory of transmission lines, radio channel, parts of the electromagnetic spectrum, spreading properties of electromagnetic waves and analogue and digital ways of recording and storing media.

Other major topics to deal with include compression procedures, the redundancy, and broadcasting: analogue and digital audio and video transmission, home devices, and telecommunication systems: leased line, and switched circuit connections, traffic theory, packet switched and circuit switched networks and terminal equipment. Communication networks, mobile systems, further applications: radio locating, navigation and astronomy are also studied during this course.

40 Communication Technics I. Laboratory KHTHI12ANC
Dr. Tibor Wüthrl associate professor

Laboratory exercises are carried out in connection with the subjects above. Hardware exercises are as follows: analyzing baseband signal properties, PSTN line observations, filtering techniques, MATLAB simulation: introducing basic usage of MATLAB. Other main guidelines are handling signals, analogue and digital modulation techniques.

41 Electrical Energetics I. KVEEE11ANC
Dr. Ferenc Novothny associate professor

The concept of electrical energetic and its connection to other natural sciences and different fields of electrical engineering are discussed in details. The processes of the electrical power supply and the operation of electrical power systems are demonstrated. The most important characteristics of the electrical power transmission and distribution are

described together with its hierarchy, its guidance and its control.

The electrical machines of the electrical power systems are discussed as follows: power transformers, synchronous and asynchronous machines, and dc machines as well as their constructions, and operation, and their equivalent circuits. Electrical devices and appliances in the electrical power systems are taken into consideration. The types, construction and operation of switch-gears are presented and so are their main characteristics. Typical consumers in the electrical power systems and the generation of the electricity are demonstrated. Types and operation of power plants are discussed together with their main and auxiliary equipment as well. The transmission and distribution of electrical power are discussed together with elements of network systems, as substations overhead lines, cables, their types, constructions, their mechanical and electrical characteristics as well. Devices of the electrical installation of buildings are also discussed.

Design and selection of electrical appliances of the low-voltage distribution network for buildings are demonstrated. The normal operation and characteristic failures of the electrical network systems are discussed. Simple failure calculation, the duties and the operation of the basic protection and control systems are presented.

42 Electrical Energetics I. Laboratory (2) KVEEE12ANC

Dr. Ferenc Novothny associate professor

The course covers the activity in laboratory: multimedia presentation: - hierarchical structure of the Hungarian Power System (HPS), and its operation - power plants, substations, overhead line and cable networks, their construction and operation; - tests on electrical machines (transformers, synchronous and asynchronous machines, universal motors). The students will also get an overview about measurements of loading characteristics together - switchgears, circuit-breakers, fuses; - measurements on consumers, loading; - reactive power compensation and different types of its realization - testing the different operational conditions of overhead lines.

43 Electronic Technology KMEET11ANC

Dr. Ildikó Szenes associate professor

During the semester the students will have the chance to examine discrete electronic parts, integrated circuits and assemblies, manufacturing of printed circuit boards, main steps of mask preparation, etching, galvanic and electroless plating.

Other major materials to study include single side and double side PCB technology, multilayer technologies; foil laminated and sequential, PCB design and design for manufacturing (DfM) and assembly processes: main steps of surface mount technologies.

Other main topics belonging here are stencil printing, component placement, reflow and wave soldering, inspection methods, hybrid integrated circuits and its technology, multichip modules and basics of the semiconductor technology. The students will also deal with advanced packaging, recent R&D's in electronic industry; photonic devices, MEMS (Micro-Electro-Mechanical Systems), nanoelectronics, polymer/printed electronics, environmental and quality assurance aspects of the electronic technologies.

44 Electronic Technology Laboratory KMEET12ANC

Dr. Ildikó Szenes associate professor

In the focal point of the subject there are topics like design of Printed Circuit Boards, computer aided design of Printed Circuit Boards, introduction of "Eagle" software package, making schematics, component placement and Design Rule Check (DRC).

Other main topics to discuss are procedure and restrictions of components' manual arrangement - meaning of airwires, correcting component placement based on them, manual and automatic routing, manufacturing processes: preparation of a double side PCB; drilling, making hole conductive, electroless and galvanic plating of copper and tin, mask preparation with solid, negative photoresist and etching. The students will acquire the knowledge of screen printing of the solder resist coating, imaging and developing, hand soldering of TH components and reflow soldering of SM components.

45 General Engineering Studies KMEAM11ANC

Dr. Sándor Csiszár senior lecturer

The main topics related to this subject include balance of forces in electromechanical structures and devices: basic concepts and laws, forces, basic calculation methods, methods of calculation of resultant forces, calculation of centre of gravity, determination of first order moment and of reaction force and concept of constraints.

The students will have the chance to learn basics of stress analysis: concept and kinds of strains, strain functions and diagrams, general problems of design for stress, stress and deformation states, stresses and deformations in bars.

Other major issues to examine are dynamics of electromechanical structures and devices: kinematics of mechanisms and of their elements, kinetics of electromechanical structures and of their elements, thermal stresses, elements of electromechanical structures and devices: locking elements, moving/mobile elements, driving- and actuating elements.

SUPPLEMENTARY SUBJECTS

73 Physical Education I. (BTOSMA1NEC)
Györgyné Fehér trainer

Aim of the subject: to provide the conditions of regular sports activities for the students, to advertize the healthy way of living and to draw attention to the preventive values of physical training. Students can choose freely from the branches and courses offered by the Physical Education and Sports Institute.

74 Physical Education II. BGRMAFVNEC
Györgyné Fehér trainer

Aim of the subject: to provide the conditions of regular sports activities for the students, to advertize the healthy way of living and to draw attention to the preventive values of physical training. Students can choose freely from the branches and courses offered by the Physical Education and Sports Institute.

OPTIONAL SUBJECTS

80 Business Communication GGTUK11ANC
Dr. Ágnes Csiszárík-Kocsir associate professor

The subject deals with the individual and communication, the need for and the necessity of communication, communication tools, verbal communication, meta- language, paralanguage, the origin and specialities of non-verbal communication, non-verbal communication tools, the relationship between verbal and non-verbal communication. The students will also get a thorough understanding of the significance and role of personal space and distance, credibility, the role of self-knowledge and understanding of human nature in the communication process, „Johari” window, personality types and communicational self-knowledge.

The course also covers impression making, sympathy, empathy, trust; fondle equivalences, communication in the economic environment, organisational culture and communication, formal and informal communication networks, the link between communication and economical efficiency.

The core material also examines the role of motivation, manipulation, critique and compliments at workplaces, conflicts, conflict management techniques, giving lectures and presentations, the role, types of meetings and communication techniques for leading a meeting, career, ambition, curriculum vitae, motivation letter and self-management techniques.

81 Sociology GGTSZ11ANC
Dr. Máté Molnár associate professor

The objective of this course of study is to familiarise the students with the basic concepts and categories of the discipline of sociology; to introduce the structure, strata and functional mechanisms of human society – with a special focus on modern Hungarian society to the students.

The course considers the relationship of sociology to other social sciences and the thoughts and opinions of the most important contributors to the field of sociology. After outlining the theories of societal structure and strata, the course considers the development of Hungarian society in the 20th century in detail. It compares the international and Hungarian trends of social mobility and analyses the position of macro-structural (international, national and ethnic) groups. It gives an overview of the changes in the role of the family and of its adaptation to modernisation as well as the problematic question of Hungarian and international demographics.

Finally, the course gives an overview of the acute problems facing Hungarian society of child-rearing, education, poverty and deviant behaviour types, and it outlines possible methods and solutions to managing and alleviating these problems.

COMMUNICATION ENGINEERING SPECIALIZATION

46 Circuit Design KHTAT11ANC *András Döring associate professor*

The course covers the application of common signal suppression in differential amplifiers, solutions in medical electronics, the applications of differential amplifiers in the field of Telecommunication, the implementation of Mathematical operation with operational amplifier and design of small-signal and power amplifiers. The students will have the chance to study different applications of operational amplifiers in the field of telecommunication, selective amplifiers, different applications of selective amplifiers in the field of telecommunication.

Other main topics related to the subject include structure of microprocessors, communication on the bus between the microprocessors and the system elements, use of the memory and the peripheral interface drivers and the microprocessor as a component. The students will get a deep insight into characteristics of the hardware: the operation and interrupt system of inner memories and in-circuit interfaces, programming of microprocessors and assembler programming. The subject also contains the use of editor, assembler, linker programs, controlled program runnings, data and output interfaces of the microprocessor systems and the presentation of the Developer Tools.

47 Communication Technics II. (Communication) KHTHI21ANC *Dr. Tibor Wühl associate professor*

The students will get a thorough notion of signals of telecommunication, description of signals (stochastic and deterministic) in time domain and frequency domain, noises, description of analogue telecommunication systems in time domain and frequency domain. Other main topics to discuss include transfer functions, distortions, design of analogue filters, modulations, description of modulated signals in time domain and frequency domain, shift keying methods, fundamentals of broadband access techniques and basics of digital signal processing. The course also covers sampling process, Nyquist-Shannon sampling theorem, quantization, coding, restoration of sampled signal, description of digital systems in discrete time domain and frequency domain.

The students will be given the opportunity to familiarise themselves with voice coding, prediction methods, design of digital filter structure (FIR), basics of spectrum analysis, Discrete Fourier Transformation, Fast Fourier Transformation and Fundamentals of TDMA (Time Division Multiple Access) systems. The subject contains line signals in time domain and frequency domain, Shannon's thesis, intersymbol interference, Nyquist criteria, Basics of FDM, TDM and WDM transmission systems, laboratory: Fourier analysis. Other major guidelines are the following: description of periodic signals in time domain and frequency domain, study of stochastic signals, system analysis in frequency and complex frequency domain, analogue and digital modulation methods. The students will also get an overview about sampling process, quantization, discrete-time systems, spectrum analysis, Discrete Fourier Transformation, Fast Fourier Transformation, digital signal transmission via analogue transport channel.

48 Communication Technics III. (Signal processing) KHTHI31ANC *Dr. Tibor Wühl associate professor*

The main topics belonging here are the following: principal summary: the basics of mathematical simulations, basics of MATLAB, the summary of the source language programming, the generation of ".m" source files; Basic principle of design and simulation of direct structure digital filters (FIR, IIR); Bilinear- and discrete Laplace transformations. In the focal point of the subject there are signal processing structures, overview of the DSP core commands, method of number representation (fixed and floating point), the effects and their elimination of the phenomena of quantization and overflow.

The course also covers granular nonlinearities, phenomena of limit cycles and their oppression, basics of wave digital signal processing, and the conception of the passivity; software structures of digital signal processors. Other major materials to study contain TIMER controlled DSP tasks, and sampling frequency, decimal and interpolate methods in practice. Laboratory exercises include practice the MATLAB programming, preparing ".m" files, matrix operations, graphic surfaces; simulation of digital filters with MATLAB (transmission functions, impulse answer); design of digital filters with MATLAB, simulation and performance of programmable structures. The students will also study simulation of modulation and demodulation processes with MATLAB Programming of DSP demo card, developed and simulated object programming into a signal processor with the help of MATLAB.

49 Telecommunication KHTTT11ANC *Dr. Zsolt Temesvári associate professor*

The students will get an overview of basic definitions, level terms, transfer attenuations, reflexion-, symmetry attenuations, nonlinear circuits, measurements of harmonic-; inter modulation- and stochastic distortion. The

subject also contains noise definitions, noise factor and its measurement, psychometric noise measurement, noise measurements in the analogue and digital channels. Other main topics belonging here are running time, phase rotation, group delay time definitions and measurements methods, jitter and measurements, the characteristics of the transmission lines (copper and optical). The students will also get a thorough notion of the basics of informatics theory, signal element, spectrum, transmission methods of different information types, wave form and hybrid speech coders, the characteristics of MPE, RPE, CELP coders, lossless and loss compression techniques in the field of video- and streaming technology.

The course also covers channel coding, error indicator processes, ARQ process, block- and convolution coding. Laboratory practice includes basic instrument practice with Agilent instruments, measurements of active and passive filters, cable measurements, testing the transmission characteristics of telecommunication circuits, time and phase measurements, testing patch cables, radio transmission measurement with spectrum analyser, simulation of transmission systems with expanded spectrum (CDMA) Simulation of channel coding (Viterbi, Trellis, etc.) and simulation of failure exploratory methods.

55 Infocommunication Networks I. KHTIH11ANC

Dr. József Beinschróth associate professor

In the focal point of the subject basic concepts, network architectures, questions of standards, OSI Reference Model, layers, protocols, primitives and TCP/IP (Transmission Control Protocol / Internet Protocol) can be found. The students will also have the chance to learn about layers and main features, comparing OSI and TCP/IP, the hybrid model, physical layer, physical medium, baseband transmission and serial transmission. Other main topics to discuss are modems data link layer, data link protocols, character and bit oriented procedures, media access layer and multiple access protocols.

56 Infocommunication Networks II. KHTIH21ANC

Dr. József Beinschróth associate professor

During the semester the following topics are introduced: network layer: basic concepts, transport directing algorithms, congestion defended protocols, quality of services and interconnection of networks. The students will learn about network layer of internet, transport layer, TCP (Transmission Control Protocol), UDP (User Datagram Protocol), application layer, classical application and web technologies. Other major issues to study include multimedia network security, cryptography, IPSec (Internet Protocol Security), VPN (Virtual Private Network) and defence in boundary of network.

58 Operating and Safety of Informatic Systems KHTIR11ANC

Dr. József Beinschróth associate professor

The course covers basic concepts, international, standard and technical solutions in IT security, threats against IT systems, providing of IT Systems, designing of IT security, business continuity management, COBIT and ITIL Service Desk, SLM incident and problem management, change and release management.

OPTIONAL SUBJECTS

82 Data and Information Security KHTSV53ANC

Dr. Beinschróth József associate professor

Subject deals with basic concepts of data and information security and relevant international standards and technical solutions. Business continuity management COBIT, ITIL Service, SLM Incidents and problem management are also presented.

83 Mobile Communication KHTSV71ANC

Dr. Dóra Maros associate professor

From 2G (GSM) to 4G (LTE) systems and their radio propagation features and models are in the focus of the subject. Mobile service quality (QoS) characterization and transmission parameters are also presented.

INSTRUMENTATION AND AUTOMATION SPECIALIZATION

46 Automatics KMAAZ11TNC *Aurél Vajda associate professor*

The students will get a deep insight into setting of work-point of linear closed loop control systems, constant value controlling systems and set point follower controlling systems, stability of complex control systems, A 'Z' transformation, stabilization and quality of sampled control systems under time and 'Z' domain. The course also covers adaptive control systems, non-linear control systems, two and three level controllers and their block charts, technical features of controllers, sensors and different generation of electrical transducers. Other major issues include digital controllers and their applications, basics of pneumatics, different generation of electrical and pneumatic effectors and parts of open loop control systems.

