COMPUTER SCIENCE ENGINEERING BSC

Mode: Full-time training
Program Coordinator: Dr. István Oniga (oniga.istvan@inf.unideb.hu)
Mentor: Dr. Attila Kuki (kuki.attila@inf.unideb.hu)
Specialization: -

General requirements of the diploma are regulated by The Rules and Regulations of The University of Debrecen.

Diploma credit requirements

- Natural Science: 44 credits
- Human and Economic Knowledge: 15 credits
- Compulsory topics: 96 credits
- Differentiated knowledge topics: 30 credits
- Thesis: 15 credits
- Free choice: 10 credits
- Work and fire safety training: 0 credit
- Physical Education (2 semesters): 0 credit

Total (number of credits required to obtain degree): 210 credits
### Natural Science – needed 44 credits

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### Human and Economic Knowledge – needed 15 credits

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### Compulsory topics – needed 96 kredits

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### Thesis work – needed 15 credits

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### Free choice – needed 10 credits

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Exam types:  
E exam  
S sign  
P practical
# COMPUTER SCIENCE ENGINEERING BSC

## Description of Subjects

### Natural Science

## ALGORITHMS AND BASIC OF PROGRAMMING

**INBMA0101-17**

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<td>Dr. Imre Varga</td>
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### Topics:


### Compulsory/Recommended Readings:

ELECTRONICS
INBMA0102-17

Semester: 1
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Obligatory
Assessment: Practical mark
Prerequisites: None
Responsible: Dr. Attila Buchman

Topics:

Compulsory/Recommended Readings:
PHYSICS

INBMA0103-17

Semester: 1
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Obligatory
Assessment: Exam
Prerequisites: None
Responsible: Dr. Imre Varga

Topics:

Compulsory/Recommended Readings:
• Chris Vuille, Raymond A. Serway: College physics (9th edition), Brooks/Cole, Belmont, 2012
CALCULUS

INBMA0104-17

Semester: 1
Type: Lecture / Seminar
Number of Classes: 2+2+0
Credit: 6
Status: Obligatory
Assessment: Exam
Prerequisites: None
Responsible: Dr. Mihály Bessenyei

Topics:
Students know the basic tools of mathematical analysis: sequences, limits, real functions, differentiation and integration.

Compulsory/Recommended Readings:
• Serge Lang, A first course in calculus, Undergraduate Texts in Mathematics, Springer-Verlag, 2012.
MATHEMATICS FOR ENGINEERS 1

INBMA0105-17

Semester: 1
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Obligatory
Assessment: Practical mark
Prerequisites: None
Responsible: Dr. Pál Burai

Topics:
Foundation of discrete mathematics, foundations of linear algebra, foundations of numerical methods.

Compulsory/Recommended Readings:
• Stoyan and Baran: Elementary numerical mathematics for programmers and engineers, Birkhäuser, 2016, ISBN 978-3-319-44659-2
• Ertel: Advanced mathematics for engineers, Hochschule Ravensburg-Weingarten, 2012
DATA STRUCTURES AND ALGORITHMS

INBMA0207-17

Semester: 2
Type: Lecture / Seminar
Number of Classes: 2+2+0
Credit: 6
Status: Obligatory
Assessment: Exam
Prerequisites: None
Responsible: Dr. György Vaszil

Topics:
The course covers commonly used data structures, the algorithms necessary to manipulate them, and introduces the basic concepts of algorithmic complexity. Topics include elementary data structures, searching, sorting; hash tables, trees, graphs; time complexity, parallel algorithms basics.

Compulsory/Recommended Readings:
• Seymour Lipschutz: Data Structures, McGraw-Hill, 2014
MATHEMATICS FOR ENGINEERS 2

INBMA0208-17

Semester: 2
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Obligatory
Assessment: Exam
Prerequisites: INBMA0104-17 (Calculus) and INBMA0105-17 (Mathematics for Engineers 1)
Responsible: Dr. Pál Burai

Topics:
Foundation of ordinary differential equations and their numerical methods, Fourier series, Fourier transform, Laplace transform.

