SUBJECT DATA SHEET AND REQUIREMENTS
last modified: 18th May 2016

NEURAL NETWORKS AND THEIR APPLICATIONS

NEURÁLIS HÁLÓZATOK ÉS ALKALMAZÁSAIK

1	Code	Semester nr. or fall/spring	Contact hours/week (lect.+semin.+lab.)	Requirements p / e / s	Credit	Language
	BMEGEGT9104	**spring**	**2+0+0**	**e**	**3**	**English**

2. Subject's responsible:

Name:	Title:	Affiliation (Department):
Dr. László Monostori	Professor	Department of Manufacturing Science and Engineering

3. Lecturer:

Name:	Title:	Affiliation (Department):
Dr. László Monostori	Professor	Department of Manufacturing Science and Engineering

4. Thematic background of the subject:

Artificial neural networks and their application in manufacturing.

5. Compulsory / suggested prerequisites:

6. Main aims and objectives, learning outcomes of the subject:

The course is aimed at presenting such methods of artificial intelligence that are particularly applicable in intelligent manufacturing systems. Theoretical basics will discussed along with application examples. Specifically, the course introduces artificial neural networks (ANNs), discusses the main models and their main application areas with a special focus on manufacturing engineering.

7. Method of education:

Lecture 2 h/w

8. Detailed thematic description of the subject:

Week	Lecture
1.	Introduction: basic concepts and network architectures.
2-4.	Supervised learning algorithms, including multilayer, radial basis, learning vector quantization, time-delay, nonlinear autoregressive, and recurrent neural network.
5.	Classification, dimensionality reduction, regression, and clustering.
6-7.	Unsupervised learning algorithms, including self-organizing maps and competitive layers.
8-9.	Deep learning methods, including convolutional neural networks, available open tools and techniques.
10.	Training methods, working with large data sets, accelerated training.
11.	Preprocessing, postprocessing, and network visualization for improving training.

12-14.	Best practice of ANN-based machine learning applications in manufacturing.

9. Requirements and grading

a) in term-period

N.A.

b) in examination period

Oral exam.

c) Disciplinary Measures Against the Application of Unauthorized Means at Mid-Terms, Term-End Exams and Homework

The following students are subject to disciplinary measures.

1. Those students who apply unauthorized means (book, lecture notes, infocommunication means, tools for storing and forwarding electronic information, etc.), different from those listed in the course requirements or adopted by the lecturer in charge of the course assessment, in the written *mid-term exams* taken, or invite or accept any assistance of fellow students, with the exception of borrowing authorized means, will be disqualified from taking further mid-term exams in the very semester as a consequence of their action. Further to this, all of their results gained in the very semester will be void, can get no term-end signatures, and will have no access to Late Submission option. Final term-end results in courses with practical mark will automatically become Fail (1), the ones with exam requirements will be labelled Refused Admission to Exams.

2. Those students whose *homework* verifiably proves to be of foreign extraction, or alternatively, evident results or work of a third party, are referred to as their own, will be disqualified from taking further assessment sessions in the very semester as a consequence of their action. Further to this, all of their results gained in the very semester will be void, can get no term-end signatures, and will have no access to Late Submission options. Final term-end results in courses with practical mark will automatically become Fail (1), ones with exam requirements will be labelled Refused Admission to Exams.

3. Those students who apply unauthorized means (books, lecture notes, infocommunication means, tools for storing and forwarding electronic information, etc.), different from those listed in the course requirements or adopted by the lecturer in charge of the course assessment, in the written *term-end exams* taken, or invite or accept any assistance of fellow students, with the exception of borrowing authorized means, will immediately be disqualified from taking the term-end exam any further as a consequence of their action, and will be inhibited with an automatic Fail (1) in the exam. No further options to sit for the same exam can be accessed in the respective exam period.

4. Those students who alter, or make an attempt to alter the already corrected, evaluated, and distributed test or exercise/problem,
   i. as a consequence of their action, will be disqualified from further assessments in the respective semester. Further to this, all of their results gained in the very semester will be void, can get no term-end signatures, and will have no access to Late Submission options. Final term-end results in courses with practical mark will automatically become Fail (1), ones with exam requirements will be labelled Refused Admission to Exams;
   ii. and will immediately be inhibited with an automatic Fail (1) in the exam. No further options to sit for the same exam can be accessed in the very same exam period.

10. Retake and repeat

N.A.

11. Consulting opportunities:

1 hr/week upon appointment by e-mail

12. Reference literature (recommended):

- S. O. Haykin: Neural Networks and Learning Machines. 3rd Edition. Prentice Hall, 2008.

- J. Schmidhuber: Deep Learning in Neural Networks: An Overview. Neural Networks, 61, 85-117, 2015

- B. Yegnanarayana: Artificial Neural Networks. PHI Learning Pvt. Ltd., 2009.

13. Home study required to pass the subject:

Contact hours	28	h/semester
Home study for the courses	14	h/semester
Home study for the exam	48	h/semester
Total:	**90**	**h/semester**

14. The data sheet and the requirements are prepared by:

Name:	Title:	Affiliation (Department):
Dr. László Monostori	Professor	Department of Manufacturing Science and Engineering