47 Embedded Systems KMABR11TNC *Gyula Zsom associate professor*

The students will acquire the knowledge of basics of embedded systems and their applications field, applications of micro controller in embedded systems, hardware questions and their development environments, software questions and their development environments. Other main topics to discuss are applications of programming logics CPLD, FPGA, basics of computer networks, OSI and TCP – IP models, protocols and their applications, types of servers and security of computer networks. The course also deals with micro and board buses (RS232C, I2C, CAN, LIN Flexray), laboratory exercises PIC microcontroller programming in assembly and C language, linear circuit testing considering stability and other features, switching power supply testing, simulation of analogue and digital circuits.

48 Signal and Image Processing KMAJK11TANC *Dr. József Kohut associate professor*

In the focal point of the subject there are features of deterministic signals under time, and amplitude domain, average - like features of signals, periodic signals and their Fourier sequence, aperiodic signals and their Fourier transformation, basics of sampling such as mathematical and physical sampling. The students will have the chance to study Fourier spectrum in case of sampling, reconstruction of the original signal from regularly sampled one, irregular sampling and un-overlapping filter. During the semester the students will examine theories of physical sampling, reconstruction of sampled signals with filters and sampling and hold circuit, discrete Fourier transformation basics, effects of windowing and methods of image.

49 Engineering Design KMAME11TNC *Károly Baka senior lecturer*

The students will get a deep insight into features of electrical parts, resistors, capacitors and their catalogue data, magnetic material, inductive parts, optoelectronic parts, passive parts, wires, strings, switches, connectors and plugs and their features, 19" rack systems and their applications. The students will also get an overview about design methods of printed circuit boards, PCB technologies and testing in case of multilayer design, grounding methods and power supply of devices, shielding of devices, EMC and ESD questions, thermal design of devices and design of cooler part. Other major materials to study include drawing of building, 3D charts using CAD systems, documentation of building automation, block charts, cable lists, path lists. graphical phase diagrams, commonly used symbols and their usage in case of CAD systems.

65 Automatic Manufacturing Systems I. KMAGY11ANC *Dr. György Schuster associate professor*

The students will be given the opportunity to familiarise themselves with structure of classical process control computers, their peripherals and applied algorithms, classification of production systems, basic phenomenon and their application fields. The course also covers subsystems of production systems, material handling subsystems, processing subsystems, testing subsystems and subsystems of informatics. The students will also learn about structure and machines of electrical and electronic production systems, front end and back end lines, SMT devices, re-flow ovens, visual and RTG testers, ICT-s, FDL-s, etc., structure and machines of mechanical production systems. In the focal point of the subject there are topics like CNC milling and lathe machines, cutting machines (laser, plasma, water jet), integrated CNC chamber, etc., sensors and actuators, simple binary sensors, industrial robots, kinematic chain, driving

system, control system and programming. The students will have the chance to study about flexible manufacturing cell, laboratory exercise, and physical devices: pneumatic manipulator, traffic light, production machine controlled by embedded controller, PLC and PC.

66 Automatic Manufacturing Systems II. KMAGY21ANC *Tamás Sándor senior lecturer*

During the semester the students will deal with review of object oriented methodology, simulation methods, network programming, soft computing methods (fuzzy logic, neural networks, genetic algorithms) and application in case of automatic production systems.

Other major topics include intelligent sensors (vibration sensors, vision modules, load sensors, etc), industrial robots and intelligent sensors, mixed type production systems (ship yard, plane production), viewpoint for building them, informatics of production systems and their connection to other information systems of the company.

Laboratory exercise contains TCP/IP programming using several protocols. RS232C, I2C (TWI), CAN bus, LIN bus programming. Usage of FPGA (simple logical application, sequential application, soft processors) and usage of 32 bit microcontrollers.

67 Automatic Manufacturing Systems Project I. KMAGP12ANC *Tamás Sándor senior lecturer*

Students have to achieve an entire development process. They can work alone or in small groups. During the semester they have to present their works twice. Task should be interdisciplinary it should contain electrical, software and mechanical parts. Students should manufacture those devices. We consider it very important that documentation of the project will be prepared.

Task can be a solvable problem in the laboratory, such as models, devices, machines or can be real industrial projects. Institute has several ones for this goal in the Automatic Production Systems Laboratory.

68 Information Systems KMAIN11ANC *Tamás Sándor senior lecturer*

The students will get a thorough notion about basics of database handling, data models and their normal forms, process of normalization, SQL knowledge, DDL, DML, DQL, MSOL application in various systems and structure of distributed systems.

The course also covers distributed system design, reliability questions of distributed systems, structure of an information system in case of a company and their main parts, basic of data mining, basic of statistic, basic of statistical process control. Other major guidelines are the following: phenomenon of statistical quality assurance, usual application, structure of quality system of a company, role of integrated control systems in a company, test and review methods. The students will also study periodically and non periodically reviews and their methods, information security and their elements and control systems, application attachment in case of a given company.

69 Automatic Manufacturing Systems Project II. KMAPR22ANC *Tamás Sándor senior lecturer*

Students have to achieve an entire development process. They can work alone or in small groups. During the semester they have to present their works twice. Task should be interdisciplinary it should contain electrical, software and mechanical parts. Students should manufacture those devices. We consider it very important that documentation of the project will be prepared. Task can be a solvable problem in the laboratory, such as models, devices, machines or can be real industrial projects. Institute has several ones for this goal in the Automatic Production Systems Laboratory. Students have the opportunity to carry on with the previous semester project.

OPTIONAL SUBJECTS

84 Intelligent Robotic Systems KMAIR11ANC *Dr. György Schuszter associate professor*

The aim of the subject is students should have the opportunity to learn applications of industrial robots and their features. The subject contains several case studies and smart solutions on industrial problems based on intelligent

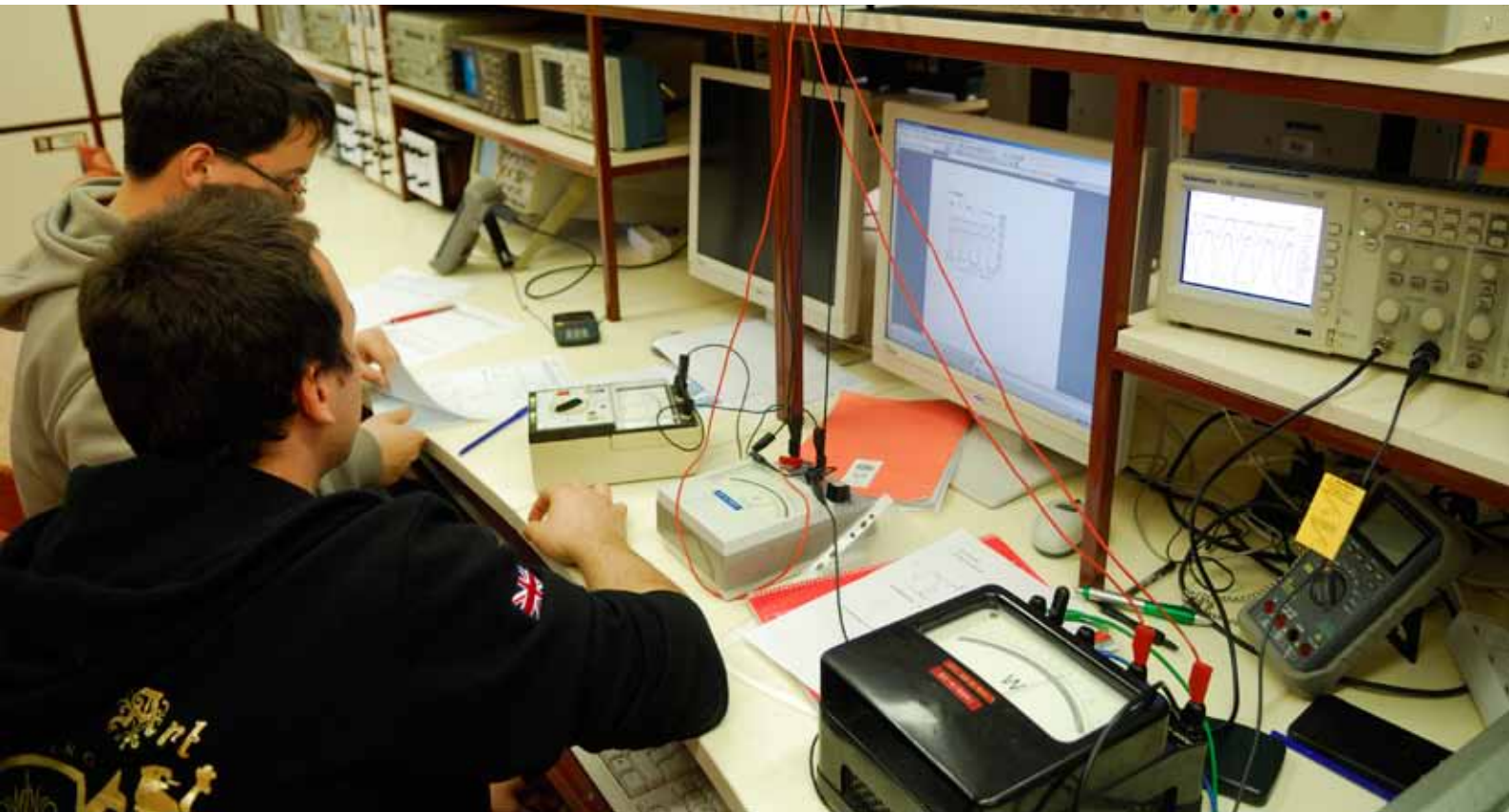
automation and application of robots. Additional topic is the protective features of industrial and non industrial robotics.

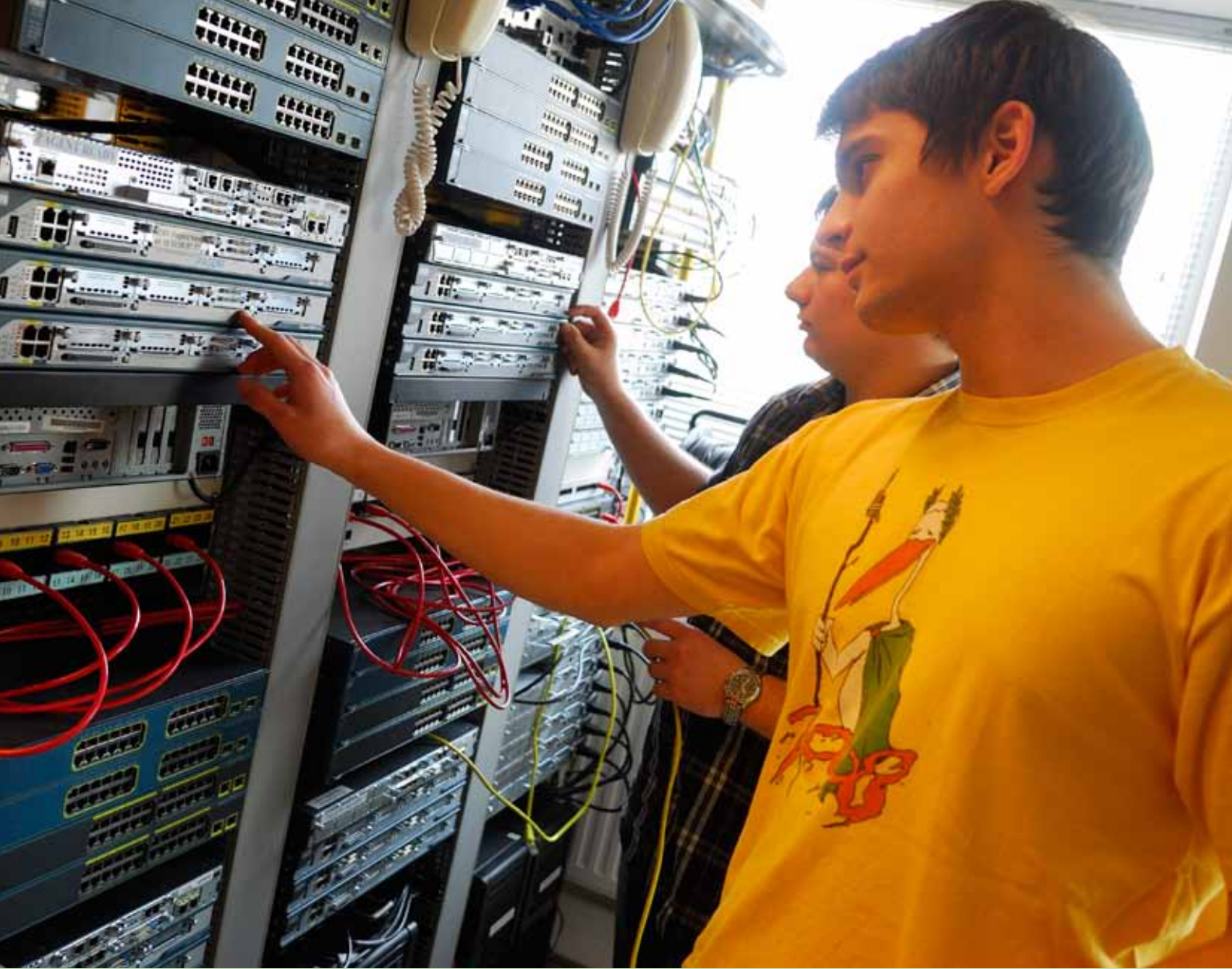
85 Object Oriented Methodology KMAOR11ANC
Dr. György Schuszter associate professor

This subject shows the main features of object oriented programming languages based on students' software technology knowledge. As a tool of this C++ programming language is to help and explain most common flavors of OOP. In the second half of the semester an object oriented script language is introduced.

86 Real-time Operating Systems KMARO11ANC
Dr. György Schuszter associate professor

Real-time problems are almost the most common tasks of software and other kind of engineering. This subject intends to show the main features of real-time problems and presents some of the most commonly used real-time operating systems. Another aim is students should be able to handle at least one RT operating system in practice.