Compulsory/Recommended Readings:
• Stoyan and Baran: Elementary numerical mathematics for programmers and engineers, Birkhäuser, 2016, ISBN 978-3-319-44659-2
• Ertel: Advanced mathematics for engineers, Hochschule Ravensburg-Weingarten, 2012
PROBABILITY THEORY AND MATHEMATICAL STATISTICS

INBMA0313-17

Semester: 3
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0104-17 (Calculus) and INBMA0105-17 (Mathematics for Engineers 1)
Responsible: Dr. István Fazekas

Topics:
Statistical observations. Numerical and graphical characteristics of the sample.
Fitting functions to observations (regression analysis).
Randomness of observations. Event, relative frequency, probability.
Conditional probability, independence of events. Theorem of total probability, the Bayes theorem.
Expectation and variance of discrete random variables. Applications.
The general notion of random variables. Cumulative distribution function, probability density function. Expectation and variance.
Uniform, exponential, normal distributions and their applications.
Laws of large numbers and the central limit theorem. Their visualizations and applications.
The Poisson process.
Statistical estimators: unbiased and consistent estimators. Confidence intervals.
Testing statistical hypotheses. The u- and the t-tests. Nonparametric tests.
Classifications: linear separation and clustering.

Compulsory/Recommended Readings:
Human and Economic Knowledge

ECONOMICS

INBMA0314-17

Semester: 3
Type: Lecture / Seminar
Number of Classes: 2+2+0
Credit: 6
Status: Obligatory
Assessment: Exam
Prerequisites: None
Responsible: Dr. Judit Kapás

Topics:

Compulsory/Recommended Readings:
FUNDAMENTALS OF BUSINESS LAW

INBMA0631-17

Semester: 6  
Type: Lecture  
Number of Classes: 2+0+0  
Credit: 3  
Status: Obligatory  
Assessment: Exam  
Prerequisites: None  
Responsible: Dr. Géza Károlyi

Topics:
Legal concepts, the structure of the legal system, The system of state agencies, The subject of economic activity (legal capacity of legal entities), The business activity of a natural person, Common rules for companies. The founding of companies, The organizational structure of companies, A general partnership and limited partnership features, The limited liability company, The features of incorporated companies, the securities law characteristics of shares, Other legal persons organizations (cooperatives, NGOs), Termination of companies without succession and succession, Types and Characteristics The procedures insolvency, Property law, acquisition of property, The general rules of civil law contracts.

Compulsory/Recommended Readings:
MANAGEMENT BASICS FOR ENGINEERS

INBMA0632-17

Semester: 6
Type: Lecture / Seminar
Number of Classes: 2+2+0
Credit: 6
Status: Obligatory
Assessment: Exam
Prerequisites: None
Responsible: Dr. Attila Kuki

Topics:
Basic concepts of managements. Elements of the life cycle. The concept of an enterprise, Foundation of an enterprise, Enterprise stakeholders, enterprise objectives, Case study, Strategic basics, Organizational behavior, leadership, Human resource management, Marketing, Management of value creation processes, Enterprise finance, Strategic management.

Compulsory/Recommended Readings:
INTRODUCTION INTO LOGIC AND COMPUTER SCIENCE

INBMA0106-17

Semester: 1
Type: Lecture / Seminar
Number of Classes: 2+2+0
Credit: 4
Status: Obligatory
Assessment: Exam
Prerequisites: None
Responsible: Dr. László Aszalós

Topics:
Syntax and semantics; interpretation, satisfiable, contradictory and valid formulae; entailment, equivalent formulae. CNF, DNF, simplification. Boole algebras. Logic calculi, soundness, completeness. Syntax and semantics of the first order language, central logic concepts. Formal languages, finite automata, concept of algorithm.

Compulsory/Recommended Readings:
DIGITAL DESIGN
INBMA0209-17

Semester: 2
Type: Lecture / Seminar
Number of Classes: 2+2+0
Credit: 6
Status: Obligatory
Assessment: Exam
Prerequisites: INBMA0102-17 (Electronics)
Responsible: Dr. István Oniga

Topics:

Compulsory/Recommended Readings:
DIGITAL DESIGN LABORATORY

INBMA0210-17

Semester: 2
Type: Laboratory
Number of Classes: 0+0+2
Credit: 3
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0102-17 (Electronics)
Responsible: Dr. László Tóth

Topics:
Simple logic function design using HDL language (Verilog). Two level digital networks, SOP realization. Combinational and sequential Logic design using HDL codes, simulation and implementation. A/D and D/A convertors simulation. FSM design, simulation and implementation.

Compulsory/Recommended Readings:
PROGRAMMING LANGUAGES 1

INBMA0211-17

Semester: 2
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Obligatory
Assessment: Exam
Prerequisites: INBMA0101-17 (Algorithms and basics of programming)
Responsible: Dr. Márk Kósa

Topics:

Compulsory/Recommended Readings:
### COMPUTER ARCHITECTURES

**INBMA0212-17**

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<td>Responsible:</td>
<td>Dr. Imre Varga</td>
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**Topics:**

**Compulsory/Recommended Readings:**
SIGNALS AND SYSTEMS

INBMA0315-17

Semester: 3
Type: Laboratory
Number of Classes: 0+0+2
Credit: 3
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0102-17 (Electronics) and INBMA0208-17 (Mathematics for Engineers 2)
Responsible: Dr. László Tóth

Topics:
The subject is responsible for acquiring the necessary knowledge to study and analyze signals and systems such as: classification of signals and systems, system functions, measurement and discretization, measurement error and error propagation, convolution and deconvolution, Fourier-transform, Nyquist-Shannon sampling theorem, modulations, Laplace-transform, Z-transform, transfer function, bode plot and filters.

