

SYLLABUS¹

1. Information about the Program

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| 1.1 Higher education institution | Politehnica University of Timișoara |
| 1.2 Faculty ² / Department ³ | Automation and Computers/ Measurements and Optical Electronics |
| 1.3 Chair | - |
| 1.4 Domain of study | Computers and Information Technology |
| 1.5 Study level | Bachelor |
| 1.6 Study programme / Qualification | Computers / engineer |

2. Information about the Course

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|--------------------------------------|--|--------------|---|---------------------|---|-----------------|-----------|
| 2.1 Course | Measurement Principles, Techniques and Devices | | | | | | |
| 2.2 Lecturer | Sl. dr. ing. Raul IONEL | | | | | | |
| 2.3 Academic staff for seminars/labs | Sl. dr. ing. Raul IONEL | | | | | | |
| 2.4 Study year | 2 | 2.5 Semester | 1 | 2.6 Assessment type | E | 2.7 Course type | Mandatory |

3. Total time estimated (hours/ semester of didactical activities)

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|---|----|-----------|-------------------|----|-----------------------|------------|
| 3.1 Hours / week | 4 | of which: | 3.2 lecture hours | 2 | 3.3 seminar/lab hours | 2 |
| 3.4 Total curriculum hours | 56 | of which: | 3.5 lecture hours | 28 | 3.6 seminar/lab hours | 28 |
| Time distribution | | | | | | hours |
| Study using manuals, support materials, bibliography and notes | | | | | | 14 |
| Supplementary documentation in library, speciality electronic platforms and on site | | | | | | 14 |
| Supplementary preparation for seminars/labs, homeworks, reviews, portofolios and essays | | | | | | 14 |
| Tutoring activities | | | | | | 7 |
| Exams | | | | | | 3 |
| Other | | | | | | |
| 3.7 Total - hours of individual study | | | | | | 52 |
| 3.8 Total - hours per semester | | | | | | 108 |
| a. Credits | | | | | | 5 |

4. Prerequisites (if appropriate)

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| 4.1 curriculum | <ul style="list-style-type: none"> Measurements Concepts, Sensors, Systems and Signals, Data Acquisition Techniques, Measurement Devices, Remote Measurement Concepts. |
| 4.2 competencies | <ul style="list-style-type: none"> Operarea cu fundamente științifice, ingineresti și ale informaticii |

5. Conditions (if appropriate)

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| 5.1 for lectures | <ul style="list-style-type: none"> Average or big classroom. Materials: laptop, whiteboard, projector |
| 5.2 for seminars/labs | <ul style="list-style-type: none"> 15-20 PCs, Programming environment for data acquisition techniques (LabVIEW), whiteboard, oscilloscopes, multimeters, signal generators |

1 Formularul corespunde Fișei Disciplinei promovată prin OMECTS 5703/18.12.2011 (Anexa3);
 2 Se înscrie numele facultății care gestionează programul de studiu căruia îi aparține disciplina;
 3 Se înscrie numele departamentului căruia i-a fost încredințată susținerea disciplinei și de care aparține titularul cursului;

6. Specific competencies acquired

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| Professional competencies ⁴ | <ul style="list-style-type: none"> • Operarea cu fundamente științifice, ingineresti și ale informaticii • Proiectarea sistemelor de achiziții de date, condiționarea semnalelor, operarea unor dispozitive de măsurare • Soluționarea problemelor folosind instrumentele științei măsurării • Îmbunătățirea performanțelor sistemelor hardware și software destinate măsurării unor parametri de mediu |
| Transversal competencies | <ul style="list-style-type: none"> • Comportarea onorabilă, responsabilă, etică, în spiritul legii pentru a asigura rezolvarea problemei • Demonstrarea spiritului de inițiativă și acțiune pentru actualizarea cunoștințelor profesionale, economice și de cultură organizațională |

7. Objectives of the course (issued from the list of the competencies acquired)

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| 7.1 Aim | <ul style="list-style-type: none"> • To provide an introduction to measurements concepts and specific instrumentation |
| 7.2 Specific objectives | <ul style="list-style-type: none"> • Understanding and using the fundamental methods of measurements, data acquisition and signal conditioning |

8. Content

| 8.1 Lecture | Hours | Instruction methods |
|---|-------|---|
| 1. Introduction to measurement concepts | 3 | Slide-based presentations, discussions, examples. |
| 2. Sensors, systems and signals | 2 | |
| 3. Data acquisition and sensor characteristics I | 2 | |
| 4. Data acquisition and sensor characteristics II | 2 | |
| 5. Measurement devices – the Oscilloscope I | 2 | |
| 6. Measurement devices – the Oscilloscope II | 3 | |
| 7. Measurement devices – the Signal Generator | 2 | |

