### IMPORTANT NOTES

If for one subject you can find several different types (lecture, practice, laboratory) of courses then please choose one and only one course from each type in order to be able to perform the subject's requirements successfully. Civil Engineering courses are on the website separately. Courses chosen from the offer of Faculty of Civil Engineering will be checked and arranged individually by the departmental coordinator.

<table>
<thead>
<tr>
<th>Subject code</th>
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<th>Requirement</th>
<th>ECTS credit</th>
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</thead>
<tbody>
<tr>
<td>BMEVIUAAB00</td>
<td>Software Techniques</td>
<td>Exam</td>
<td>5</td>
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</table>

**Course type** Line: Laboratory
**Course code** Line: ALE
**Course language** Line: English
**Timetable information** Line: THU:10:15-12:00

https://portal.vik.bme.hu/kepzes/targyak/VIUAAB00/en/

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<tbody>
<tr>
<td>BMEVIHIAA02</td>
<td>Computer Architectures</td>
<td>Exam</td>
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**Course type** Line: Lecture
**Course code** Line: EA
**Course language** Line: English
**Timetable information** Line: WED:10:15-12:00

**Course type** Line: Practice
**Course code** Line: GA
**Course language** Line: English
**Timetable information** Line: WED:14:15-16:00

https://portal.vik.bme.hu/kepzes/targyak/VIHIAA02/en/

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<tbody>
<tr>
<td>BMEVIHIAAC01</td>
<td>IT Security</td>
<td>Mid-semester mark</td>
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**Course type** Line: Lecture
**Course code** Line: EA
**Course language** Line: English
**Timetable information** Line: THU:10:15-13:00

https://portal.vik.bme.hu/kepzes/targyak/VIHIAC01/en/ This course gives an overview of the different areas of IT security with the aim of increasing the security awareness of computer science students and shaping their attitude towards designing and using computing systems. The course prepares BSc students for security challenges that they may encounter during their professional carrier, and at the same time, it provides a basis for those student who want to continue their studies at MSc level. We put special emphasis on software security and the practical aspects of developing secure programs.

<table>
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<td>BMEVIHIAV34</td>
<td>Security and Privacy: an Economic Approach</td>
<td>Mid-semester mark</td>
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**Course type** Line: Lecture
**Course code** Line: E
**Course language** Line: English
**Timetable information** Line: WED:12:15-14:00

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<tr>
<td>BMEVIHIAV37</td>
<td>V2X Communication Technologies of Autonomous Vehicles</td>
<td>Exam</td>
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**Course type** Line: Lecture
**Course code** Line: EA
**Course language** Line: English
**Timetable information** Line: WED:12:15-14:00

**Course type** Line: Practice
**Course code** Line: GA
**Course language** Line: English
**Timetable information** Line: FRI:12:15-14:00

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<tr>
<td>BMEVIHIM009</td>
<td>Signal Processing Fundamentals</td>
<td>Mid-semester mark</td>
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**Course type** Line: Lecture
**Course code** Line: EA
**Course language** Line: English
**Timetable information** Line: TUE:10:15-12:00(QBF11); WED:14:15-16:00(QBF11)

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<td>BMEVIHIMA07</td>
<td>Mobile and Wireless Networks</td>
<td>Exam</td>
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**Course type** Line: Lecture
**Course code** Line: EA
**Course language** Line: English
**Timetable information** Line: WED:14:15-16:00

**Course type** Line: Practice
**Course code** Line: GA
**Course language** Line: English
**Timetable information** Line: FRI:08:15-10:00

2019/20/2
https://portal.vik.bme.hu/kepzes/targyak/VIHVAA00/ The objective of this course is to introduce today’s modern wireless and mobile systems to our students. This contains basic knowledge needed to operate and maintain such networks. Further goal of this course is to show the possibilities and operations of advanced radio and wireless solutions, through practical examples.

#### Signals and Systems 1

Course type: Lecture, Practice
Course code: BMEVIHVAA00
Course language: English
ECTS credit: 6

#### Course description

- **Course type:** Lecture, Practice
- **Course code:** BMEVIHVAA00
- **Course language:** English
- **ECTS credit:** 6

The course is divided into two main parts: Definitions and Timetable information.