COMPUTER SCIENCE ENGINEERING

No.	Neptun Code	Subjects	Semesters																																			Prerequisites				
			1.					2.					3.					4.					5.					6.					7.									
			lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr					
Basics of Natural Science																																										
1	NAMAN1SEND	Calculus I.	3	2		ex	5																																			
2	NAMAN2SEND	Calculus II.						3	2		pm	6																										1				
3	NAMBS1SEND	Introduction to the Theory of Computing I.	3	2		ex	5																																			
4	NAMBS2SEND	Introduction to the Theory of Computing II.						3	2		pm	6																										3				
5	NAMMS1SEND	Mathematics Final Exam									s																										2	4				
6	NAMVS1SEND	Applied Probability And Mathematical Statistics											2	2		ex	5																						5			
7	NIRIA1SEND	Basics of Information Systems	2	2		pm	4																																			
8	KVEFI1SEND	Physics	2	1		ex	5																																			
9	KVEVI1SEND	Electrical Engineering						3	1		ex	5																										8	1			
Economical and Human Knowledge																																										
10	GGTKG0SEND	Economics I-II.	3	1		pm	6																																			
11	GSVVG0SEND	Business Economics											3	1		pm	6																						10			
12	GVMME0SEND	Management																3																						11		
13	GGTJA1SEND	Legal and Government Administrative Studies																2																						11		
Basics of Profession																																										
14	NSTPR1SEND	Programming I.	3		2	ex	6																																			
15	NSTPR2SEND	Programming II.						3		2	ex	6																												14		
16	NSTPR3SEND	Programming III.													3	pm	3																							15		
17	NSTMP1SEND	Modern Programming Language													2	pm	2																						15			
18	NSTAB0SEND	Database Management											2		2	ex	4																						15			
19	NSTST1SEND	Software Engineering I.											2			ex	3																						15			
20	NSTST2SEND	Software Engineering II.																4	pm	5																				19	16	18
21	NSTSS1SEND	Technical Final Exam																																					25	20		
22	NIRIT0SEND	Control Engineering																2		1	pm	3																			25	
23	NIRDT0SEND	Digital Technology						2		2	ex	4																												3		
24	NIREL0SEND	Electronics											2		2	ex	4																						9	23		
25	NIRDROSEND	Digital Systems											3			ex	3																						9	23		
26	NIRSA1SEND	Fundamentals of Computer Architectures I.																2			ex	2																			25	
27	NIRKA1SEND	Advanced Computer Architectures																																		2		ex	2	28		
28	NIRSA2SEND	Fundamentals of Computer Architectures II.																		2			pm	5																	26	
29	NIROPOSEND	Operating Systems											2		3	ex	5																						7			
30	NIRSHOSEND	Computer Networks													3			2	ex	5																					29	

No.	Neptun Code	Subjects	Semesters																					Prerequisites															
			1.					2.					3.					4.					5.					6.					7.						
			lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr	lb	re	cr	lc	pr
31	NIRBR1SEND	Introduction into Embedded Systems																																			16	23	
32	NIRIROSEND	Intelligent Systems																																			7	16	
33	NSTVI1SEND	Enterprise Information Systems																																			18	19	11
34	NSTVI2SEND	Modelling of Business Information Systems																																				33	
35	NIRIB0SEND	Fundamentals of Informatics Security																																			6	30	
36	NSTFN1SEND	Formal Languages and Automata																																			21	5	
37	NSTDR1SEND	Decision Support Systems																																			32	21	
38	NIRIK1SEND	Infocommunication Techniques																																				30	
Supplementary Subjects																																							
41	GTSTESTNEV	Physical Education I.																																					
42	GTSTESTNEV	Physical Education II.																																					
Common and Optional Subject of Specialisation																																							
50	NAMRA1SENC	Basics of Robotics																																					
51	NAMRK1SENC	Kinematics and Dynamics of Industrial Robots																																					
52	NAMRM1SENC	Robotmechatronics																																					
53	NAMRL1SENC	Application of Robots																																					
54	NAMIR1SENC	Intelligent Robot Systems																																					
55	NAMRI1SENC	Robot Control																																					
56	NAMMR1SENC	Mobil Robots																																					
57	NAMFR1SENC	Fuzzy Systems in Engineering																																					
58	NAMAM1SENC	Basic Mathematical Methods in Engineering																																					
59	NAMMS1SENC	Engineering Calculation Methods																																					

ex – examination, pm – practice mark, ce – course examination, as - assignment
p - both the subject and the prerequisite can be chosen in the same semester

BASICS OF NATURAL SCIENCE

1 Calculus I. NAMAN1SEND
Dr. Endre Pap full professor

The aim of the course is to bring students coming from different secondary schools to the same level and to introduce them to the bases of one-variable calculus.

The course material is based on revision of secondary school material, numbers, algebraic formulae, equations and inequalities, functions, graphs of functions, function analysis, elementary functions, trigonometry, sequences and series, limits and continuity of functions, differentiating, numerical and symbolic derivation, applications.

2 Calculus II. NAMAN2SEND

Dr. Endre Pap full professor

The aim of the course is to acquire the basic concepts and techniques of calculus of one- and multi-variable functions according to the international trends and requirements of information specialist training. The course material consists of indefinite and definite integral and its meaning, symbolic and numerical integration, applications, plane- and space curves, differentiation and extrema of multi-variable functions, function series, integration of two-variable functions and its applications, concept of differential equations and solution with symbolic and numerical methods and examples of application.

3 Introduction to the Theory of Computing I. NAMBS1SEND

Dr. János Fodor full professor

The aim of the course is to acquire the basic concepts of analytic geometry and linear algebra which are necessary for students' further studies and for the common applications.

The course material includes Cartesian coordinate systems, vectors and vector operations, scalar and vector product, equations of straight lines and planes, linear transformations, matrices and matrix operations, linear independence, rank, inverse matrices and transformations, systems of linear equations and their solution, eigenvectors and eigenvalues.

4 Introduction to the Theory of Computing II. NAMBS2SEND

Dr. János Fodor full professor

The aim of the course is to improve the abilities of students in concept formulation, abstraction, problem solving by means of becoming acquainted with the basic topics of finite mathematics and using them in problem solving and model creation. The course material is the following: sets, set-operations, Boole-algebra, relations, equivalence classes, partial ordering, elements of combinatorics (permutations, combinations), proof by induction, graphs, trees, applications, propositional and predicate logic and algebraic structures.

5 Mathematics Final Exam NAMMS1SEND

Dr. Imre Rudas full professor

A final exam which checks students' comprehensive knowledge of the first year's mathematical subjects, such as calculus, linear algebra, and discrete mathematics.

6 Applied Probability and Mathematical Statistics NAMVS1SEND

Dr. Ágota Cserjés associate professor

The aim of the course is to give an introduction to probability and mathematical statistics, to discuss basic concepts, to develop problem-solving skills; it provides an insight into the possibilities of practical application.

The course material contains axioms of probability, conditional probability, Bayes's theorem, independent events, geometrical probability. Discrete and continuous random variables, discrete and continuous distributions. Error estimation, Bernoulli's theorem, central limit theorem.

The students will also learn about descriptive statistics, basic concepts, sample statistics, point estimation, confidence intervals, hypothesis testing, hypotheses for normal distribution, non-parametric methods, correlation and regression.

7 Basics of Information Systems NIRIA1SEND

Dr. László Kutor associate professor

Presentation is one of the most important determining factors and theoretical basic concepts of the information technology. The core material is divided into the subject and place of the IT in the science, features of data process, analogue and digital computation, Von Neumann architecture, coding basics, information representation (digits, numbers, characters, pictures, and music).

The students will also have the chance to study minimum redundancy thesis, dictionary based data compression, code tables, adaptive compression, fault-tolerant systems (SED-SEC, Hamming code). During the seminars MATLAB will be presented in order to link their mathematical knowledge with the most important engineering software of the world.

8 Physics KVEFI1SEND

Dr. János Orosz associate professor

The course covers fluids at rest: pressure, pressure gauges, surface tension, Archimedean principle, fluid in motion: Bernoulli's equation and its applications, laminar flow and turbulent flow, viscosity, the working fluid, heat, work and the system. Other major materials to study include state equations, The First Law, reversible and irreversible processes, Carnot's cycle, the heat engine and the heat pump, The Second Law and entropy.

CSE

9 Electrical Engineering KVEVI1SEND

Dr. Sándor Bognár associate professor

In the framework of this subject the students are presented the basic elements of the electrical circuits, structure and characteristics of the active and passive circuit elements, semiconductors, the basic laws, relations of electrical engineering, semiconductor's techniques: diode, transistors, DIAC, TRIAC. Rectifiers: 1 and 2 ways rectifying.

ECONOMICAL AND HUMAN KNOWLEDGE

10 Economics I-II. GGTKG0SEND

Dr. András Medve associate professor

The purpose of the economic and business environment. Business-types. Construction of individual and collective enterprises operating characteristics. Value-creating processes in businesses. General characteristics of firms producing products and services. Profile, operating performance capacity, lead time, production systems. Organizational forms and applications. Main features of the single-line and multi-line organization and management. Competitive activities, marketing the business. Market strategy. Resources used in the value-creation process. Utilization and economy of means. Human resource requirements planning, management and governance issues. Costing Basics. Cost planning and calculation. Ecology and measurement. Investment in the venture. Economically analyzing investments. Production management and economics. Financial and earnings position of the company management. Logistics activities and controlling.

11 Business Economics GSVVG0SEND

Dr. György Kadocsa associate professor

The content of managerial activities, activity elements. The decision as center of activity elements. Decision models. The relationship between managers and subordinates. Management style - management types. Organizational operations, organizational forms. The effective manager. Key managerial disciplines, strategy, marketing, project, innovation, quality assurance. Responsibilities of the management environment. Conflict and crisis management. Key objectives of human resource management. The functions of the Human Resources Manager. The manager and the corporate culture. Managerial aptitude, communication skills, personality development and testing. Psychology creation, creation of technical methods. Case studies of decision and responsibility for the decision and emotion - the topic of morality. Job Hunting, interviews practical demonstrations.

12 Management GVMME0SEND

Dr. István Szűts associate professor

The content of managerial activities, activity elements. The decision as center of activity elements. Decision models. The relationship between managers and subordinates. Management style - management types. Organizational operations, organizational forms. The effective manager. Key managerial disciplines, strategy, marketing, project, innovation, quality assurance. Responsibilities of the management environment. Conflict and crisis management. Key objectives of human resource management. The functions of the Human Resources Manager. The manager and the corporate culture. Managerial aptitude, communication skills, personality development and testing. Psychology creation, creation of technical methods. Case studies of decision and responsibility for the decision and emotion - the topic of morality. Job Hunting, interviews practical demonstrations.

13 Legal and Government Administrative Studies GGTJA1SEND

Dr. István Csillag associate professor

The students will get a deep insight into the history, development and social role of the law, state and law, the concept

of law, the legal system and the types of law, hierarchy of sources of law, the concept, validity and effect of the legislation, the legal capacity and certain groups of entities. In the focal point of the subject there are topics like the place and role of the Constitution in the Hungarian legal system, the social relationships governed by the Constitution, the fundamental citizens' rights and obligations, groupings of public bodies and their main task and authority, the national and local bodies of legislation and enforcement. The subject also deals with the task and authority of the Parliament, the government and the local governments, the judicial authorities, the courts and the prosecutors.

BASICS OF PROFESSION

14 Programming I. NSTPR1SEND *Dr. Szabolcs Sergyán associate professor*

Introduction to the principles and methods of structured and object oriented programming. Introduction to an object oriented programming language. Main competencies: Concepts of algorithms, flow controls. Methods and tools of algorithm description. Data structures. Basic programming procedures: sequence calculation, decision, selection, linear search, counting, maximum selection.

Complex programming procedures: copy, assorting, intersection, union. Elementary sorting algorithms: selection sort, bubble sort, insertion sort. Binary search. Set methods. Recursive algorithms, quicksort and merge sort. Elements of the object oriented paradigm: object, class, connections between classes. Features of the object oriented methodology: encapsulation, data hiding, inheritance, polymorphism, code regeneration. Textbooks:- T.H. Cormen, C.E. Leiserson, R.L. Rivest, C. Stein: Introduction to Algorithms. (3rd edition) Massachusetts Institute of Technology, 2009 - A. Troelsen: Pro C# 2010 and the .NET 4 Platform, Apress; 5 edition (May 14, 2010).

15 Programming II. NSTPR2SEND *Dr. Szabolcs Sergyán associate professor*

Outline of programming paradigms. Constructors in inheritance. Methods hiding. Inheritance and ancestor references. Polymorphism. Abstract class and interface. Iterators. Components. Operator overloading. Exception handling. Generics. Advanced sort algorithms. Dynamic array. Simple and one directional sorted linked list. Other evaluation of linked lists. Evaluation of queue and stack. Binary search tree. Red-black tree. B-tree. Heaps. Directed and undirected graphs. Spanning trees, Kruskal algorithms. Graph walks. Path searching. Determination of connected components. Topological sort. Hash tables. Textbooks: - D. Clark: Beginning C# Object-Oriented Programming. Apress, 2011 - A. Troelsen: Pro C# 2010 and the .NET 4 Platform, Apress; 5 edition (May 14, 2010).

16 Programming III. NSTPR3SEND *Dr. Zoltán Vámosy associate professor*

Revision and practice using OOP. Introduction to the .NET framework: managed code, Intermediate Language, native code, memory management, garbage collection. Introduction to the .NET Class library, its namespaces, basic classes and components. Usage of simple controls and events, designing a Graphical User Interface, arranging controls. MDI application development. Delegates and events. File and stream management for different types of storage, synchronous and asynchronous operations. Graphical possibilities using the System.Drawing namespace. Performing tasks using timer-based animation. Using and creating DLL files. Textbook: A. Troelsen: Pro C# 2010 and the .NET 4 Platform, Apress; 5 edition (May 14, 2010).

17 Modern Programming Language NSTMP1SEND *Dr. László Erdődi senior lecturer*

Introduction to the Object-Oriented Programming Paradigm and related technologies using the Java programming language. Creating and using objects (fields, constructors, methods, getter-setter pattern) and classes. Visibility and encapsulation. Implementation of inheritance. Access levels. Using packages. Abstract classes and interfaces. Using the built-in class library. Exception handling. Developing console applications. Developing web applications. Introduction to dynamically generated web pages based on HTML and HTTP. Creating Java servlets: Model-View-Controller design, life-cycle of servlets, parameter handling (POST and GET method), text and binary output generation, session handling (cookies, hidden fields, parameterized URL, session API). Introduction to JavaServer Pages: syntax, directives, runtime compilation, request dispatching. Textbook: B. Spell: Pro Java Programming, Apress; 2nd edition, (2000).

