
# Study plan proposition

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| Student name | ***Zampaglione, Aaron Dennis*** |
| Home institution | Florida Institute of Technology |
| Degree program at the home institution | Computer Science |
| Total US credit hours required for graduation | 129 |
| Total US credit hours completed by the end of the spring semester of the academic year 2009/2010[1] | 105 (14 transferred) |
| EU degree sought | BME[2] Software Engineering |
| Total ECTS credits required for the EU degree | 210 |
| Amount of ECTS credits recognized based on studies in the US | 145 |
| Amount of ECTS credits to obtain during studies in Europe | 65 |

## *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** |
|---|---|---|---|---|
| BMEVIHIA209 – Coding Technology | *5* | CSE4510 – Special Topics | *3* | Fall |
| BMEVIMIA313 – Artificial Intelligence | *5* | CSE4301 – Artificial Intelligence | *3* | Fall |
| BMEVITMA311 – Databases | *5* | CSE4020 – Database Systems | *3* | Fall |
| BMEVIMIA401 – System Modeling | *5* | - | - | Fall |
| BMEVIIIA316 – Computer Graphics and Image Processing | *4* | | - | Fall |
| BMEVITMA310 – Telecommunication Networks and Services | *4* | Technical Elective - CSE 4xxx | *3* | Fall |
| BMEVIIIA217 – Software Technology | *4* | - | - | Fall |
| BMEVIIIA363 – Project Laboratory | *6* | CSE 4101 – Computer Science Projects 1 | *3* | Fall |
| BMEGT62AF51 – French for Engineers | *2* | - | - | Fall |
| MS008 – Mechatronics | *5* | - | - | Spring |
| OM004 – Optronics and radar | *3* | Technical Elective - ENS4xxx | *3* | Spring |
| OM003 - Remote sensing | *3* | Technical Elective - ENS4xxx | *3* | Spring |
| BMEVIIIAxxx -Thesis (at the RMA) | *15* | CSE 4102 – Computer Science Projects 2<br>CSE 4510 Special Topics | *3*<br>*6* | 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.
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, 19 July, 2010

[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:

**System Modeling (BMEVIMIA313, 3/1/0/exam/5 credits)**. The course presents the highest level of the design process of information systems, namely the hardware-software co-design and dimensioning of the architecture from a model based perspective. The students will learn the basic concepts of correctness verification, the performance analysis, the service safety, and their role in the modeling. They will also get acquainted with practical problems of dimensioning and measurement by completing of their previous knowledge in harder and software technologies. The course focuses on general models used in various application fields (such as general data processing, business related interactive systems, web based and embedded systems) the main emphasis being placed, however, on the web based applications.

**Computer Graphics and Image Processing (BMEVIIIA316, 3/1/0/mid-semester mark/4 credits).** The course presents the fundamentals of computer graphics and image processing and introduces methods of creating, animating, and rendering virtual worlds.

**Software Technology (BMEVIIIA217, 3/1/0/exam/4 credits).** Software engineering. Historical background. Software crisis. Concept of the technology. Software as a product. Software quality aspects. Software development process. Life cycle models. Software project planning. Riscs, Simple cost models. Scheduling. Requirement analysis and definition. Specification: functional, structural, and dynamical views. Functional description: data-flow modeling. Structural description: data dictionary, entity relationship model. Dynamical description: state transition model. Design concepts: abstraction, information hiding, cohesion, coupling. Software architectures. Object oriented software development: Object concepts. Object oriented paradigm. UML notation. Use-cases. UML structural diagrams. (Class and object diagrams). Sequence, collaboration, activity diagrams. Component and deployment diagrams. Overview on the Rational Unified Process. Component software, academic concepts: Aspest oriented programming. Verification and validation. applied techniques. Testing. Configuration management.