### Definitions

#### Lecture

- **Course type:** Lecture
- **Course code:** A2
- **Course language:** English
- **ECTS credit:** 3

#### Practice

- **Course type:** Practice
- **Course code:** C2
- **Course language:** English
- **ECTS credit:** 3
High Frequency System Techniques


Subject code | Subject name | Requirement | ECTS credit
--- | --- | --- | ---
BMEVHVAC04 | High Frequency System Techniques | | 4

Course type | Course code | Course language | Timetable information
--- | --- | --- | ---
Lecture | CA | English | MON:14:15-16:00
Practice | CB | English | THU:10:15-12:00

https://portal.vik.bme.hu/kepzes/targyak/VIHVAC04/en/ The objective of the subject is to give an overview of the fundamental design considerations applied in high frequency systems (extending up to 3 GHz), along with the properties of common analog and digital modulations schemes, including also OFDM.the following major topics are covered: General radio technology: -noise figure, -linearity, compression of amplifiers, intermodulation, passive intermodulation, linear and nonlinear distortions -mixers, superheterodyne principle, (test) receivers and spectrum analyzers Modulations: -AM, FM, PM (waveforms and spectra), analog QAM -single carrier digital modulations (I/Q-signals, xFSK, xQAM, xPSK) -multi carrier (OFDM) systems: orthogonality, guard interval, transmission cells /* Font Definitions */ @font-face {font-family:Calibri; panose-1:2 15 2 2 2 4 3 2 4; mso-font-charsize:238; mso-generic-font-family:swiss; mso-font-pitch:variable; mso-font-signature:-536870145 1073786111 1 0 415 0;} /* Style Definitions */ p.MsoNormal, li.MsoNormal, div.MsoNormal {mso-style-unhide:no; mso-style-qformat:yes; mso-style-parent:""; margin:0cm; margin-bottom:.0001pt; mso-pagination:widow-orphan; font-size:11.0pt; mso-ascii-font-family:Calibri; mso-ascii-theme-font:minor-latin; mso-hansi-font-family:Calibri; mso-hansi-theme-font:minor-latin; mso-bidi-font-family:Times New Roman; mso-bidi-language:EN-US;}

### Subject code:
- BMEVHVAC04

### Subject name:
- High Frequency System Techniques

### Requirement:
- Exam

### ECTS credit:
- 4

### Course type:
- Lecture
- Practice

### Course code:
- CA
- CB

### Course language:
- English

### Timetable information:
- **MON:** 14:15-16:00
- **THU:** 10:15-12:00

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<table>
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<th>Subject code</th>
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<tr>
<td>BMEV/HVMA05</td>
<td>Optical Networks Elements</td>
<td>4</td>
<td>Exam</td>
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</table>

### Course Timetable Information
- **Lecture**: A2  English  MON:10:15-12:00
- **Practice**: C2  English  THU:10:15-12:00

https://portal.vik.bme.hu/kepzes/targyak/VIHVMA05/en/

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<td>BMEVISZAA04</td>
<td>Introduction to the Theory of Computing 2</td>
<td>5</td>
<td>Exam</td>
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</table>

### Course Timetable Information
- **Lecture**: A0  English  MON:10:15-12:00

https://portal.vik.bme.hu/kepzes/targyak/VISZAA04/en/

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<tr>
<td>BMEVISZAB03</td>
<td>Theory of Algorithms</td>
<td>5</td>
<td>Exam</td>
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</tbody>
</table>

### Course Timetable Information
- **Lecture**: A0  English  MON:10:15-12:00

https://portal.vik.bme.hu/kepzes/targyak/VISZAB03/en/

<table>
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<tbody>
<tr>
<td>BMEVISZMA02</td>
<td>Advanced Mathematics for Informatics - System Optimisation</td>
<td>4</td>
<td>Exam</td>
</tr>
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</table>

### Course Timetable Information
- **Lecture**: A0  English  TUE:10:15-12:00; WED:08:15-10:00

https://portal.vik.bme.hu/kepzes/targyak/VISZMA02/en/

The subject introduces some areas of operations research and combinatorial optimization. Besides covering the most relevant algorithms and methods and their limits, it also aims at giving a glimpse into some of their engineering applications. Thus the subject also covers some general algorithmic approaches like linear and integer programming and matroid theory. Furthermore, the course aims at extending and deepening the knowledge formerly provided by the Introduction to the Theory of Computing 1 and 2 and the Theory of Algorithms subjects of the BSc degree program in Software Engineering.

