Study plan proposition

Student name	***Eugene, Carey***
Home institution	Florida Institute of Technology
Degree program at the home institution	Electrical Engineering
Total US credit hours required for graduation	130
Total US credit hours completed by the end of the spring semester of the academic year 2009/2010[1]	109
EU degree sought	BME[2] Electrical Engineering
Total ECTS credits required for the EU degree	210
Amount of ECTS credits recognized based on studies in the US	149
Amount of ECTS credits to obtain during studies in Europe	61

List of courses to complete in Europe during the academic year 2010/2011

Course code and name (BME/RMA[3])	**ECTS**	**Course code and name FIT**	**US credit hours**	**Semester in Europe**
BMEVIIIA303 – Control Systems	*5*	ECE 4231-Control Systems	*3*	Fall
BMEVIEEA306 – Microelectronics	*5*	ECE 4311– Microelectronics Fab Lab	*3*	Fall
BMEVIIIA202 – Informatics 1	*5*	ECE 4551 – Computer Architecture	*3*	Fall
BMEVIAUA300 – Electronics 2	*5*	-	-	Fall
BMEVIETA302 – Electronics Technology	*5*	-	-	Fall
BMEVIMIA304 – Laboratory 1	*5*	ECE 4224 – Comm. Systems Lab	*3*	Fall
BMEVIIIA355 – Project Laboratory	*5*	ECE 4241 – System Design 1	*3*	Fall
BMEGT63AF51 – French for Engineers	*2*	-	-	Fall
OM004 – Optronics and radar	*3*	ECE 4332 – EO Systems	*3*	Spring
EL003 - Image interpretation	*6*	-	-	Spring
BMEVIIIAxxx –Thesis (at the RMA)	*15*	ECE 4242 – System Design 2	*3*	Spring

Important remarks and conditions

1. The amount of ECTS credits obtained under BME course code must be at least 52 in order to obtain any BME degree. The above list satisfies this condition.
2. The BME degree in addition to the 210 ECTS credits obtained requires a thesis defense and final examination in two subjects. All BME courses with at least 5 ECTS credits in the above list can be candidate for final examination.
3. The list of courses may slightly change due to course scheduling conflicts since some of the courses are offered to 3rd or 2nd year students at the BME.
4. Official English language transcripts will be provided to the student by the BME and by the RMA.

Budapest, 1 March, 2010

Professor János Levendovszky
Deputy Dean for International Affairs (BME VIK)

[1] Assuming that the student will obtain all credits for the courses selected for the current (spring) semester
[2] Budapest University of Technology and Economics
[3] Royal Military Academy

Descriptions of BME courses:

Control Systems (BMEVIIIA303, 3/2/0/exam/5 credits). The control of technological, economical, and environmental processes belongs to the electrical engineers' most important professional activities that require both abstract and applied knowledge and competences. Besides its contribution to form an engineering viewpoint of problem solving, the course teaches the fundamentals of control engineering, the main principles of analysis and synthesis of control loops, and the use of the related technical computing tools. Students successfully satisfying the course requirements are prepared to analyze discrete and continuous control loops, to design different types of compensators, and to later engage courses in more advanced fields in control theory such as optimal control and identification of dynamical systems. Moreover, the course provides students with the necessary theoretical and technical background to start their specialization study blocks (such as embedded control systems, robotic systems, vehicle control systems, etc.) and to solve in laboratory practice exercises in the framework of the practical courses Laboratory I and II.

Microelectronics (BMEVIEEA306, 3/0/1/mid-semester mark/5 credits). The main purpose of this subject is to fill the gap between the abstract electronic functions and the physical reality. Basic knowledge will be given by lectures on material science, physics of semiconductors (fundamental properties, doping, majority and minority carriers, basic equations), physics, properties and characteristics of electron devices (pn junctions, diodes, bipolar and MOS transistors, junction FETs, thyristors, photovoltaic devices, functional devices included small and large signal behavior), equivalent circuits and models of electron devices, thermal effects, solid state integrated circuits (bipolar, MOS, BiCMOS), microsystems, relation between construction and technology, realization of active and passive elements, semiconductor technology from the sand to the encapsulated IC chip (oxidization, photolithography, diffusion, ion implantation, metallization, encapsulation and testing), roadmaps of technology, scale down effects, limits of integration, nanoelectronics. Based on earlier subjects (Electronics I-II) the integrated realization of the analog and digital circuits will be discussed (operational amplifiers, A/D, D/A converters, inverters, logic gates). Important part of this subject is to exercise and train the students for numerical calculations and to demonstrate some case studies. Practical knowledge will be given through laboratory exercises on the computer modeling of electron devices and circuits, CAD tools for IC design too.