18 Database Management NSTAB0SEND Dr. Domonkos Tikk associate professor

Lectures: Data, information and information processing. Goal-oriented information processing. Consecutive and non-consecutive file structures. Database oriented information processing. Data modeling. Entities, attributes, relationships. Data independency, DDL, DML. Database administration. Database management models. The hierarchical, the nested, and the relational approach. Using the relational model. Anomalies, normalization. Relational algebra, calculus. SQL, extended tools. The EER model. Object-oriented databases. Deductive systems, knowledge bases. Database architectures. Client-server architectures. Distributed systems. Data security and safety. Data authentication. Physical, procedural, algorithmic protection. User and partner identification. Encoding, decoding. Message authentication. Accessing protection. Digital signature. Newest demands. OLTP, OLAP, ROLAP, MOLAP. Data warehouses, data marts. Data mining. Lab sessions: The students learn how to plan, construct and query databases, and how to program in an interactive and embedded way on the ORACLE platform. Other topics include: database planning, normalization (0NF, 1NF, 2NF, 3NF, BCNF), anomalies. Using the SQL*Plus interactive environment in the ORACLE system. Queries using the SQL SELECT statement. Joining the tables, subqueries. DML commands, database transactions. DDL commands, creating tables, data types, constraints, views. DCL statements, handling the authorities. PL/SQL blocks, control constructions, complex data constructions, cursors, ROWID. Handling exceptions, sub-programs, triggers, applications. Textbook:- K. Loney, Oracle Database 10g: The Complete Reference, Osborne (2004)

19 Software Engineering I. NSTST1SEND Dr. József Tikk associate professor

The lectures' aim is to present the fundamental paradigms of Software Engineering, especially the methods of software design and development, focused on object-oriented and component based techniques. The lectures cover the following topics: the basics of software engineering, software development paradigms, traditional life cycle models, early methodologies of OO software development (OOD, RDD, OOAD, OMT), object-based modelling, Unified Modelling Languages, the models of UML, software development with UML, UML profiles, Model Driven Architecture, Design Patterns, the Rational Unified Process. Compulsory textbooks: I. Sommerville: Software Engineering, 8th edition, Pearson Education Limited, England 2007. R. S. Pressman: Software Engineering: A Practitioner's Approach 6th edition, McGraw-Hill, New York 2005.

20 Software Engineering II. NSTST2SEND Dr. Zoltán Vámosy associate professor

The laboratory sessions consist of two parts: the first part provides training the skills of software development by UML and RUP in teamwork, to learn the best practice in application development by case-tools. The second part introduces new technologies of .Net framework: using attributes and reflection, shows application development using lambda expressions and LINQ, XLINQ and LINQ to Entities, introduces the ADO.NET Entity Framework, its structure and data modelling (EDM). In the framework of the course the students study application development for data manipulation (update, insert) using Database Engine Queries, entities and associations, process management: starting processes from static methods and objects, usage of the Enable Raising Events and Has Exited properties, thread management: initialization, priority, state, state transition diagram for background and foreground threads. The course also deals with grouping of threads: Thread Pool, introduction to thread-synchronization problems (locking, monitoring, and waiting), parallel algorithms: Parallel.For. Recommended textbooks are the following: I. Sommerville: Software Engineering, 8th edition, Pearson Education Limited, England 2007. R. S. Pressman: Software Engineering: A Practitioner's Approach 6th edition, McGraw-Hill, New York 2005. A. Troelsen: Pro C# 2010 and the .NET 4 Platform, Apress; 5 edition (May 14, 2010).

21 Technical Final Exam NSTSS1SEND Dr. László Csink associate professor

A final exam which checks students' comprehensive knowledge on software engineering and digital technology courses: Programming I-III, Software Engineering I-II, Digital Technology and Digital systems.

22 Control Engineering NIRIT0SEND Dr. László Nádai associate professor

Theory: Open loop control system, closed loop systems, linear, time-invariant, continuous control systems, Block diagrams, some illustrative examples. Modelling Formulation of equation of Linear electrical, mechanical systems. Use of Laplace-transform, Transfer function, concepts of state variable modelling. Block diagram representation signal flow

graphs and associated algebra, characteristics equation. Time Domain Analysis Typical test - input signal, Transient response of the first and second order systems. Time domain specifications, Dominant closed loop poles of higher order systems. Steady state error and coefficients. Pole-zero location and stability. Frequency Domain Analysis Closed loop frequency response, bode plots, stability and loop transfer function. Frequency response specification relative stability, relation between time and frequency response for second order systems. Series compensations.

23 Digital Technology NIRDT0SEND *Dr. András Molnár associate professor*

Theory: Introduction to digital technology, digital signals views. Logical circuit one and two variable, Boolean algebra, ways to describe logic functions. Minimization of logic functions. Combination Logic members, decoders, multiplexers, comparators. Sequential logic circuits, flip-flop, shift registers, counters, memories. Basics of Computer Science, the internal layout of your computer. Fundamentals of microprocessor technology. Single microcomputers. Laboratory: Basics of VHDL language and schematic design. Designing, creating and simulating one and two variables logical circuits with CAD software. Design of complex logical and sequential circuits.

24 Electronics NIRELOSEND *Dr. László Nádai associate professor*

Nowadays, the mostly digital world also requires a basic knowledge of analogue circuits. In this course the students will learn about the basic principles of analogue circuits design and operation. The students will examine discrete components such as resistors, capacitors, diodes and transistors as well as integrated components such as operational amplifiers. In addition, the students will become familiar with the operation of basic electronic circuits

25 Digital Systems NIRDR0SEND *Dr. András Molnár associate professor*

Theory: There has been a tremendous development in digital circuits over the past 3 decades, and there are a number of approaches for implementation of digital circuits. This course intends to give a background on digital electronics. The course will cover various circuit families, including diode-transistor logic (DTL), transistor-transistor logic (TTL), NMOS, and CMOS logic. In addition, various other circuits used in digital world will be covered. These include regenerative circuits, Schmitt-triggers, integrated circuits, RAMs, ROMs. The second part of this course is an introduction to VHDL programming: VHDL – Overview, Concepts of VHDL, Modularity and Hierarchy, VHDL Language and Syntax, VHDL Structural Elements, Data Types, Operators, Concurrent and Sequential statements, Synthesis, Example codes.

26 Fundamentals of Computer Architectures I. NIRSA1SEND *Dr. Péter Broczkó associate professor*

The lectures present relevant knowledge about instruction level architectures and the microarchitecture of traditional Neumann computers. The material presented is based on the design space approach. Case examples and major trends will be given to illustrate the evolution. Major topics include: Computational models, programming languages and architectures. Data based computational models, the von Neumann computational model, and data flow computational model. The concept of computer architecture and different levels of abstraction. The students will also study main dimensions of the Instruction Set Architecture (ISA), memory space and register space. data types, operations, operand-types, instruction formats, addressing methods, user visible status characteristics, operations, and introduction to processor architectures. In the framework of this subject students are presented centralized and decentralized control, execution units, basics of bus-systems, alternatives of organizing bus operations, signal systems, classes of bus systems, parallel and serial buses, speed limit of parallel buses, basic characteristics of parallel and serial buses (FSB, PCI, PCIe, HT, QPI). The core material contains programmed I/O, memory mapped I/O, DMA, I/O channel, the interrupt system, operation of DRAMs, types of DRAMs (SDRAM, DDR, DDR2, DDR3), characteristics of DIMMs (UDIMM, RDIMM, ECC), architecture and principle of operation of a hypothetical computer.

27 Advanced Computer Architectures NIRKA1SEND *Dr. Péter Broczkó associate professor*

Main objective of the presented material is to identify decisive aspects and main steps of the evolution of advanced processor and system architectures. The subject discussed is based on the design space approach, emphasizing main aspects and options for each step of the evolution as well as major trends identified. Many case examples illustrate the material presented. Main competences aimed at include classes of multicore and manycore processors, sub-classes of

homogeneous multicore processors. Main aspects of the implementation of recent multicore processors, such as power management, alternative implementations of the turbo boost technology, processor level support of the virtualization, alternative ways to achieve cache coherency, basics of the remote management of processors. Implementation aspects and examples of manycore processors. Main classes of heterogeneous ad-on processors. Heterogeneous master-slave processors. Execution paradigm and micro-architecture of GPGPU-s. Main dimensions of platforms. Implications of increasing core counts to system architecture. Main steps of the evolution of Intel's, AMD's, IBM's, ARM's processor and system architectures, case examples.

28 Fundamentals of Computer Architectures II. NIRSA2SEND

Dr. Péter Broczkó associate professor

The lectures provide an overview about main classes of parallel architectures such as: pipeline, superscalar and VLIW processors. The material presented is based on the design space approach. Case examples and the identification of major trends concerning the evolution enhance the lectures. Major topics include levels of the utilized parallelism, Flynn's and an updated classification of architectures, data, control and resource dependencies and basic methods of their handling, preserving sequential consistency, pipelined processors, superscalar processors of 1st, 2nd and 3rd generation and ISA enhancements (MMX, SSE, etc.).

The students will also learn about layout alternatives of caches, 2-3 level cache-hierarchies, optimum size of caches, trends, examples, VLIW and EPIC architectures, thread-level parallel, fine and coarse-grained, and SMT architectures, process-level parallel architectures and motherboards. Objectives of the lab exercises are the following: to give an overview of major processor architectures, registers and instructions, execution mechanisms of machine-level programs, their connection to operating systems, basics of compilers, structure of executable files (architecture of .COM and .EXE files). Writing simple sequential programs, iterations and input/output operations, writing programs for calculations, data conversations and simulations, displaying and programming of peripheral equipment (displaying graphical elements, handling of serial and parallel ports) belong to the requirements of the course.

29 Operating Systems NIROPOSEND

Dr. András Rövid associate professor

The main tasks of the operating systems are evolution of the components and its appearance in the popular operating systems (Windows, Unix, and Linux versions). The students can use command line tools and different operating systems in the lab. The Linux system is the primary platform for the exercises; however, certain areas of the Windows system solutions will be presented too. Key skills for students to acquire: operating systems architecture, main operating system features and modules (process and thread management, scheduling, memory management, i/o and file management, communication between processes), the factors of development, and the need and opportunities to standardize the adapter interfaces, solutions in the widely used operating systems.

30 Computer Networks NIRSH0SEND

Dr. Miklós Kozlovsky associate professor

The students are introduced to the structure and operation principals of computer networks. They learn about basic terms, implementation principals and methods and reference models. The students acquire knowledge of TCP/IP family, structure of internet, addressing scheme, IP protocol, and its directions of further development, and finally the operation of basic protocols which provide the basic functionality of the modern internet. The students learn about the basic physical transmissions medium in computer networks and its operating modes and features. They get an overview of computer networks, operating methods, application possibilities and the expected performance.

Key competencies for students to reach: Network reference models, Internet principles, the addressing and name handling policies, the IP protocol operating mode, the connection-free and connection-oriented characteristic of data transfer and transport protocols. Local network techniques, Ethernet networks, switching and routing, Wide area network technologies.

31 Introduction into Embedded Systems NIRBR1SEND

Dr. András Molnár associate professor

Students are introduced to modern embedded systems. ARM-based C # .Net programmable environment device. The practice provides a link between the ""classical"" programming and the target hardware. The course starts from a ""hello world""-type program to complex computer games and by different simulations guides the students in hardware and software applications. Key skills for students to possess: hardware-based programming, use of peripheral devices, use of sensory data, graphical LCD programming, touch screen use, CCD camera using solid-state storage devices. The exercise involves the preparation of the hardware components and appropriate program creation. The students will come

into contact with peripherals and software modules necessary for their operation relationship which is essential to any writing program of embedded systems.

32 Intelligent Systems NIRIROSEND *Dr. László Kutor associate professor*

Definition and measurement of intelligence (IQ, EQ). Biological intelligence. Machine intelligence (sensing, knowledge, learning, data process, execution, communication). Biological and technical sensors. Knowledge representation, machine learning. First-order logic, semantic networks. Problem solving solutions (distributed, concentrated). Biology based information process (artificial neural networks, fuzzy logic, genetic algorithms) Agent technology basics and solutions. Neural network design and implementation. Expert systems, decision support systems. Mobile robots and navigation, satellite positioning.

33 Enterprise Information Systems NSTVI1SEND *Dr. László Erdődi senior lecturer*

Ground Concepts: information system, IT, IT resources and their classification, requirements against information and IP. External Information Model: customers, suppliers, the financial sector, government, typical data flows. Goods, Stock in Hand: changes, typical flows, the data model. Customers, Suppliers: fundamental concepts, activities, the data model. Service of Customers: quotation, order, business transactions, data model, and relations to other subsystems. Procurement: request for proposal, order, business transactions, data model, and relations to other subsystems. Invoicing: preparing an invoice, invoice processing, returning goods, connected tasks, data model, relations with other subsystems. Financial Issues: accounts receivable and payable, connected tasks, data model, relations to other subsystems. Service Functions of the System: event based/time based functions, risks and controls, user roles. Communicating with Partners: Paper – based, EDI, E-business. The History of IS's: from the isolated subsystems to the integrated standard systems, HW/SW background.

34 Modelling of Business Information Systems NSTVI2SEND *Dr. László Erdődi senior lecturer*

Project work gives a base to this course. The students acquire practice in teamwork, in designing business processes and related data models and subsystems. They will focus on decomposition of a system to functional subsystems, allocating subsystems to teams, designing business processes relating to the subsystems, design of the data models of the subsystems, design of relations among subsystems, design of procedures and inputs, design of input control, design of outputs, tools to be used for design: process modelling software (e.g. ARIS or Signavio), or a CASE tool.

35 Fundamentals of Informatics Security NIRIBOSEND *Dr. Valéria Póser associate professor*

An overview of the history of information security. Ethical issues, the importance of developing policy. Motivations, targets. Symmetric encryption methods (DES, 3DES, AES). Asymmetric encryption methods (RSA), authentication, digital signature. MAC. Hash functions (MD4, MD5, SHA1). Block cipher modes of operation (ECB, CBC, CFB, OFB, CTR). Message Authentication (CBC MAC). Hash functions-based MAC functions. The basics of the protection networks. Use and configuration the firewalls, fine tuning. Intrusion detection, IDS/IPS. Internet security protocols (SSL, TLS). Scan of foreign computers, vulnerability testing. Secure communications. Secure mail and data storage (PGP). Key exchange protocols, authentication. Viruses, virus protection. Password control of operating systems. Password choice problems, password decryption. Dictionary-based password break, brute force, the properties of a good password, password recovery programs.