<table>
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</thead>
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<td>BMEVISZMA06</td>
<td>Advanced Mathematics for Electrical Engineers - Combinatorial Optimization</td>
<td>3</td>
<td>Mid-semester mark</td>
</tr>
</tbody>
</table>

### Course Timetable Information
- **Lecture**: A0  English  MON:08:15-10:00

https://portal.vik.bme.hu/kepzes/targyak/VISZMA06/en/

The subject introduces some areas of operations research and combinatorial optimization. Besides covering the most relevant algorithms and methods and their limits, it also aims at giving a glimpse into some of their engineering applications. Thus the subject also covers some general algorithmic approaches like linear and integer programming and matroid theory. Furthermore, the course aims at extending and deepening the knowledge formerly provided by the Foundations of Computer Science subject of the BSc degree program in Electrical Engineering.

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<tr>
<td>BMEV/ITMAB01</td>
<td>Communication Networks II.</td>
<td>4</td>
<td>Exam</td>
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### Course Timetable Information
- **Laboratory**: ALER  English  MON:14:15-18:00
- **Lecture**: AER  English  MON:12:15-14:00

https://portal.vik.bme.hu/kepzes/targyak/VITMAB01/en/

To provide both theoretical and practical knowledge about communication networks, especially about telecommunication networks. Starting from the classical telephony networks, through mobile (cell) phone systems and IP access networks, to high speed backbones, the students of this course will get acquainted with the architecture of these networks, along with their main building blocks as well as the communication protocols they apply. This course, in accordance with Communication Networks 1, aims to provide strong foundation for the relevant specialization courses. Synopsis: Introduction to the course Basics Overview of telephony networks Analog and digital speech transfer Architecture of telephony switches Wired IP access networks Digital subscriber loops (xDSL) Cable television Internet access Optical access networks Voice over IP (VoIP) speech codecs, SIP and H.323 protocols 3play services: Video on Demand, IPTV, etc. Mobile telephony networks overview, GSM, UMTS, HSPA, LTE, satellite telephony systems Signaling Backbone network technologies MPLS and its extensions, optical wavelength- and waveband switching Outlook: Peer-to-peer, AdHoc networks, Machine to machine communication – Internet of Things The lectures are accompanied by laboratory measurements: 3 measurements, each 4x45 minutes, allowing the students to exercise with some of the
### BMEVITMAB03 - Infocommunications

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<td>BMEVITMAB03</td>
<td>Infocommunications</td>
<td>Exam</td>
<td>5</td>
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</table>