**Coding Technology (BMEVIHIA209, 3/1/0/mid-semester mark/5 credits).** Objective: Clear understanding of the basic principles, notions, models, techniques in the field of data compression coding, error control coding, and cryptography security encoding, supported by solving lots of numerical problems. The aim is to develop the ability to apply basic techniques and solve standard design problems. Data compression coding: Prefix code. Average codeword length and the entropy. Shannon-Fano code, Huffmann code, Lempel-Ziv code. Quantization. Uniform quantization. Lloyd-Max quantizer. Transformation encoder. Predictive encoding. Voice compression. Video compression. Error control coding: Basic notions of error control (code, codeword, error models, Hamming distance, error correction, error detection, code distance, code parameters). Binary linear code: generator matrix, parity check matrix, systematic code. Hamming code. Cyclic linear code, generator polynomial, parity check polynomial. CRC detection technique. Nonbinary linear codes. Reed-Solomon code. Encoding of the CD. Code combination techniques (product code, interleaving, cascading). Convolutional code, Viterbi decoding technique. Security coding: Basic notions, encryption, authentication, integrity protection, access control, repudiation. Ideal encryption. Linear encryption. Public key encryption. RSA algorithm. Hash functions. Basic cryptographic protocols: party authentication, integrity protection, key distribution, digital signature, key certificate. Typical security holes in cryptographic primitives and protocols.

**Artificial Intelligence (BMEVIMIA313, 3/1/0/exam/5 credits).** Agent paradigm: Intelligent system and its environment. Formal modeling and solving of complex problems within agent paradigm. Comparing problem solving methods (search strategies). Heuristics for reducing complexity. Knowledge intensive approach and complexity. Experimenting with the scheduling problems: modeling within the paradigm and solving with the search algorithms. Planning: Planning as a tool of problem solving. Basic representations for planning. The basics of the modern planning algorithms. Hierarchical and conditional planning. The question of the resource constraints. Integrated planning and execution. Experimenting with the assembly problems: developing plans taking into account various problems of increasing complexity. Knowledge intensive systems. Formal representation and manipulation of knowledge. Logic based methods. Using first order logic to describe problems and to compute solutions. The functioning of rule-based systems. Inference methods for uncertain knowledge. Probabilistic inference systems. Representing vague meaning with fuzzy sets. Experimenting with the diagnostic problem with knowledge of different levels of uncertainty, using suitable methods, or experimenting with building a fuzzy system (rule-based language, fuzzy software packages, etc.). Learning. Learning within agent paradigm. Inductive logical learning (decision trees, learning general logical expressions). Learning in neural and Bayesian networks. Reinforcement learning. Genetic algorithms and evolutionary programming. Experimenting with multiple learning problems, using suitable software packages.

**Databases (BMEVITMA311, 3/1/0/exam/5 credits).** Database concepts, history, entity-relationship model/diagram, attributes, relation-types, constraints, weak entity sets. Relational database, relational algebra, extended operations, design from E/R model. Tuple relational calculus, domain relational calculus, safe expressions, completeness. Introduction to ISBL, QUEL, QBE. SQL queries: basic structure, set operations, aggregate functions, NULL values, subqueries, SQL Data Manipulation Language, SQL Data Definition Language. Functional dependencies, logical consequence, Armstong axioms, derivation rules, key, closure, multivalued dependency, decompositions, normal forms. Transaction management: serializability, precedence graph, locks, deadlocks, 2PL, RLOCK/WLOCK, tree protocol, timestamps, logging, UNDO/REDO protocols.

**Telecommunication Networks and Services (BMEVITMA310, 3/1/0/exam 4 credits).** Architecture of telecommunication networks. Network hierarchies, numbering plans, signaling systems and signaling protocols. Telecommunication technologies: wired and wireless access, backbones. Plesiochronous Digital Hierarchy, Syncron Digital Hierarchy, Asynchronous Transfer Mode and optical networks. Telecommunication systems: Public Switched Telephone Networks, Global System Mobile, Voice over IP. Convergence of telecommunication-, computer- and broadcast networks. Software and hardware elements of telecom systems. Telecom software technology. Specification of telecom software. Infocom services. Teleservices. Message, data, voice and conference services. Content services. Video on Demand, Internet services. Web portals and services, media information systems, electronic commerce, electronic civic centre. Broadband integrated services. Authentication, authorization, and accounting.