36 Formal Languages and Automata NSTFN1SEND *Dr. László Csink associate professor*

Fundamentals of formal languages. Formal grammars and their normal forms. The Chomsky hierarchy. Deterministic and nondeterministic finite automata. Recursivity. Bar-Hillel theorems, Kleene theorem, Myhill-Nerode theorem. Context-free languages. Compilers. Recursive languages. Syntactical analysis using special grammars (LL, LR). Turing machines. Programming with a Turing machine. Applications of finite automata: lexical analysis, pattern recognition. String matching with an automaton. Textbook: J. Hopcroft, R. Motwani, and J. Ullman: Automata Theory, Languages, and Computation (3rd edition), Addison-Wesley, 2007.

37 Decision Support Systems NSTDR1SEND
Dr. László Csink associate professor

The goal is to make students able to analyze problems using DSS and BI tools. Main topics: Fundamentals of decision theory, its main processes, history of decision support systems (DSS). Typical services and technology of DSS, group DSS, online analytical processing (OLAP), expert systems, learning systems, and data mining. Effective business intelligence systems. Creative computer software. Idea processing systems. Knowledge extraction tools. Analytical processing systems, corporate planning. Knowledge discovery software, business intelligence software. Data mining products, marketing decision makers. Financial intelligence. Textbook: J. E. Aronson et al: Decision Support and Business Intelligence Systems (8th Ed.), Prentice Hall, 2007

38 Infocommunication Techniques NIRIK1SEND
Dr. Miklós Kozlovsky associate professor

The basics of telecommunication: fundamentals of telecommunications networks, voice / speech transmission, network topologies. Technological background knowledge. Physical Basics: wired and wireless transmission media features. Evolution of microelectronics, optical transmission and radio access. Broadcasting fundamentals. Access of IP networks by telecommunication or cable-TV networks. Voice transmission data networks (VoIP). Mobile communication systems (cellular networks, GSM, GPRS, EDGE, UMTS and further developments, satellite systems, stand-by systems. Backbone techniques (P / SDH, ngSDH, OTN), as well as their development trends.

SUPPLEMENTARY SUBJECTS

41 Physical Education I. GTSTESTNEV
Györgyné Fehér trainer

Aim of the subject: to provide the conditions of regular sports activities for the students, to advertize the healthy way of living and to draw attention to the preventive values of physical training. Students can choose freely from the branches and courses offered by the Physical Education and Sports Institute

42 Physical Education II. GTSTESTNEV
Györgyné Fehér trainer

Aim of the subject: to provide the conditions of regular sports activities for the students, to advertize the healthy way of living and to draw attention to the preventive values of physical training. Students can choose freely from the branches and courses offered by the Physical Education and Sports Institute.

COMMON AND OPTIONAL SUBJECT OF SPECIALISATION

50 Basics of Robotics NAMRA1SENC
Dr. Attila Bencsik associate professor

Classification of robots, industrial robots characteristics. Mobile robots, industrial robots, direct and indirect manipulators, master-slave systems. The basic concepts of robotics: Kinematic motion-space, work-space, coordinate systems. Basic principles of arm mechanisms, mechanical, manipulative and robotic aspects. Key elements of enforcement mechanisms. Technical implementation of degrees of freedom, characteristics and scope of the executive elements of the shoots. Direct and indirect drives, gearboxes. Measuring systems for robots. Internal and external sensors, the control aspects of design requirements. General tasks of industrial robot control: position control and tracking control and its requirements. Opportunities for teaching robots, their characteristics.

51 Kinematics and Dynamics of Industrial Robots NAMRK1SENC
Dr. Jozsef Tar full professor

Translation and rotation group properties. Discrete, continuous, and Lie groups. Group-algebra, tangent space, generators, Lie algebra Jacobi identity, representations of Lie groups. The rotation group representations: orthogonal matrices

kvaterniono-algebra, spinors. The homogeneous matrix representation. Robots open kinematic chain, general coordinates. Denavit-Hartenberg convention. The Jacobi matrix. Kinematic singularities, the Gram-Schmidt method, redundant robot arms, generalized inverse, some special kinematic structure. Newton axioms, Lagrange function. The Hamilton's principle. Euler-Lagrange equations, generalized forces and their physical meaning. The dynamic model set up by measurements and homogeneous transformations, the generalized inertia matrix. The internal symmetries of mechanical systems: Legendre transformation, Hamilton-function, canonical coordinates. Closed mechanical system of internal symmetries. The symplectic groups and symplectic geometry. Symplectic basis, symplectic algorithms, phase current, Poisson brackets, symmetry conservation principles, Liouville theorem.

52 Robotmechatronics NAMRM1SENC
Dr. Attila Bencsik associate professor

The classification of mechatronics, its characteristics in industrial robots: basics of arm mechanisms, integrated elements of mechanical systems in manipulation, robotics point of view. Implementing elements and their application in the mechatronics robot drives. Engines in service robotics, construction requirements. Proportional servo drives and mechatronic systems for electrical, pneumatic and hydraulic enforcement agencies. Industrial robot grippers. Mechatronic units in the ends of the enforcement mechanism. Robots Monitoring: Internal and external sensors, construction, information technology requirements, designs under the control requirements. The robot's technical structure: According to the requirements of mechatronics, control-related hardware components. The practice themes: TINA-based computer simulation program practices.

53 Application of Robots NAMRL1SENC
Dr. Attila Bencsik associate professor

Types of industrial robots according to the application criteria. Terms of robotization. Technical requirements to the technology, welding, handling, painting, assembly areas. Requirements in connection with an industrial robot. Faculty mechanisms, mechanisms and mechanical systems integrated components, manipulative skills, requirements of robotic features. Economics of robotization introduction. Other aspects of robot selection: human and material, links to other elements of the technological system. Industrial robot grippers based on the robot application. Robots measurement systems, information requirements and control requirements of the application. Electrical, pneumatic and hydraulic-powered robots in a variety of technologies and services. The industrial robot according to the characteristics of the service and maintenance systems. Case studies in the area of application of industrial robots.

54 Intelligent Robot Systems NAMIR1SENC
Dr. Gyula Hermann associate professor

Interactive relationship with the environment. Intelligent sensor systems at a glance, what makes the robot intelligent? Potential amalgamation of different sensor systems. Robotic Vision Systems, description of basic methods: laser-eye stereo camera, ultrasonic systems, infrared systems and triangulation. Basic problems of mobile robots: path planning,



navigation (known and unknown environments), map making, obstacles (static and dynamic) avoidance. Marker-based position measurement is based, intelligent markers. Cooperation of mobile robots (description and basic problem of multi agent environment). Central and distributive management funds.

55 Robot Control NAMR1SENC

Dr. Imre Rudas full professor

Kinematic control: control for position: independent axis control, track control. Dynamic control: calculated torque-based control; feedforward control; control for the force: hybrid position-force control. Traditional adaptive control: sliding control; Adaptive controls: Lyapunov's second method, Barbalat's lemma. Adaptive inverse dynamics; Slotine and Li algorithm; adaptive Slotine-Li algorithm. Soft computing control: fuzzy robot control, neural network-based control (perceptron, Kohonen networks, Hopfield network, Elman network, CNN). Adaptive control based on fixed point transformations and SVD method. Topics of the practices: setting up special, simple models; PID-like trajectory control; Investigating the effect of Stribeck-type friction and backlash model for the quality of the control; DC motor model; servo controlled differential cylinder drive-based model. Comparison of classical and new adaptive methods by numerical examples.

56 Mobile Robots NAMMR1SENC

Dr. Zoltán Vámosy associate professor

Robotized systems: objectives, functions and general structure. Mobile robots: wheeled robots, CLAWAR machines. Static and dynamic stability of motion. Manipulation of objects in the workspace: description of tasks. Relative transformations in the working area. The use of visual information for determination of relative position. Track controls: Rough path planning methods: the use of GVD for path planning. Neural-based path planning. Fine-level path planning: interpolated motion. The use splines. Linear interpolation with parabolic transitions. Robot navigation: external sensors. The use visual information. Optical properties and applications of the PAL. Image processing techniques and basic concepts: morphological algorithms, rank order filters, noise filtering. Edge detection for split and merge edges. Pattern recognition methods. Determination of area, perimeter, torque and crankshaft.

57 Fuzzy Systems in Engineering NAMFR1SENC

Dr. Márta Takács associate professor

The role of logic in engineering systems. Bivalent, multivalent and fuzzy logic in decision-making. Fuzzy sets and operations. Rules and fuzzy models. Mamdani and Takagi-Sugeno models. Inference systems working in virtue of new operations. Matlab environment. Simulink environment. Matlab fuzzy environment. Control models in Matlab fuzzy environment. Economic models.

58 Basic Mathematical Methods in Engineering NAMAM1SENC

Dr. Ágota Cserjés associate professor

Abstract spaces; optimum search under constraints; curve fitting for measurement data or data from tables; the Legendre transformation: variable substitution in multivariate functions: switchover to directly measurable quantities in thermodynamics: the introduction of the thermodynamic potentials. Declaration of the Hamiltonian and the canonical equations of motion in classical mechanics. Tensor fields in ordinary three-dimensional physical Euclidean space and its internal symmetries, bases of the group theory; real SVD and HOSVD and its geometric interpretation; Lyapunov function; Barbalat's lemma; Pontryagin's optimal controller, Hamiltonian; robust control, sliding control; the SVD-based adaptive control.

59 Engineering Calculation Methods NAMMS1SENC

Dr. Ágota Cserjés associate professor

The Engineering Calculation Methods' content, objective and tools. A brief overview of the applied information technology (hardware/software) and mathematical methods, and the fields of application. Computer-oriented numerical methods. Fundamental architectures and programming features. The floating-point arithmetic standard. Numerical methods of linear algebra, discretization methods, FEM (Finite element method). The effects of floating point arithmetic to the achievable accuracy and numerical stability. Arithmetic elements of the interval. Computer architectures and efficient numerical algorithms. Numerical software. Software standards and libraries (BLAS, LAPACK, etc). Special numerical and symbolic software packages (MATLAB, Scilab, Derive, Maple, etc). The graphical display techniques and devices. Simulation techniques. Monte Carlo methods, simulation languages, SIMULINK elements. Case study.



INDUSTRIAL D E S I G N ENGINEERING

ordinary differential equations and the structure of their solutions, the most basic concepts of linear algebra and the vector geometry of the three-dimensional Euclidean space. The core material also examines the structure of the convergence concept of the n-dimensional Euclidean space and the differential calculus of multivariable functions, geometric questions related to smooth curves and surfaces, the description of the basic concepts of mathematical statistics and construction of regression lines.

3 Ecology RMKOK1ATNC

Dr. Bayoumi Hamuda Hosam Eldin A.F. associate professor

The students will get an overview of the interpretation of the environmental liability of geology: the science of geology is a science that deals with Earth as a whole and the habitat of living creatures. The course also describes the composition (materials), build-up (structure) and evolution (past) of the Earth's crust, general and structural geological basics, mineralogy and petrography: the causes of the occurrences of raw materials. Other main topics belonging to this subject are geological analysis, evaluation and finite quantity of raw materials, mineral wealth management and need for mineral wealth protection, the interpretation and analysis of the rational utilization rate of raw materials and energy forms. The students will also have the chance to study about the forecast and assessment of environmental damage occurring during the mining of raw materials, the methods of recultivation, researching environmental raw materials, and environmental geological forecast and mapping the complex geological environmental potential.

4 Technical Chemistry I. RMTMK1ATNC

Dr. Cecília Tamás Nyitrai E. associate professor

The aim of the course is to learn the basic knowledge related to the structure, properties and transformations of chemicals. The properties and reactions of material are discussed from the formation of individual atomic and molecular structure, through chemical bonds and interactions to the characterization of homogenous and heterogeneous clusters. Furthermore, the students are familiarized with the grouping, production and most important areas of applications of elements and inorganic compounds. In the practical classes the students practise how to solve the most important calculations related to the topic of inorganic chemistry (writing and ordering reaction equations on the basis of oxidation numbers, stoichiometry, calculating the concentration of solutions, conversion of concentration units, gas laws).

5 Physics I. RMKFI1ATNC

Dr. Lóránt Szabó assistant professor

The students will get a deep insight into division of physics, physical quantities, optics (light reflection and refraction, optical devices), mechanics of liquids and gases (hydrostatic pressure, Bernoulli's equation). The course also examines basics of acoustics (sound intensity level, Doppler effect), basics of relativistic physics (mass growth, mass-energy relationship), thermodynamics (state equation of ideal gases, special changes of state and their description).

6 Physics II. RMKFI2ATNC

Dr. Andrea Paukó assistant professor

In the focal point of the subject there are topics such as molecular heat theory: state equation of ideal gases, major terms of thermodynamics, heat propagation, Carnot cycles, basics of electrodynamics, charges at rest and moving charges. The students will be given the opportunity to study about alternating and direct current, Maxwell's equations, introduction to atom physics: basic concepts of quantum mechanics, photoelectric effect, uncertainty relation and nuclear physics: Bohr's atomic model. The course also covers the structure of the atomic nucleus, relationship between mass defect and binding energy, the mechanism of atomic fission, the operating principle of nuclear power plants, radioactive decays and their lawfulness.

7 Technical Mechanics I. RMKME1ATNC

Dr. Lóránt Szabó assistant professor

During the semester the major issues contain STATICS introduction, scalars and vectors, vectors in 3-D, static equilibrium for a particle moment of a force, equivalent force systems: distributed loads, equilibrium of rigid bodies and the analysis of trusses, internal forces, dry friction, belts, and centre of gravity. The students will also get a thorough notion of STRENGTH OF MATERIALS, linear-elastic response and factor of safety, the way how materials carry load, area moment of inertia, pure bending, shear stress in beams, beams with axial loads, torsion, stress-element and plane stress. The core material also examines DYNAMICS, rectilinear motion, curvilinear motion, and rectangular coordinates, normal and tangential coordinates, and equation of motion for a particle: Newton's 2nd law, the work-energy relation, the

linear impulse-momentum relation and the angular impulse-momentum relation. Kinematics of rigid bodies, relative motion of points on a rigid body, instantaneous centre of velocity, mass moment of inertia, and work-energy relation for a rigid body will be introduced as well.

8 Technical Mechanics II. RMKME2ATNC *Dr. Lóránt Szabó assistant professor*

During the semester the major issues contain STATICS introduction, scalars and vectors, vectors in 3-D, static equilibrium for a particle moment of a force, equivalent force systems: distributed loads, equilibrium of rigid bodies and the analysis of trusses, internal forces, dry friction, belts, and centre of gravity. The students will also get a thorough notion of STRENGTH OF MATERIALS, linear-elastic response and factor of safety, the way how materials carry load, area moment of inertia, pure bending, shear stress in beams, beams with axial loads, torsion, stress-element and plane stress. The core material also examines DYNAMICS, rectilinear motion, curvilinear motion, and rectangular coordinates, normal and tangential coordinates, and equation of motion for a particle: Newton's 2nd law, the work-energy relation, the linear impulse-momentum relation and the angular impulse-momentum relation. Kinematics of rigid bodies, relative motion of points on a rigid body, instantaneous centre of velocity, mass moment of inertia, work-energy relation for a rigid body will be introduced as well.