#### Course type

| Lecture | AE1 | English | THU:10:15-12:00 |

#### Timetable information

https://portal.vik.bme.hu/kepzes/targyak/VITMAB03/en/

Basic goal of the „Infocommunication” subject is to present specific terms, procedures, problems and solutions used in telecommunications. The subject strives to give solid basis of the most important terms and procedures to support further studies of related orientations. For all future electroengineers the subject provides basic knowledge for the forthcoming studies, whatever specialization is chosen by the student. Both the lectures and the seminars aim to teach the students so that they not only understand but are able to apply the known methods, procedures, etc., on their own. On the other hand, it is also important to point out the trends and innovations of the infocommunication technologies so that the students could be able understand them with a little individual effort. Synopsis: 1) Stochastic processes. Parameters, classification, operations on processes. 2) Sampling. Spectrum of a Sampled Signal. Narrow Band Signal Sampling. 3) Signal Reconstruction from Samples. Shanon Theorem. 4) Linear and Nonlinear Quantization. Quantization Error and Noise. PCM signal. 5) Physical Properties of Sound. Physiological Properties of Hearing. 6) Physical properties of Light. Physiological Properties of Vision. 7) Information contents of still and moving images. 8) Construction of metal cables (aerial cable, flat cable, UTP, coaxial cable) and their parameters (specific attenuation and phase, propagation delay and velocity). 9) Construction of optical fiber cable types (SI, GI, SM) and their parameters (NA, modal dispersion, chromatic dispersion). 10) Hybrid, two and four-wire repeater. The loop stability issue. Near and far end crosstalk. 11) Wave Propagation Modes I. Line-of-sight, multipath, and surface wave propagation. 12) Wave Propagation Modes II. Refraction, diffraction, tropospheric scatter, ionospherical propagation. 13) AMDSB, AMDSB/SC, AMSSB. Spectrum, representations, demodulation. 14) Analog Phase and Frequency Modulation. Bandwidth, demodulation. 15) Baseband Digital Modulation. PAM. Probability of Error. 16) Matched Filters. Inter-symbol Interference. Nyquist criterium 17) Digital Carrier Modulations. ASK, PSK, FSK. Time domain repr., spectrum. 18) M-ary PSK. Constellation diagram. Bandwidth and power comparison to BPSK. 19) QAM, a and q components. QAM modulator and demodulator. Carrier recovery. 20) Channel Allocation Methods (FDM, TDM). Voice channel multiplexing. 21) Random TDMA procedures: Roll-call polling, Hub polling, token ring. 22) Random TDMA procedures: pure and slotted Aloha, carrier sensing multiple access. 23) Spread Spectrum Multiple Access: CDMA, FHMA, slow and fast freq. hopping 24) Terrestrial and Satellite P-Point Communication. Transmitter, transponder, receiver. 25) Mobile Operational Modes: Simplex, Half Duplex, Mobile Relay, Full Duplex. 26) Mobile Propagation Features: Multipath propagation, Rayleigh fading, Doppler effect. 27) GSM Channel allocation: uplink, downlink, FDMA/TDMA 28) GSM Network Structure. BSS, BSC, MSC, HLR, VLR, EIR, OMC. 29) GSM area coverage, clusters, S/I ratio.

### BMEVITMAC02 - Information Systems Management

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<th>Requirement</th>
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<tr>
<td>BMEVITMAC02</td>
<td>Information Systems Management</td>
<td>Mid-semester mark</td>
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#### Course type

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<th>AL1</th>
<th>English</th>
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<tr>
<td>Lecture</td>
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<td>English</td>
<td>MON:14:15-16:00</td>
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https://portal.vik.bme.hu/kepzes/targyak/VITMAC02/en/

Objective, learning outcomes and obtained knowledge


https://portal.vik.bme.hu/kepzes/targyak/VITMAB03/en/
Subject code | Subject name | Requirement | ECTS credit
---|---|---|---
BMEVITMAV24 | Performance Evaluation of Infocommunication Systems | Exam | 4

Course type | Course code | Course language | Timetable information
---|---|---|---
Lecture | AE1 | English | TUE:12:15-14:00
Practice | AG1 | English | THU:12:15-14:00

BMEVITMMA01 | Agile Network Service Development | Exam | 4

Course type | Course code | Course language | Timetable information
---|---|---|---
Lecture | AE1 | English | MON:08:15-10:00
Practice | AG1 | English | WED:10:15-12:00

Subject code | Subject name | Requirement | ECTS credit
---|---|---|---
BMEVITMMA09 | Sensor Networks and Applications | Exam | 4

Course type | Course code | Course language | Timetable information
---|---|---|---
Lecture | AEER | English | MON:10:15-12:00
Practice | AGER | English | THU:10:15-12:00

https://portal.vik.bme.hu/kepzes/targyak/VITMMA01/en/

BMEVITMMA10 | Intelligent Transportation Systems | Exam | 4

Course type | Course code | Course language | Timetable information
---|---|---|---
Lecture | AER | English | WED:10:15-12:00
Practice | AERG | English | MON:14:15-16:00


Subject code | Subject name | Requirement | ECTS credit
---|---|---|---
BMEVITMMB03 | Engineering Management | Exam | 4

Course type | Course code | Course language | Timetable information
---|---|---|---
Lecture | AE1 | English | FRI:08:15-12:00

self-regulation, public hearing, standards. Regulation of the information and communication technologies and markets. Technology and marker regulatory models in the ICT sector. Regulatory tasks for deploying the convergence of the telecommunications, information and media technology sectors. Community and national regulation of the electronic communications network and services. Framework and specific directives. Rules for the cooperation of the network operators and service providers. Regulation for managing scarce resources, frequency, number and address management. Concept for regulating information security, data protection and content. https://portal.vik.bme.hu/kepzes/targyak/ViTMMB03/en/