⁴ Aspectul competențelor profesionale va fi tratat cf. Metodologiei OMECTS 5703/18.12.2011. Se vor prelua competențele care sunt precizate în Registrul Național al Calificărilor din Învățământul Superior RNCIS (http://www.rncis.ro/portal/page?_pageid=117,70218&_dad=portal&_schema=PORTAL) pentru domeniul de studiu de la pct. 1.4 și programul de studii de la pct. 1.6 din această fișă.

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| 8. Measurement devices – the Multimeter | 2 | |
| 9. Signal Conditioning design techniques | 2 | |
| 10. Principles of Sensing I | 2 | |
| 11. Principles of Sensing II | 2 | |
| 12. Remote measurements concepts | 2 | |
| 13. LabVIEW programming concepts | 2 | |
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References

1. J. Fraden, *Handbook of Modern Sensors Physics, Designs, and Applications*, Springer, 2010.
2. D.V. Kerns, J.D. Irwin, *Essentials of Electrical and Computer Engineering*, Pearson Prentice Hall, 2004.
3. A. Ignea, D. Stoiciu, *Măsurări electronice, senzori și traductoare*, Editura Politehnica, Timișoara, 2003.
4. G. Rizzoni, *Principles and Applications of Electrical Engineering*, McGraw-Hill Companies, Inc., Boston, 2004.

| 8.2 Seminar/lab | Hours | Instruction methods |
|--|-------|---|
| 1. Introduction to measurement concepts | 2 | Short presentation, discussions, implementation |
| 2. Data acquisition elements and temperature measurement | 2 | |
| 3. Circuitry for temperature, illumination and noise measurement I | 2 | |
| 4. Circuitry for temperature, illumination and humidity measurement II | 2 | |
| 5. The analog Oscilloscope I | 2 | |
| 6. The analog Oscilloscope II | 2 | |
| 7. The Multimeter | 4 | |
| 8. The Operational Amplifier, the Instrumentation Amplifier | 2 | |
| 9. Circuitry for amplification and filtering | 2 | |
| 10. Arduino and LabView in data acquisition applications | 2 | |
| 11. Arduino and LabView in data acquisition applications | 2 | |
| 12. Remote measurements examples | 2 | |
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References

1. J. Fraden, *Handbook of Modern Sensors Physics, Designs, and Applications*, Springer, 2010.
2. D.V. Kerns, J.D. Irwin, *Essentials of Electrical and Computer Engineering*, Pearson Prentice Hall, 2004.
3. A. Ignea, D. Stoiciu, *Măsurări electronice, senzori și traductoare*, Editura Politehnica, Timișoara, 2003.
4. G. Rizzoni, *Principles and Applications of Electrical Engineering*, McGraw-Hill Companies, Inc., Boston, 2004.

9. Correlation between the course content and the requirements of the specialists in the field and the expectations of the main employers

The knowledge acquired is expected to be particularly useful to the students working in the field of measurements of different environmental parameters.

10. Assessment

| Activity type | 10.1 Assessment criteria | 10.2 Assessment methods | 10.3 Weight in final mark |
|---------------|---|-------------------------|---------------------------|
| 10.4 Lecture | Answers to questions related to the content of the lectures | Written exam | 66% |

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| 10.5 Seminar /labs | Solving the problems given during the labs | Describing the proposed solution, answering questions | 20% |
| | Homeworks (assignments) | Describing the proposed solution, answering questions | 10% |
| | Presence | Presence monitoring | 4% |
| 10.6 Minimal performance standards (minimal specific knowledge required for passing the exam, the means to assess mastering the specific knowledge) | | | |
| <ul style="list-style-type: none"> Minimum performance standard is to prove the understanding of the basic knowledge of measurements and devices principles, design of basic instrumentation and analysis that contribute to problem solving. | | | |

11. International compatibility

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| 1. MIT, Measurements and Instrumentation, http://web.mit.edu/2.671/www/ 1. |
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Date

Signature of the course instructor

Signatures of the academic staff for seminars/labs

Șl. dr. ing. Raul Ionel

Șl. dr. ing. Raul Ionel

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Date of approval in the Department

Signature of the Department Director

Prof. dr. Ing. Traian JURCA

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