„POLITEHNICA" UNIVERSITY OF TIMIŞOARA

SYLLABUS
for the discipline:

DATA COMMUNICATIONS AND APPLICATIONS TO AUTOMOTIVE

FACULTY OF AUTOMATION AND COMPUTERS
DOMAIN/SPECIALIZATION: MASTER AUTOMOTIVE EMBEDDED SOFTWARE

Year of studies: I

Semester: *1*

Titularul cursului: *s.l. dr. ing. Bogdan Groza*
Colaboratori*:*

Numar de ore/saptamana/Verificarea/Credite					
Curs	**Seminar**	**Laborator**	**Proiect**	**Examinare**	**Credite**
2	**1**	**0**	**0**	**E**	**6**

A. COURSE OBJECTIVES

The main objective is improving student's theoretical knowledge and practical skills in data communications with practical applications in Automotive. Curse graduates will have the skills to identify and solve various problems in general purpose information systems and Automotive. The course improves knowledge on software, hardware and networking. Competence lines are covered in percents as follows: 35% line 1, 10% line 2, 35% line 3, 20% line 4.

B. COURSE SUBJECTS

1. Data communications basic concepts: *Basic principles, Analog and Digital Channels, Synchronous and Asynchronous protocols, Data Encoding, Communication Applications and Services, Protocols and Standards (2 hours);* ***2. Data communication equipments survey:*** *Transmission Media and Bus options: ISA, PCI, PCMCIA, USB, IEEE1394 (Firewire); Serial Communication, Parallel communication, Cabled devices, Wireless devices (2 hours)* ***3. Overview on network architectures and equipements:*** *Wireless and cabled networks, LAN, WAN, OSI Reference Model, Protocols: TCP, UDP, RTP, Equipements: multiplexer, repeater, bridge, switch, router, gateway, Optical equipements (2 hours);* ***4. Automotive data communcation:*** *CAN general aspects, protocol, properties and features, physical layers, components, applications and tools; (8 hours);* ***5. New bus concepts for automotive data communications:*** *LIN concepts, costs and components, Safe-by-Wire history and technology, Audio-video busses (I2C, D2B, MOST, Firewire), RF communication (8 hours);* ***6. Data control and monitoring:*** *Error management and detection, Synchronization issues (2 hours),* ***8. Performance metrics:*** *Network performance models, System simulation and performance prediction, Performance of wireless and mobile networks (2 hours);*

C. APPLICATIONS SUBJECTS (laboratory, seminar, project)

CAN BUS (8 hours): Bus description, specifications, parameters, interfaces and signals; CAN simulations in MatLab/Simulink: Calibration issues, Real-time message transmission, PWM Control; Application developmemt on CAN: Setting up parameters to observe baud-rate limitations, Implementing a communication protocol, Simulation of a network with multiple CAN nodes, Error management on CAN, Evaluation of counters RxErr and TxErr. RFID based authentication systems for automotive (4 hours):implemetation of an authentication protocol for car keys on RFID, comparison between RFID, magnetic cards and smart-cards, development of smart car keys.

D. REFERENCES

1. William Stallings, Data & Computer Communications, ISBN-10: 0130843709, ISBN-13: 978-0130843708, Prentice Hall, 810 pages, 1999. (availlable at BUPT)

2. Andrew S. Tanenbaum, Computer Networks, ISBN-10: 0130661023, ISBN-13: 978-0130661029, 4 edition, 912 pages , Prentice Hall PTR, 2002. (availlable at BUPT)

3. Wolfhard Lawrenz, CAN System Engineering: From, Theory to Practical Applications, ISBN-10: 0387949399, ISBN-13: 978-0387949390, 468 pages, Springer, 1997. (availlable at BUPT)

4. Bogdan Groza, Lecture Notes on Data Communications and Applications to Automotive, lecture slides availlable at www.aut.upt.ro/~bgroza.

E. EVALUATION PROCEDURE

Written examination 3 hours. Structure: 3 subjects which coresponds to theory (based on lecture notes) and applications (based on lecture notes subjects that were implemented). Final mark is the arithmetic mean between written examination mark and laboratory mark.

F. INTERNATIONAL COMPATIBILITY

University at Albany, Albany, New York, USA, Lecture Notes for Computer Communication Networks, http://www.cs.albany.edu/~maniatty/teaching/networks/lectnotes.html
University of Aberdeen, Internet Communications Engineering, UK, http://www.erg.abdn.ac.uk/users/gorry/eg3561/
University of Sydney, New South Wales, Australia, Advanced Computer Networking, http://www-staff.it.uts.edu.au/~dhoang/hon99/spec.htm

Date: 1.09.2008

HEAD OF DEPARTMENT
Prof. Dr.ing. Ioan Silea

COURSE INSTRUCTOR,
s.l. dr. Ing. Bogdan Groza