Compulsory/Recommended Readings:
• Luis F. Chaparro, Signals and Systems Using MATLAB, Elsevier 2011
INTRODUCTION TO GRAPHICAL PROGRAMMING ENVIRONMENT

INBMA0316-17

Semester: 3
Type: Laboratory
Number of Classes: 0+0+2
Credit: 3
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0101-17 (Algorithms and basics of programming)
Responsible: Dr. Tamás Bérczes

Topics:

Compulsory/Recommended Readings:
PROGRAMMING LANGUAGES 2

INBMA0317-17

Semester: 3
Type: Laboratory
Number of Classes: 0+0+4
Credit: 6
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0101-17 (Algorithms and basics of programming)
Responsible: Dr. Márk Kósa

Topics:

Compulsory/Recommended Readings:
COMPUTER NETWORKS

INBMA0318-17

Semester: 3
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Obligatory
Assessment: Exam
Prerequisites: INBMA0212-17 (Computer architectures)
Responsible: Dr. Zoltán Gál

Topics:

Compulsory/Recommended Readings:
• RFC Documents: http://www.rfc-editor.org
MANAGEMENT OF DATA NETWORK SYSTEMS

INBMA0419-17

Semester: 4
Type: Lecture
Number of Classes: 2+0+0
Credit: 3
Status: Obligatory
Assessment: Exam
Prerequisites: INBMA318-17 (Computer Networks)
Responsible: Dr. Zoltán Gál

Topics:

Compulsory/Recommended Readings:
• https://www.nagios.org/projects/nagios-config-tools/
  Nagios Enterprises, LLC
• http://oss.oetiker.ch/mrtg/
• https://sms-sgs.ic.gc.ca/eic/site/sms-sgs-prod.nsf/eng/home
OPERATING SYSTEMS

INBMA0420-17

Semester: 4
Type: Laboratory
Number of Classes: 0+0+2
Credit: 3
Status: Obligatory
Assessment: Practical mark
Prerequisites: None
Responsible: Dr. Tamás Krausz

Topics:

Compulsory/Recommended Readings:
• Silberschatz, Galvin, Gagne: Operating system concepts Wiley; 9 edition (October 10, 2012)
• Andrews, West, Dark: A+ Guide to IT Technical Support (Hardware and Software) Course Technology; 9 edition (January 1, 2016)
SYSTEM PROGRAMMING

INBMA0421-17

Semester: 4
Type: Laboratory
Number of Classes: 0+0+2
Credit: 3
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0211-17 (Programming Languages 1)
Responsible: Dr. Imre Varga

Topics:

Compulsory/Recommended Readings:
Topics:
The subject is responsible for acquiring the necessary knowledge related to the control systems such as; principles of control, feedback control and open loop control; set point control and reference signal tracking; role of negative feedback; synthesis of continuous time control systems; closed control loop, open loop, loop gain, type number; gain and phase margin. PI, PD, PID controllers, Nyquist and Bode diagrams; digital control systems: sampling theorem of Shannon, holding elements; discrete time transfer function; transfer functions and pole-zero configurations of typical elements; impulse response of sampling systems and typical components; linear systems and their description in time- and frequency domains; signal transfer in control systems; requirements for control systems; continuous signal linear control systems; performances of control systems. Stability criteria. Idea and application of root locus.

Compulsory/Recommended Readings:
• Wolfgang Altmann, Practical process control for engineers and technicians, Elsevier/Newnes 2005
SOFTWARE DEVELOPMENT FOR ENGINEERS

INBMA0423-17

Semester: 4
Type: Laboratory
Number of Classes: 0+0+2
Credit: 3
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0317-17 (Programming languages 2)
Responsible: Dr. Gergely Kocsis

Topics:
The aim of the subject is to provide an introduction to the technologies and methodologies applied during the development of multi-actor programming projects.
One goal is to make the student being involved to a project similar to real ones during the semester.
As a project the student can chose between desktop and multiplatform/mobile application development.
During the semester the student get introduction to the following topics: Agile software development methods and tools. Requirement engineering. Build automation and project management. Version control. OO planning principles and design patterns. MVC. Testing principles. Data management. GUI development basics.