9 Electrotechnics RMKEL1ATNC *András Ménesi senior lecturer*

The goal of the subject is to expanding the students' technical approach, acquire electrotechnical knowledge and practising it in the laboratory, during which students get an overview of the operation of electrical equipment, DC circuits, electric field (capacitors), magnetic field (induction), single phase alternating current (RLC circuits), producing 3-phase voltage and its characteristics. During the semester they will learn about star and delta connection, the basics of electronics, semiconductor devices (diodes, thyristors, etc.), the operation of transistors, their types, characteristics and basic circuits. Other major materials to study include the use of semi conductors in circuits, rectifier and amplifier circuits, electric machines, the operation and use of electric machines.

10 Functional Modelling RTSFM1ATNC *Dr. Gabriella Oroszlány assistant professor*

The course covers the concept of modelling, models, simulation of function, proportional simulation, dynamic scale models, law of similarity and analysis in sustainable respect through design. The students will also get a thorough understanding of decomposition of models to basic geometric forms, their presentation and study of their features, design of new models from the basic geometric forms (penetration analysis), introducing to spacial geometry, representations of spacial formations and elements, perspective representation: geometric redact of models of 1, 2 and 3 landmarks and redact of wall-view figures modelling the reality.

11 Environmental Studies RMKKT1ATNC *Márta Soós Berecz senior lecturer*

The students will be given the opportunity to familiarise themselves with the concept, aims, elements of environmental protection, environmental impacts of anthropogenic origin, the tools of environment protection, the history of environmental protection, its role these days, principles of environmental law, conditions of sustainability and the concept of the ecological footprint.

They will also examine development stages of the global Earth system, the major geochemical cycles, the biosphere as a global ecosystem, the composition, structure of the atmosphere, the local and global consequences of air pollution, the importance of hydrosphere for wildlife and society, the formation of soils, their general characteristics and basic functions.

ECONOMICAL AND HUMAN KNOWLEDGE

12 Economics I. GGTKG1ATNC *Dr. András Medve associate professor*

Main guidelines of the subject are the following: an introduction to economics, scarcity and efficiency, the three main

concepts of economics organization, consumer behaviour, the optimal choice of the consumers and price elasticity of demand. In the framework of this subject the students are also presented consumer surplus, manufacturers' behaviour, company and enterprise, production function, production costs, short and long-term cost functions. The course covers the profit, market structures, offer of companies in perfect competition, long-term supply. Profit maximization of monopoly and oligopolies.

The students will examine market of input factors, labour market, capital market, stock market, property market and externalities.

13 Economics II. GGTKG2ATNC

Dr. András Medve associate professor

In the focal points of the subject there are topics such as macroeconomics and its interrelations, actors, output and income, measurement of the macroeconomics performance, macroeconomics cycle, consumption and saving function, demand on the capital market and multiplier effect.

The students will also have the chance to study equilibrium income, macro demand, labour market and employment, macro supply, economic equilibrium, the modern money and banking system. Other major materials contain economic growth, conjuncture, inflation and unemployment, the role of the state in economy, fiscal and monetary policy and international trade policy.

14 Business Economics I. GSVVG1ATNC

Dr. György Kadocsa associate professor

The core material of the course contains the purpose of the economic and business environment, business-types, construction of individual and collective enterprises operating characteristics, value-creating processes in businesses, general characteristics of firms producing products and services. The main topics related to the subject include profile, operating performance capacity, lead time, production systems, organizational forms and applications, main features of the single-line and multi-line organization and management.

15 Business Economics II. GSVVG2ATNC

Dr. György Kadocsa associate professor

The students will be given the opportunity to familiarise themselves with competitive activities, marketing the business, market strategy, resources used in the value-creation process, utilization and economy of means, human resource requirements planning, management and governance issues. The course covers costing basics, cost planning and calculation, ecology and measurement, investment in the venture and economically analyzing investments. Other major topics to examine are production management and economics, financial and earnings position of the company management, logistics activities and controlling.

16 Management GVMME1ATNC

Dr. István Szűts associate professor

The students will get an overview of acquiring management theory and practice, self-management, development of leaders' personality characteristics, managerial-organizational knowledge, learning methods and techniques for applying these. The subject also includes development of interpersonal communication skills necessary for managerial activity, mechanisms of decision, problem –solving techniques and their correct application.

17 Law for Engineers RTTKJ1ATNC

Dr. Livia Kokas Palicska associate professor

In the focal point of the subject there are materials like public law (constitutional law, administrative law), civil law (property law, contract law, and corporate law), copyright protection, inventions and patents and legal fundamentals related to undertakings, corporate law. The course also covers environmental protection, safety at work (safety and fire protection), copyright (invention, patent, and trademark), the task and tools of consumer protection, consumer rights, consumer protection laws, guarantees and warranties.

The students will get a notion of commercial law fundamentals related to the sale of light industry products, market control, the obligation to disclose information, forms of disclosure, giving information related to products, labelling light industry products, the characteristics of consumer contracts and competition law. During the semester they will meet Product Liability Act, the legal regulation of commercial advertising activities, the regulation of the Commercial Advertising Act and advertising monitoring procedures.

18 Project Management RTSPM1ATNC
Dr. Áron Takács assistant college professor

In the industrial, - and service activities and in the business sphere there is a huge number of tasks in which it is a must to prepare a new product or design a service using the finite resource to a given schedule. These types of projects need the use of new approach, concrete methods and techniques. In this explanation the project management is a new discipline. The topics of the subject help how to realize the projects defined with different aims strategy oriented, how to handle the emerging uncertainties and risks and how to find solutions with the help of organization-management, technological-technical and economic knowledge.

19 Marketing and Trade I. RTTMK1ATNC
Dr. Lívia Kokas Palicska associate professor

The students will get a deep insight into the basic concepts of marketing, the concept of the marketing mix, Maslow's hierarchy of needs, the economic characteristics of the sectors of the light industry, the elements of the product, price, communication and distribution policy. They will also learn marketing strategy decisions when introducing new products, fashion marketing, product features and benefits, innovation, intelligent and high-tech materials. Other major materials to study include intellectual property, concept of invention, patent, trademark, know-how, industrial design protection, licensing, franchising, brand decisions, trademarks, distinctive markings, and manufacturer's and commercial trademarks in the light industry. The course also covers the services of the Hungarian Intellectual Property Office, designing advertising for the distribution of new products, advertising goals and tools, pricing strategy and sales promotion methods. During the semester the students will deal with the practice of selling in retail, personal selling, the basic principles of business ethics, the concept of sustainable development, fair trade, shaping the conscious consumer attitude and the methods of market research. In the focal point of the subject there are topics like the rules of editing questionnaires, market segmentation, primary and secondary sources of information for designers for market research, forms of concentrated markets, the stock market, trade fairs and auctions. Other major guidelines are exhibitions, introduction of innovation opportunities (Hungarian Association for Innovation, Wamp, etc.), and communication in international trade, the characteristics of foreign cultures and the role of non-verbal signs during business meetings.

20 Marketing and Trade II. RTTMK2ATNC
Dr. Lívia Kokas Palicska associate professor

In the framework of the subject the students are presented current situation of the light industry, textile and garment industry, leather and footwear industry, paper and packaging industry, international outlook, trends in the industry, the future of the industry and economic opportunities in the light industry. Other main topics belonging here are foreign trade transactions, simple and special commodity and service transactions, barter and compensation, re-export, transit operations, the role of lease work in the manufacturing sector and the participants in the sales channel. The students will study about traders trading in their own name on their own account, in their own name on others' account, in others' name on others' account, role of commission agents, grouping of securities, methods of payment used in foreign trade. The core material is divided into cheque and draft, methods of payment from the point of view of the seller's security in international trade, letters of credit, documentary collection and its variations, conventions in transport, INCOTERMS, consumer protection (Consumer Protection Law), the basic rights of consumers, product safety and compliance, Product Liability Law and mystery shopping.

BASICS OF PROFESSION

21 Structures of Materials I. RTSAS1MTNC
Dr. habil. Judit Borsa professor

During the semester the students will acquire the knowledge of materials structures overview (levels of material structures, the features of constructions building on each other, the possibilities of influencing), processing of test results (statistical characteristics, estimates and distributions), characterization of metallic structures (crystal structures, properties of metals, effects of alloying and heat treatment). They will also examine characterization of fluids (mechanical properties and typical tests of fluids), qualitative characterization of visco-elastic materials (qualitative identification, modelling of deformation components), systemization of mechanical basic tests, presentation of stress forms and evaluation of tensile strength charts. Other major materials to study include air humidity, moisture content of materials, vapour permeation, basic tests of light industry products (permeation, moisture, absorption), interpretation of the membrane in material structures, material properties connected to electromagnetic waves and electricity (light, UV chargeability, conductivity).

22 Structures of Materials II. RTSAS2ATNC
Dr. Tibor Gregász associate professor

The students will get a deep insight into the recognition of light industry materials (morphology, solution tests; thermal, flammability, spectral tests), the phenomenon of friction (Coulomb, Euler, dry-, fluid friction, interfacial friction, lubrication possibilities), material content and evenness (length, area and volume density and the basics of the statistical description of fluctuations, influencing evenness). The course also covers heat-related properties of polymers and their changes, structure of polymers, their typical temperatures, thermodynamic bases, moisture related characteristics (moisture regain of materials, its measurement, change, the effect of air moisture), fundamentals of composites (the purposes and possibilities of pairing qualities, typical composites) and deterioration mechanism (wear, corrosion, aging of polymers, other degradation effects).

23 Machines of Industrial Technologies I. RTTIT1ATNC
Dr. Gabriella Oroszlány assistant professor

The students will acquire general knowledge of mechanics, basic concepts, basic volumes, operating principles, equations, study of machines commonly occurring in industrial technologies – typical parameters, operating principles, structural design, machine selection criteria, calculations and tests related to operation. The students will examine the tested machine types: lifting machines, transport machines, drives, vehicles, water machines (different types of pumps), fans (axial, radial,) compressors, refrigerators (absorption, compressor), paper industry machines: general structure, screen section, press section, dryer section, winding, calenders, packing machines: operations of machine packaging. They will also get a deep insight into automatic solutions of packaging systems, feeding equipment types, groupings, packaging machines, development, design, construction and installation of packaging lines in plants, packaging machine technologies and constructions (unit load generators, strapping machines, shrink and stretch wrapping machines.)

24 Machines of Industrial Technologies II. RTTIT2ATNC
Dr. Gabriella Oroszlány assistant professor

In the focal point of the subject there are issues like textile industry machinery: the machines of producing yarns and threads, machines for producing non-woven textiles, textile industry definitions: defining the amount of twist, breaking ""km"", finishing machinery: finishing textile products, dyeing special textile machinery. The students will get an overview of the production equipment and technology of spinning and ropes, spatial density, determining thickness, material and air ratio determination, special garment finishing: garment welding, laser cutting, etching technology, pneumatic and actuating cam control of automated sewing machines, paper production technology and machines.

25 Technical Drawing and Documentation RMKMR1ATNC
Dr. Rita Boda Kendrovics assistant professor

During the semester the students will be informed about the planar representation of spatial formations, drawing techniques, the general requirements of technical drawing, technical representation, projections, using line types, views, sections and segments. The course also covers symbolic and simplified representation, giving measurements; measurement, shape and position tolerances, surface roughness, drawings of structures and systems, computer aided drawing and planning, the purpose, levels and content of designing.

26 Machine Structures RMKGM1ATNC
Dr. Rita Boda Kendrovics assistant professor

The subject deals with the different types of machine elements and machine structures present in the majority of modern machines, their features and the principles of their design in the following areas: basic concepts, the purpose and types of sizing, bindings, stands, springs and tribological basic concepts. The students will be given the opportunity to meet sliding and rolling-contact bearings, shafts and rolling parts, mechanical drives (friction, belt, chain, cogwheel and hybrid drives), mechanisms and closure (pipes, pipe fittings, tanks, sealing).

27 Informatics I. RMTIN1ATNC
László Kiss assistant college professor

In the focal point of the subject there are the components of the computer, its operation, Neumann principles, data representation, arithmetic, structure/function of processors, operation of serial, parallel, USB ports and operation of printers, scanners. Other topics belonging here are operation of monitors, storage media, optical storage, mass storage

devices, classification of software, program development systems, user systems, and Windows applications: Office suite (Word, PowerPoint, and Excel) and the description of Maple mathematical software package. The course also covers types of viruses, their operation and identification, network basics: network communication, TCP/IP protocol and Internet applications.

28 Informatics II. RMTIN2ATNC

Dr. Kornélia Ambrus Somogyi associate professor

The students will learn about the basics of programming, tools describing algorithms, preparing algorithms, programming languages, the classification of programming languages, object-oriented programming and the basics of Visual Basic programming. Other main materials to study are the basics of web programming, web page making, basics of database management, normalization, description of Ms Access, description of SQL language, introduction to multimedia: basics of image processing, video processing and audio processing and computer graphics.

29 Informatics Laboratory RMTIN3ATNC

Dr. Kornélia Ambrus Somogyi associate professor

In the focal point of this course there are topics like MS Word (mail merge, styles, templates and links), MS Excel (search and financial functions, database management, reports, solver, etc.) preparation of algorithms, programming basics, database design and normalization. The course also covers creating tables, setting keys, contacts, selection and crosstab queries, compilations, parameterized queries, action queries, creating forms and reports.

30 CAD/CAM I. RMTCA1ATNC

Dr. Kornélia Ambrus Somogyi associate professor

In the framework of this subject the students are presented computer aided technologies, the partial technologies comprising CAD, the system of computer-aided technologies, the position of CAD/CAM, the hardware and software requirements of computer design environment, graphics, computer modelling: the shape model, curve, surface and body modelling procedures. Other main topics belonging here are the role of realistic display in technical design systems, interoperability between different systems, standard data exchange formats, the data formats necessary for production, solution of tasks from conceptual modelling to tool making, the role of realistic display in technical design systems, the basic knowledge of the graphic design of composition tasks and visual image elements.