Informatics 1 (BMEVIIIA202, 3/2/0/exam/5 credits). Computer Architectures: Typical units and block-diagram of computers. CPU, memory, I/O controllers, connections, integrated solutions, motherboards and extensions. Software model of a CPU, characteristic parameters, performance. Possibilities of improving performance, advanced architectures. Structuring and managing the main memory. Hardware support for multitasking. Overview of a typical simple CPU (e.g. Intel 386). Peripherals, I/O subsystem, controllers. Multiprocessor systems, loosely and tightly coupled architecture. Modularization, bus systems. Bus controllers, control policies on multi-master buses. Operating Systems: Historical overview, stages of the evolution. Basic concepts and principles: multiprogramming, processes, system of multiple processes, cooperation and competition, communication and synchronization. Deadlock situations. Multiprogramming: processes and threads in a single processor system, queuing and state model of OS. CPU scheduling. Memory management and virtual memory. File-system, I/O system, disk scheduling. Networking and distributed systems. Case-studies: Windows, Linux and Unix.

Electronics 2 (BMEVIAUA300, 3/2/0/exam/5 credits). Noise in electronic devices, noise bandwidth, power density spectrum, probability density function of the noise signal. Thermal noise, flicker noise, etc. Equivalent noise circuits of the electronic devices, equivalent input and output noise of the amplifiers. Noise figure. The phase-locked loops and their applications. Structure, linear small signal baseband model, different types of the PLL-s. Analysis of the linear baseband model. FM modulator and demodulator. Clock signal generators, jitter. Selective electronic circuits. Specification, approximation, tolerance scheme, transformations. Active RC circuits, switched capacitor selective circuits, resonant filters (LRC circuits, ceramic filters, etc.). Nonlinear circuit: rectifiers, limiters, piecewise linear circuits. Logarithmic and exponential amplifiers. Circuits of mixers and frequency transpose. Modulators and demodulators. Basic knowledge of energy conversion techniques. Power rectifiers, DC regulators: analog and switch-mode circuits. DC- DC and DC-AC converters. Overcurrent protection. Thyristors and their applications, new power electronic semiconductor devices and modules. Tree phase rectifiers, power converters. Power efficiency of the electronic circuits. Problems of the implementation. Description of passive distributed circuits in the time and frequency domain. Modeling and design of active analog circuits with distributed reactive elements (very high frequency amplifiers, oscillators, mixers, etc.). Microelectronic implementation of distributed circuits. High frequency integrated circuits (oscillators, power attenuators, etc.). Thermal problems of the electronic circuits, methods of heat removal. Conduction, convection, radiation. Thermal resistance and capacitance. Cooling methods, heat pipe. Thermal design of electronic devices with CFD. Heat sink of mobile equipment.

Electronics Technology (BMEVIETA302, 3/1/1/exam/5 credits). Lectures: Classification of electronic products and technologies; types forms, and assembling methods of electronic components; interconnection substrates of circuit modules, materials and technologies; printed wiring boards (PWBs), insulating substrate passive (thin- and thick-film) networks and high density interconnects; design methods and considerations; mounting and assembling methods of circuit modules; design and application of combined (optoelectronic and mechatronic) modules; basics of appliance design; quality, reliability, environment and other human oriented issues of electronics technology. Laboratories: technology of double sided printed wiring boards with through-hole metallization; film deposition technologies of thick film circuits: screen-printing and firing. film deposition and patterning technologies of thin film networks: vacuum evaporation, photolithography and etching; laser processed applied in electronics technology; through-hole mounting of circuit modules; surface mounting of circuit modules.

Laboratory 1 (BMEVIMIA304, 0/0/4/mid-semester mark/5 credits). The primary aim of this laboratory course is to improve the skills of the students on the following areas: to get acquainted with the materials, components and instruments in the area of electrical engineering, to practice the designing of measurement setups, setting up the measurement, measuring and using the infrastructure of the laboratory, to practice the evaluation and documentation of the measurement results. The topics of the measurements:

1. measurement: Get to know the instruments
2. measurement: Basic measurements
3. measurement: Basic digital tools
4. measurement: Signal analysis I.
5. measurement: Signal analysis II.
6. measurement: Investigation of two poles
7. measurement: Investigation of four poles
8. measurement: Investigation of active electronic devices
9. measurement: Investigation of logic circuits
10. measurement: Investigation of synchronous devices
11. measurement: Measurement of programmable peripheries