Compulsory/Recommended Readings:
• Tomek Kaczanowski: Practical Unit Testing with Junit and Mockito, Tomasz Kaczanowski, 2013 ISBN 8393489393
ENTERPRISE INFORMATION SYSTEMS

INBMA0424-17

Semester: 4
Type: Lecture
Number of Classes: 2+0+0
Credit: 3
Status: Obligatory
Assessment: Exam
Prerequisites: None
Responsible: Dr. Attila Kuki

Topics:
Information systems, life cycle, dimensions, architecture levels, Categories of information systems, management information systems, Basic concepts of system engineering, different paradigms, Classical methodologies, waterfall (structured) models, Iterative models (evolution, spiral, incremental). Basics of UML, most important diagrams, Modeling system life cycle by UML – structure diagrams, Modeling system life cycle by UML – other diagrams, Elements of the Unified Process, Enterprise information processes – technological and economical processes, Abstract models for an enterprise – the five layer model, Different approaches for designing the enterprise layers, Enterprise information systems – Case studies.

Compulsory/Recommended Readings:
WEB SOLUTIONS

INBMA0425-17

Semester: 4
Type: Laboratory
Number of Classes: 0+0+2
Credit: 3
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0211-17 (Programming languages 1) or INBMA0317-17 (Programming languages 2)
Responsible: Dr. Attila Adamkó

Topics:

Compulsory/Recommended Readings:
• Julie C. Meloni, Michael Morrison: SAMS Teach Yourself HTML and CSS in 24 Hour. 2010 by SAMS Publishing.
• Robin Nixon: Learning PHP, MySQL, JavaScript, and CSS. O’Reilly Media.
INTRODUCTION INTO ARTIFICIAL INTELLIGENCE

INBMA0526-17

Semester: 5
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Obligatory
Assessment: Exam
Prerequisites: INBMA0106-17 (Introduction into logic and computer science) and
INBMA0207-17 (Data structures and algorithms) and
INBMA0211-17 (Programming languages 1)
Responsible: Dr. László Aszalós

Topics:
Intelligent agents, representing state-space, search with noninformed and
heuristic algorithms. Constraint Satisfaction Problem, Two Person Games,
winning strategy. Planning, decision trees, learning algorithms.

Compulsory/Recommended Readings:
• Peter Norvig, Stuart J. Russel: Artificial Intelligence: a Modern Approach,
• Pedro Domingos: The Master Algorithm, Basic Books; 1 edition 2015
ASSEMBLY PROGRAMMING

INBMA0527-17

Semester: 5
Type: Laboratory
Number of Classes: 0+0+2
Credit: 3
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0211-17 (Programming languages 1) and INBMA0212-17 (Computer architectures)
Responsible: Dr. Imre Varga

Topics:

Compulsory/Recommended Readings:
EMBEDDED SYSTEMS

INBMA0528-17

Semester: 5
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Obligatory
Assessment: Exam
Prerequisites: INBMA0102-17 (Electronics) and INBMA0212-17 (Computer architectures)
Responsible: Dr. László Tóth

Topics:

Compulsory/Recommended Readings:
MODELING AND ANALYSIS OF INFORMATION TECHNOLOGY SYSTEMS

INBMA0529-17

Semester: 5
Type: Seminar
Number of Classes: 0+2+0
Credit: 2
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0313-17 (Probability theory and mathematical statistics)
Responsible: Dr. János Sztrik

Topics:

Compulsory/Recommended Readings:
MOBILE SOLUTIONS

INBMA0530-17

Semester: 5
Type: Laboratory
Number of Classes: 0+0+2
Credit: 3
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0317-17 (Programming languages 2)
Responsible: Dr. Gergely Kocsis

Topics:
The aim of the subject is to introduce a mobile platform and the basics of application development for the students. During the semester the following topics will be introduced: The mobile development environment. The user interface. Persistent data storing. Sensors and locations services. Low and high level network communication. Communication solutions. Multimedia solutions. API calling. Performance tuning. Other mobile platforms and solutions.

Compulsory/Recommended Readings:
DATABASE SYSTEMS AND KNOWLEDGE REPRESENTATION

INBGA0633-17

Semester: 6
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0211-17 (Programming languages 1)
Responsible: Dr. Tamás Bérczes

Topics:

Compulsory/Recommended Readings:
IT SECURITY

INBGA0634-17

Semester: 6
Type: Laboratory
Number of Classes: 0+0+2
Credit: 3
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0420-17 (Operating systems)
Responsible: Dr. Andrea Huszti

Topics:
File access control, Encrypted File System, Configure users, groups, and authentication, SSH authentication, key generation, Wireshark network packet analyzer, OpenSSL cryptographic library.