31 CAD/CAM II. RMTCA2ATNC

Dr. Kornélia Ambrus Somogyi associate professor

During the practice one independent computer design task must be solved. The solved task must be presented personally in the 14th week session according to the timetable. The mark consists of the submitted practical task and the evaluation of the student's activity in class.

32 Theory of Design I. RTSTE1ATNC

Dr. Zoltán Koczor professor

Midyear mark is given if the student's attendance meets the requirements of TVSZ (code of studies and exams); if the student submits the tasks required in the practice completely as well as reaches the pass level in the one in-class test (minimum 40% so not mark "1"). The midyear mark comprises the submitted tasks with 1/3 weighing, the result of the in-class test with 2/3 weighing, and together evaluated by a mark given in the range 1 to 5.

33 Drawing and Colour Studies I. RTRRS1ATNC

Edit Csanák DLA assistant professor

The main guidelines of the course are the establishment and development of drawing skills, the proportional representation of three-dimensional objects and the human figure, techniques and tools, rhythm exercises, composition editing, the various graphical representations of object compositions, linear and tonal drawings. The students will have the chance to meet drapery and still life, understanding the anatomical structure of the human body, skeleton and muscle studies, the scaled, individual and aesthetic representation of designs, and the role of colour in the compositional representation of objects.

Other main issues belonging here are colour mixing, the visual dimensions of colour, tone series, colour wheel, notable

colour contrasts, pattern editing and processing, and presentation techniques of finished works, possible solutions for preparing these works for exhibition.

34 Drawing and Colour Studies II. RTTRS2ATNC

Edit Csanák DLA assistant professor

In the focal point of the subject there are the style variations of object representation, still life - colour, shape, surface representation, transformation / colour technique, colour dynamics, colour functions, colour harmonies, profession-specific representations of objects and materials, applied graphic knowledge and the proportional representations of the human body. The course also covers group compositions with graphite and colourful technical solutions, stylized representation of figure, the study of complex ways of representation, preparation of documentation and preparing the graphics for an exhibition.

35 Aesthetic Modelling RTTMO1ATNC

Ágnes Szűcs honorary associate professor

The students will get an overview of developing through exercises the vision and skills that help to form the optimal shape, the concept and types of product model, the study of natural and geometric forms by the analysis of the components, creating simple 3D forms from basic elements and exploring the regularities. The course also covers spatial ratio system, balance, rhythm, experimenting with the plasticity and spatiality of different kinds of materials according to functions, the methods of the perspective representation of space, application areas, and planning processes by combining the form and colour functions, by emphasizing the special needs of professional areas.

36 Visual Communication RTTVI1ATNC

Ágnes Szűcs honorary associate professor

The students will be given the opportunity to familiarise themselves with the significance of aesthetics, semantic communication through images, the forms of the visual conveyance of meaning, creativity and visual thinking based on freehand drawing, practising the different graphical methods, genres, techniques and introducing the possibilities of graphic design. Other major materials include the psychological context of vision, basic concepts of aesthetics, personality-colour-style, depiction of garments, accessories, and product packaging, representations of material surfaces, structures and patterns, plain and spatial composition tasks.

The students will also examine the development of individual visual expressions, style exercises, the concept, content and form elements of corporate identity, corporate identity and image, corporate identity and corporate design, the main aspects of designing the information system, designing corporate identity through group projects and documentation.

37 Colour Studies and Colorimetry I. RTTSZ1ATNC

Ágnes Szűcs honorary associate professor

The students will get basic notions of colour theory, the physical, physiological and psychological bases connected to colours. They will study the spectrum of electromagnetic radiation, optical radiations, the structure of the human eye, photoreceptors, the structure of the retina, the general context of visual performance, the basics of colour vision, the properties of colour perception, and colour features.

The course also covers the factors influencing colour sensing, the methods and tools of colour communication: the questions of subjective and objective colour characterization; colour systems, colour sample atlases and the basic principles of colour systems. Other main materials related to the subject are the bases of colour measurement, the objective modelling of reduced colour vision, the methods and instruments of colour stimulus measuring, spectrophotometers, colour contrasts, colour harmony systems, the effects and functions of colours, colourful environment.

The students will also have the chance to study about the basics of colour dynamic design, the relationships of people and colours, the special characteristics of colour usage, the questions of colour reproduction, reproducible colour ranges, and colourful techniques.

38 Form Design I. RTTFO1ATNC

Dr. habil. Márta Kisfaludy associate professor

During the semester the subject deals with establishing the creative design approach necessary for the design of industrial products, the interpretation of the concept of design from the designer's point of view, knowledge of the qualities of different types of trade-specific materials and experimentation with their shape forming possibilities. The

students will also learn innovative experiments of creating spatial forms, module structures, connection regularities, the ratio systems, size and material qualities as well as further development possibilities of leather, paper, plastic and textile spatial structures, functionality and visualisation.

39 Form Design II. RTTFO2ATNC
Dr. habil. Márta Kisfaludy associate professor

The course covers establishing the creative design approach necessary for the design of industrial products, the interpretation of the concept of design from the designer's point of view, study of natural and geometric forms by the analysis of the components, creating simple 3D forms from basic elements, exploring the regularities. The students will acquire knowledge of the qualities of different types of trade-specific materials and experimentation with their shape forming possibilities, get to know and analyse technical, structural, functional and aesthetic solutions through 2D and 3D compositing exercises.

The course covers the role of information-exploration in the process of industrial design, design basics (principles, processes and functions of industrial design, the connection between design and image design), product design: design study basics, dominant shape characteristics, the aesthetic and technical interpretation and planning of dimensions. The core material also deals with innovative experiments of creating spatial forms, planning processes by combining the form and colour functions, by emphasizing the special needs of professional areas.

40 Art Studies RTTMI1ATNC
Ágnes Szűcs honorary associate professor

This subject examines art as part of visual culture, art in prehistoric times, in ancient Egypt and Mesopotamia, the ancient Greek and Roman art, the art of the early medieval times, Byzantium and the Migration Period, The Romanesque and Gothic art. The course also covers the art of the Renaissance, Baroque and Rococo art, art in the 19th century, (classicism, romanticism, historicism, impressionism, post-impressionism, secession), art in the 20th century (avant-garde art movements, fauvism, expressionism, cubism, futurism, surrealism, geometric abstraction, functionalism, modern architecture, post-modern, action art).

41 Ergonomics RTTER1ATNC
Dr. Gabriella Oroszlány assistant professor

In the focal point of this subject there are topics such as the concept, purpose and development stages of ergonomics, the man - product (machine) system, anthropometric knowledge, the use of anthropometric data in design, physiological and psychological bases of ergonomics: vision, hearing, smell, touch perception and memory. Other major issues to deal with are product ergonomics, the user base, designer approaches, the ergonomic quality of the product, ergonomic criteria, biomechanical bases, human power and applying torque.

The students will also deal with design for special groups, (significantly different from the average, restricted) user groups for, process of product development, user involvement in product development, the ergonomics of product usage, product informatics, advertising, packaging, the ergonomic aspects of creating documentation accompanying the product, environmental ergonomics and ergonomic design of work environment.

42 Consumer Protection RTTFO1ATNC
Dr. Lívía Kokas Palicska associate professor

Teacher's signature is awarded if the student's attendance meets the requirements of TVSZ (code of studies and exams), if the student submits the tasks required in the practice completely as well as reaches the pass level in the one in-class test (minimum 40%, so not mark „1" (fail)). The exam is in written form. If the student reaches 40% of the score given for all of the tasks, the exam paper is acceptable.

43 Integrated Management Systems I. RTSIR1ATNC
Dr. Zoltán Koczor professor

Teacher's signature is given if the student's attendance meets the requirements of TVSZ (code of studies and exams) and reaches the pass level in the in-class test (minimum 40%). The in-class test consists of test questions and essay questions as well as calculations; the acceptable level is 40% of the score given for the totality of tasks. The exam is taken in written form (test and essay type questions) and in the form of calculations. If the student reaches 40% of the score given for all of the tasks, the exam paper is acceptable, and it is evaluated by a mark given in the range 1 to 5.

44 Integrated Management Systems II. RTSIR2ATNC
Dr. Zoltán Koczor professor

In the framework of this subject the students are shown the principle of environmental management systems, their operation conditions, (the expectations of ISO 14000 standard and EMAS), the types and characteristics of quality management systems, the integration of systems, (standards and philosophies, ISO 9001, TQM, 6-sigma, quality awards, ISO/TS 16949, etc.), other systems (HACCP, GMP, GLP accredited laboratories, environmental management systems, data security systems, etc.). The students will also get a deep insight into quality improvement based on self-assessment (quality awards, evaluation models, EFQM), the principle of ongoing development, its implementation in various management systems, the description of company operation with indicators, establishment and operation of the monitoring system.

Other main topics belonging here are correction and prevention (data collection methods, group work with "cross-functional teams"), the concept of risks, search for causes of error, the possibilities of determining error probability, the logic of regulating processes, the specialities of regulating recurring and project processes. The course also covers the SPC logic, review of systems, the purpose of quality control audits, its process, criteria and results, the essence of certification, its process, certification standards, trade-specific management systems integrated with quality management, (trade-specific management systems integrated with quality management and modern company management systems).

SUPPLEMENTARY SUBJECTS

80 Physical Education I. GTSTESANEV
Györgyné Fehér trainer

The aim of the subject is to provide the conditions of regular sports activities for the students, to advertize the healthy way of living and to draw attention to the preventive values of physical training. Students can choose freely from the branches and courses offered by the Physical Education and Sports Institute.

81 Physical Education II. GTSTESANEV
Györgyné Fehér trainer

The aim of the subject is to provide the conditions of regular sports activities for the students, to advertize the healthy way of living and to draw attention to the preventive values of physical training. Students can choose freely from the branches and courses offered by the Physical Education and Sports Institute.

Optional subjects

68 3D Product Design I RTTAS1AVNC
Gergely Barna part-time tutor

In the framework of this subject the students are presented 3D modelling, rendering, box and Spline modelling, solid and hard surface modelling, textures and materials. They will be asked to design their own model and documentation.

69 3D Product Design II RTTAS2AVNC
Gergely Barna part-time tutor

The students will get an overview of the possibilities of visualization of different models, usage of 3D Studio Max or Rhinoceros graphical programs based on the previous semester, adaptation of new modelling techniques, process of work, surfaces, structures, textures, shades, rendering, lightening, animation and personal designs.

70 3D Visualization I. RTTST1AVNC
Gergely Barna part-time tutor

In the focal point of the subject there are topics like Corel X5 and 3D Home programs, perspectives and proportions in vectorgraphic programs, drawings of furniture and fixtures, sizing of layouts and objects, architectural elements in vectorgraphic programs, presentation and sizing of viewed from above, sizing of coatings, visualization in 3D programs, designing one's own interior, documentation and presentation.

71 3D Visualization I. RTTST2AVNC
Gergely Barna part-time tutor

The course covers Corel X5 and 3D Home programs, visualizations of architectural and supplementary elements in interiors, presentation of viewed from above and sides, interiors of sitting rooms, kitchens, and bathrooms, visualization in 3D programs, designing one's own interior, documentation and presentation.

72 Computer Aided Product Design RTTSTAAVNC
Orsolya Nagy Szabó assistant lecturer

The students will be given the chance to familiarise themselves with CorelDraw terminology and concepts, drawing lines, shapes and selecting object. They are expected to combine, weld, intersect, simplify and use guidelines, work with layers, fill object, use fill flyout and draw a house. Other main topics belonging here are drawing shapes: polygon, star, complex star, graph paper, spiral, using interactive tools: interactive blend, contour, distortion, drop shadow, envelope, extrude and transparency tools, drawing cogwheel and other objects with interactive tools, adding and formatting text: paragraph and artistic text, business cards, working with bitmaps, project work, and digital printing.

73 Product Construction and Design in the Clothing Industry RTTRKAAVNC
Orsolya Nagy Szabó assistant lecturer

Students should obtain the knowledge of the process of designing a product so as to be able to work in any part of the manufacturing. The course covers product as a design task, the whole process of a product from the wide range of research work through sketches of the idea till the final presentation of the project, market analysis, basics of sociology, research work, product development (fashion, textile, leather, graphics), construction, the main features of garment industry, drawing techniques, expressions of fabric surfaces, textures and other materials. The students will be introduced proportions and movements of the human body, colour awareness and understanding of design trends. They will be expected to give a presentation of project work.

74 Finishing RTTKIAATNC
Dr. Livia Kokas Palicska associate professor

The core material of this course includes changes and chance of the textile market in the EU The Hungarian textile and garment industry (in the past and the future), basic knowledge of textile technologies, definition of textile materials, natural fibres, man-made fibres, innovation – smart textiles, principles of fabric preparation and finishing. Other major issues belonging here are modification of fabric appearance, fundamentals of dyeing and printing, (heat printing), project work for digital printing, history of textiles technologies, trends and technologies in the textile industry, meaning of colours and digital printing on textile. They will be expected to give a presentation of project work and take a test.

COMMON SUBJECTS OF SPECIALISATION

45 Methodology of Product Design I. RTTMM1ATNC
Dr. Zoltán Koczor professor

The students will be given the opportunity to meet product life cycle and product environment, the structure, activity and time schedule of the product development process, product idea exploration and product definition, the characteristics, aspects and management of product development. They will also get an overview of the process of product design, process models, the methodology and rules of product design, task analysis, formulation and refinement, the list of requirements and its compilation. This subject also examines the creation, evaluation and selection of product concepts, product modelling and simulation, the product design principles and rules.

46 Methodology of Product Design II. RTTMM2ATNC
Enikő Deés DLA associate professor

In the focal point of this subject there are topics like product design as the harmonious expression of the unity of man – object - environment, product analysis and synthesis according to the consumer and producer demands, the basic design problem areas: Man and identity, Man and information, Man and environment. Man and work, Man and travelling, Man and nutrition, Man and leisure time, Man and his home. Other major materials to study include the assessment criteria

of product design: the freedom of design and the limitation of manufacturing, the visual representation of operation through the interpretation of sub-elements, designing product properties recommended for different target groups, showing psychological and sociological product features. Other main guidelines are the following: serviceability and the design of quality in accordance with the technical feature, designing with the optimal cost relative to product function and ecological functions.

47 Integrated Product Design I. RTTTT1ATNC
Dr. habil. Márta Kisfaludy associate professor

In the framework of this course the students are presented consumer needs, survey of habits and market participants, analysis and feedback into planning, collection of information, by endorsing design principles, solution of simple design tasks individually and in group work, product modelling, presentation and evaluation and establishing the function structure.

The students will also acquire the knowledge of creation philosophy, model families, aiding design by computers, and system design ranges from the suggestion of simple problems to more complicated projects. The course focuses on the preparation of functional prototypes according to the design tasks.

48 Integrated Product Design II. RTTTT2ATNC
Dr. habil. Márta Kisfaludy associate professor

The course covers consumer needs, survey of habits and market participants, analysis and feedback into planning, by endorsing design principles, solution of simple design tasks individually and in group work, product modelling, presentation and evaluation, colour and form, colour and ergonomics, colour harmonies and colour dynamics design. The students will also get an overview of the cooperation of designers and manufacturers, the cost factors of designing, the criteria of product features with individual, series and mass products as well as production management, design for manufacturability, standardization of types (standardization), designing collections, and model families.

They will also examine supporting design with applied computer technology, CAD, CAM basic knowledge and their industry-specific applications: ready-to-wear clothing, printing, packaging industry, machine industry, goods protection and the design methodology of its tools (package design), the design process of ready-to-wear products from fibres to finished products, and systemic design ranges from the suggestion of simple problems to more complicated projects. The course focuses on product development in team work primarily by helping the preparation of functional prototypes according to the plans.

49 Integrated Product Design III. RTTTT3ATNC
Dr. habil. Márta Kisfaludy associate professor

The students will have a thorough notion of recycling-reuse-redesign, ecological approach in product design, and the experiments of colour and design studies aim at the diverse presentation of product variants through a design project. The integrated product design on the basis of socio-economic and technical aspects lays great emphasis on the unified and coordinated display of products and product groups in addition to the functional, market, long standing, and safety and feasibility aspects. The implementation of product design and development projects is aided by the preparation of prototypes and technological model experiments.

The most optimal creation of aesthetic product appearance is assisted by the product construction knowledge and the current state of the art industrial background. The students will study collection planning, product line planning, complex designer's approach and methodology of design.

FASHION AND LEATHER ACCESSORIES SPECIALISATION

50 Garment and Leather Product Design I. RTTBT1AVNC
Dr. habil. Márta Kisfaludy associate professor

The students will be given the opportunity to familiarise themselves with the aspects of garment formation, the formation of women's and men's garments, elements, combinations, basic silhouettes, the proportions of the garment, cutting lines, colours, patterns as aspects influencing proportionality and materials of garment textiles.

This subject also focuses on types and typical shapes of skirts, trousers, dresses, coats women's and men's suits, types of design tasks, typical design elements, collection of detail variations, technological decorative solutions on product drawings, design according to article categories, creative shape experiments, drapery studies and grouping and practice of leather products. The students will also get an overview of designing small goods (key chain, purse, etc.), designing

products made with cut, fold technology (folders, car bag, ladies fashion bags, etc.), the complex design of patterns (working pattern, marking pattern, pattern for making knife, pockets, handles, lining solutions) and the basics of computer-aided pattern design.

51 Garment and Leather Product Design II. RTTBT2AVNC *Ágnes Szűcs honorary associate professor*

In the framework of this subject the students are presented types of commercial collections, characteristics of their making, designing the basic wardrobe, designing the trend collection for a particular target group, analysing the connection between build peculiarities and aesthetic dressing, basic build types and designing favourable garments for them according to colour types.

The course also covers design-style consultancy, designing workwear and uniforms, fashion houses, designers, styles, Haute couture and Pret-à-porter, types of formal clothing, expectations of protocol and market research according to given criteria. The students will also be examined on compilation of bid collections, preparing documentation, description of typical kinds of footwear, the anatomy of the foot, ways of designing accessory collections, understanding the bases of computer-aided cut-pattern design, creating and organizing collections for fashion shows and applications.

52 Garment and Leather Technology I. RTTRT1AVNC *Orsolya Nagy Szabó assistant lecturer*

The main guidelines of the course are the following: the structure, professional tasks and manufacturing documentation preparation of a manufacturing company, the raw and auxiliary materials of the garment industry and their relationship with the manufacturing technology, the design of products and their relationship with manufacturing technology and manufacturing preparation (editing, modelling, pattern making, and marks for further technological operations). The students will also have the chance to study about placement, preparing the placement drawing, its aspects (material proportion, pattern, structure of the fabric), the methods and tools of spreading, tailoring methods, tailoring machines and equipment, the technological process of gluing, gluing parameters, self-adhesive textiles, adhesives, machines and equipment used for gluing.

The core material also includes sewing technology, sewing machines, sewing types, stitches, decorative stitching, the quality control of garment industry products, packaging requirements, technological aspects of storage, structure and properties of rawhide, the technical process of leather manufacturing, properties of finished leather, the history and ways of leather usage, grouping, cutting of leather goods and optimal material usage and technological solutions of leather goods.

53 Garment and Leather Technology II. RTTRT2AVNC *Orsolya Nagy Szabó assistant lecturer*

Understanding the relationships between the garment industry technology solutions and the decorative possibilities of garment industry products is the key to this course. The students will acquire the knowledge of processing cotton, flax, viscose and wool fabrics, processing silk, synthetic silk and wool fabrics mixed with synthetic threads, processing knitted fabrics. They will understand the possibilities of pairing materials and textiles of different properties and special characteristics, analyse the testing aspects of textiles taking the possibilities of manufacturing into account, based on the technological, economic and wearability aspects of the products.

Other major issues to study are the characteristics of wet heat treatment, their testing, pressing head covers, ironing operations, the general technological process of leather products manufacturing, the technological process of manufacturing leather garment products, the technology of fur processing and footwear products. As a summary of the studies, students have to prepare one garment product and the matching leather accessory.

54 Garment and Leather Product Construction I. RTTRK1AVNC *Éva Hottó assistant lecturer*

The main topics related to this subject are construction design as part of the garment industry product design planning process, size research, size charts, sizing standards, the proportions of the human body from the point of view of garment construction, body divisions, body proportions, different body characteristics and their effects on the garment construction.

The course also covers basic construction of women's skirts, garment waist, sewn in sleeves, trousers, the principles and methods of preparing technical series, preparing dress-patterns, charts of raw size, - ready size – partial size, technical series of women's skirts, creating calculation tables and grouping of leather goods. The students will also learn types and characteristics of smaller leather goods, bags, technical leather goods, sports goods, the construction variants of leather goods, and the aspects of size definition.

55 Garment and Leather Product Construction II. RTTRK2AVNC
Éva Hottó assistant lecturer

In the framework of this course the students are presented the types of modifying the basic constructions, basic modelling rules, the modelling methods of different part types, the modelling solutions of base garments and modelling of women's skirts. The students will get a thorough notion of the front-back formation of upper parts, relocation of forming seam, placement of cut lines, modelling different sleeve and collar solutions, modelling trousers, the basic tailoring methods of creating silhouette forms, model reconstruction on the basis of photos, the interpretation fashion graphics, product design and model drawing.

Other major materials to study include model-making and innovative experiments for the diploma work, the structure of footwear and various accessories, the types and groupings of fur ready-to-wear industry products, the basic technology and variations of making ready-to-wear products, modelling leather and imitation leather products for the thesis.

TEXTILES AND INTERIOR SPECIALISATION

56 Textile and Interior Design I. RTTTT1AVNC
Ágnes Szűcs honorary associate professor

The course covers interior design project-tasks and their computer-aided graphic presentation, the general design and safety aspects of selecting different structural materials in interior design, textile printing processes, production criteria of the patterns, transfer printing process in practice, the display of fabrics in different styles of interiors, exhibition from the realised project works, and study at the Design week programmes.

57 Textile and Interior Design II. RTTTT2AVNC
Dr. habil. Márta Kisfaludy associate professor

The students will get an overview of furniture history, flats and their equipment from the beginning until today, historical styles, types of furniture, houses, house forms and settlement forms, styles according to lifestyle, emotions and function, the arrangement of the functional flat, and corridor spaces. The core material also examines the architectural technical drawing, projection representations, floor plan, section, view, scales, the layout of interior, closed and open spaces, furniture arrangement, the design of storage areas, ergonomics and lifestyle knowledge, the role of decoration (paintings, photos, wall decorations, plants, etc.), design of various residential functions, special spaces, according to individual needs and styles. Taking the structural characteristics and functional properties of textile and leather sheet products into account in design is really important for this subject.

The course also contains the materials available for making upholstered furniture and the basic and special design considerations of design.

58 Textile and Interior Design Technology I. RTTTT2AVNC
Éva Hottó assistant lecturer

This subject includes the technologies used for creating the functional characteristics of the most important sheet products used in interior design, the basics and tools of leather processing technology and the production technologies of the most important textile and leather products used in interior design. In the framework of this subject the students are presented the technological operations, equipment of woven, knitted and nonwoven fabric making and those of braiding, technologies of producing ready-made table linen; coordination of raw materials, colours, patterns, forms and styles.

59 Textile and Interior Design Technology II. RTTTE2AVNC
Éva Hottó assistant lecturer

The students will be given the opportunity to familiarise themselves with household textiles: curtains (shade structures), furniture upholstery, carpets, bathroom textiles, bed sheets/pillow manufacturing technology in practice, accessories: properties and applications of cords, piping, borders, etc., the processing options of textile and accessories on the basis of material qualities, styles and functions. The course also deals with technological decorations (gathering, creasing, quilting, embroidery, patchwork, etc.), the technologies of producing ready-made the textiles of the living space; the style coordination of colours, patterns and shapes in one project task.

60 Textile and Interior Design Materials RTTA2AVNC
Éva Hottó assistant lecturer

The students will get a deep insight into the traditional and modern ingredients of upholstery and other textiles used in the home (jacquard, plush, chenille, alcantara upholstery, genuine leather and fabric leather, fur and fake fur, glass fibre and textile wallpaper etc), the characteristics of modern structures meeting the needs of today's sleep culture (health protection, comfort features, etc), the features of traditional and modern filling materials, feathers used in pillows and quilts. They will examine intelligent textiles, the features of foam board, foam construction used in upholstery structures, the factors constituting the value of leather suitable for upholstery making; the qualitative characteristics of upholstery leather and artificial leather, their care and cleaning.

Other major topics belonging here are basics of architecture, the properties and uses of materials used in buildings, coverings, doors and windows, etc., building engineering basics, the sizes / types / specifications of household and home accessories, light sources, lighting fixtures, the signal system of spatial representation, ergonomic sizing principles, computer-aided representation in CAD systems and preparing documentation.

61 Textile Materials and Testing RTTA1AVNC
Dr. Livia Kokas Palicska associate professor

In the focal point of this subject there are issues like requirements regarding the laboratory testing of textile materials, sampling, the concept of weight, volume, temperature, density, viscosity, their measurement, tools, the structural characteristics of sheet products and the relationship between the production technologies. The students will also examine grouping of woven and knitted fabric, size specifications, types of household textiles, the special needs resulting from the application area, grouping of technical textiles, the requirements of textiles used in different areas, the determination of the behaviour of textiles as a result of various mechanical impacts and strength tests (tensile strength, wear resistance).

Other guidelines are the following: the quality determination of the composition of textile raw materials (burning, microscoping), the measurement methods and comparative study of the behaviour of textiles due to water, heat and air-related effects, the functioning properties of textiles (anti-static, water repellent, flame retardant, crease reduction, etc), testing the protection function of textiles (such as flame resistance, protection against electro-smog, chemical resistance) and testing the dye-fastness of textiles.

PACKAGING SPECIALISATION

62 Packaging Design I. RMTCT1AVNC
Anna Tiefbrunner senior lecturer

The course covers the introduction to general issues of packaging design, introduction of the kind, types and production-conditions of paper-based packaging, sample making with modelling, plastic-based packaging design, basic design knowledge of wooden boxes, crates, the packaging design tasks in the logistics process, packaging design of a selected product, and preparation of technical documentation.

63 Packaging Design II. RMTCT2AVNC
Dr. Róbert Németh assistant professor

The students will get a deep insight into computer technology and their relationship, the internal and external integration of CAD, a computerized environment of design, hardware and software requirements of computer design-systems, curve and surface modelling knowledge and fundamentals of computer graphic. Other major materials to study include bitmapped graphics features and areas of application, the characteristics of vector-graphic, vector-graphic applications, opportunities of CorelDraw 12, solving of vectorgraphic tasks and digital imaging (scanning, digital photography, filming).

The students will also learn bitmap applications, CorelPhotoPaint12 and Photoshop software, photo retouching, and presentation of a CAD system: box design in computerised environment, standards and freeform modelling, output generation: tool path, photo-realistic images, 3D animations and, standard data exchange formats.

64 Paper and Packaging Technology I. RMTPT1AVNC
Dr. László Koltai associate professor

The subject examines the history of the paper-producing, the paper industry status and future on Hungary and abroad,

manufacture of semi-paper products, paper raw material, mechanical-, thermo-mechanical semi-finished products, pulp bleaching, pulp preparation, pulp unlock, grinding, gluing, filling, colouring and paper machines. The students will be informed about paper machine types, main parts, cardboard and sheet production, paper processing, the methods of paper finishing, calenders, sheet cutting, paper processing, areas of paper processing and producing corrugated products.

65 Paper and Packaging Technology II. RMTPT2AVNC
Dr. László Koltai associate professor

The main guidelines of this subject are packaging basic knowledge, the purpose of packaging, classification of usage, knowledge of packaging materials, paper-, glass- and plastic- based packaging materials, packaging and logistics, logistics packaging, loading units, packaging and environmental protection, Hungarian laws, waste recovery, packaging and advertisement and consumer packaging.

66 Paper and Packaging Materials and Testing I. RMTPA1AVNC
Dr. László Koltai associate professor

The course covers paper types classification, and their main characteristics, measurement theory, the reproducibility of measurements methods, evaluation of test results, and introduction of general properties of the paper: production direction, transverse direction, sieve, the upper side, square weight, and volume weight. The students will have to understand mechanical properties of paper, stretch, expansion, fracture, laceration, methods of measuring surface hardness, gain knowledge of gluing properties, writeability, COBB, PLG, etc., advanced paper characteristics, flow, smoothness, etc., theory of measurement of optical properties, colour measurement, whiteness measurement and opacity measurements. Other major issues contain basic concepts of printing, various printing processes, structure of printing machines, text and image processing, fitment and offset-plate producing technology, technology of book-binding and bindery equipment.

67 Paper and Packaging Materials and Testing II. RMTPA2AVNC
Dr. László Koltai associate professor

The students are expected to verify the conditions of climate-controlled paper laboratory, Measure general properties of paper, mechanical properties of paper, gluing properties of paper and optical properties of paper. They will be given introduction of printing processes: plant visit. They will have to understand technology of book-binding: factory visits.



ÓBUDAI
EGYETEM

UNIVERSITAS
BUDAENSIS