Compulsory/Recommended Readings:
COMPUTER GRAPHICS

INBGA0635-17

Semester: 6
Type: Laboratory
Number of Classes: 0+0+2
Credit: 3
Status: Obligatory
Assessment: Practical mark
Prerequisites: INBMA0211-17 (Programming languages 1) or INBMA0317-17 (Programming languages 2)
Responsible: Dr. Róbert Tornai

Topics:

Compulsory/Recommended Readings:
Differentiated knowledge topics

**MICROCONTROLLERS**

INBMA9937-17

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**Topics:**

**Compulsory/Recommended Readings:**
PROGRAMMING NETWORK DEVICES 1

INBMA9938-17

Semester: 5
Type: Seminar / Laboratory
Number of Classes: 0+2+2
Credit: 6
Status: Optional
Assessment: Practical mark
Prerequisites: INBMA0318-17 (Computer networks)
Responsible: Dr. Szabolcs Szilágyi

Topics:

Compulsory/Recommended Readings:
• Cisco Networking Academy: https://www.netacad.com/
PROGRAMMABLE LOGIC DEVICES

INBGA9939-17

Semester: 5
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Optional
Assessment: Practical mark
Prerequisites: INBMA0209-17 (Digital design) and INBMA0211-17 (Programming languages 1)
Responsible: Dr. István Oniga

Topics:

Compulsory/Recommended Readings:
• Pong P. Chu, FPGA Prototyping By Verilog Examples: Xilinx Spartan-3 Version, ISBN: 978-0-470-18532-2,
DEVELOPMENT OF EMBEDDED SYSTEMS

INBGA9940-17

Semester: 6
Type: Laboratory
Number of Classes: 0+0+4
Credit: 6
Status: Optional
Assessment: Practical mark
Prerequisites: INBMA0528-17 (Embedded systems) and (INBMA9937-17 (Microcontrollers) or INBMA9939-17 (Programmable logic devices))
Responsible: Dr. Gergely Kocsis

Topics:

Compulsory/Recommended Readings:
PROGRAMMING NETWORK DEVICES 2

INBGA9941-17

Semester: 6
Type: Seminar / Laboratory
Number of Classes: 0+2+2
Credit: 6
Status: Optional
Assessment: Practical mark
Prerequisites: INBMA9938-17 (Programming network devices 1)
Responsible: Dr. Szabolcs Szilágyi

Topics:

Compulsory/Recommended Readings:
• Cisco Networking Academy: https://www.netacad.com/
MODELING AND PERFORMANCE EVALUATION OF NETWORKS

INBGA9942-17

Semester: 6
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Optional
Assessment: Practical mark
Prerequisites: INBMA0529-17 (Modeling and Analysis of Information Technology Systems)
Responsible: Dr. János Sztrik

Topics:
Queueing systems, $M/M/1$ systems, $M/M/1$ queueing networks. Queueing systems with balking customers, multiple server systems, finite capacity systems. Priority systems, Erlang-loss systems, $M/G/1$ systems. Engset-loss systems, finite-source queueing systems.

Compulsory/Recommended Readings:
TELECOMMUNICATION SYSTEMS

INBGA9943-17

Semester: 6
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Optional
Assessment: Practical mark
Prerequisites: INBMA0318-17 (Computer networks)
Responsible: Dr. Tamás Bérczes

Topics:

Compulsory/Recommended Readings:
SENSORS AND ACTUATORS NETWORK

INBGA9944-17

Semester: 7
Type: Lecture / Laboratory
Number of Classes: 2+0+2
Credit: 6
Status: Optional
Assessment: Practical mark
Prerequisites: INBMA0318-17 (Computer networks) and INBMA9937-17 (Microcontrollers)
Responsible: Dr. László Tóth

Topics:
Sensors: classification, properties, physical principles. Sensors used in desktop and mobile computing devices. Actuators: classification, properties, physical principles. Sensor network architectures. IEEE 802.15.4 standard. Network layer, energy and location-aware routing; attribute-based addressing, clustering; Data-driven operation. Transport Layer: TCP-like protocols, application-layer protocols (SMP, TADAP, SQDDP) standardization issues (ZigBee). Typical sensor networking applications, case studies (health, engineering applications, environmental protection, smart home, etc).

Compulsory/Recommended Readings:
• H. Karl, A. Willig, „Protocols and Architectures for Wireless Sensor Networks”, John Wiley & Sons Ltd, 2005