| COURSE INFORMATION | | | | | |
|---|---|---|---|---|---|
| **Course Title** | *Code* | *Semester* | *L+P Hour* | *Credits* | *ECTS* |
| ADVANCED METROLOGY | PHYS 542 | 2 | 3+ 0+0 | 3 | 8 |

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| **Prerequisites** | |

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| **Language of Instruction** | English |
| **Course Level** | Postgraduate |
| **Course Type** | Compulsory |
| **Course Coordinator** | |
| **Instructors** | Assist. Prof. Dr. Melda Patan Alper |
| **Assistant** | |
| **Goals** | To provide students with knowledge of how to use physics knowledge in measurements of science. |
| **Content** | Brief history of measurements, measurements instruments; instrumer classification and characteristic, active/passive filter, sensitivity, bias, toleranc etc., Error in measurements, firs and second order instruments, guidelines fc evaluating and expressing uncertainty, Primary, secondary and workin standards, traceability, measurements of electrical quantities; Bridge circuits, Nu type-Wheatstone bridge, deflection bridge etc. temperature measurements; ITS 90 scale, practical temperature measurements etc. |

| **Learning Outcomes** | **Teaching Methods** | **Assessment Methods** |
|---|---|---|
| 1) To learn measurement systems from past to present | 1,2,3 | A,C |
| 2) To learn how to use physics knowledge for physical measurements system | 1,2,3 | A,C |
| 3) To learn the importance of instrument classification and characteristics | 1,2,3 | A,C |
| 4) To understand wide range of measurement techniques in physics, used for industry. | 1,2,3 | A,C |
| 5) To understand the realisation and maintanance of SI base units | 1,2,3 | A,C |

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| **Teaching Methods:** | 1: Lecture, 2: Question-Answer, 3: Discussion, 9: Simulation, 12: Case Study |

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| **Assessment Methods:** | A: Testing, C: Homework, I:Laboratory |

| COURSE CONTENT | | |
|---|---|---|
| **Week** | **Topics** | **Study Materials** |
| 1 | History of measurements | |
| 2 | Instrument classification and characteristics | |
| 3 | Instrument classification and characteristics | |
| 4 | Error in measurements system and quide to evaluation of measurement uncertainties | |
| 5 | Error in measurements systems and quide to evaluation of measurement uncertainties | |
| 6 | Primary, Secondary and working metrological standards | |
| 7 | Primary, Secondary and working metrological standards | |
| 8 | Measurements of electrical quantatities | |
| 9 | Bridge circuits, errors in bridge measurement system | |
| 10 | Realisation of national voltage standards, volts | |
| 11 | Realisation of national Ampere standard | |
| 12 | Realisation of national resistance; quantum hall effect | |
| 13 | Temperature measurements; ITS-90 scale | |
| 14 | Practical temperature measurements | |

| RECOMMENDED SOURCES | |
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| **Textbook** | 1. G.M.S. de Silva, "Basic Metrology for ISO 9000 Certification<br>2. Alan S. Morris, "Principles of Measurements and Instrumentation" |
| **Additional Resources** | 1. Bernhard Kramer, "The Art of Measurement", PTB, Germany.<br>2. Tom Duncan, "Success in Electronics" |

| MATERIAL SHARING | |
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| **Documents** | Lecturer Notes |
| **Assignments** | Homework assignments every three to four weeks |

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| **Exams** | Two mid-term exams and one final |

| **ASSESSMENT** | | |
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| **IN-TERM STUDIES** | **NUMBER** | **PERCENTAGE** |
| Mid-terms | 2 | 40 |
| Home-works and presentations | 4 | 10 |
| | | |
| **Total** | | |
| **CONTRIBUTION OF FINAL EXAMINATION TO OVERALL GRADE** | | 50 |
| **CONTRIBUTION OF IN-TERM STUDIES TO OVERALL GRADE** | | 50 |
| **Total** | | **100** |

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| **COURSE CATEGORY** | Expertise/Field Courses |

| **COURSE'S CONTRIBUTION TO PROGRAM** | | | | | | |
|---|---|---|---|---|---|---|
| No | Program Learning Outcomes | Contribution | | | | |
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | Gets a sound base for the main fields of physics such as Classical Mechanics, Quantum Mechanics and Electromagnetism, | | X | | | |
| 2 | Gets the ability of interpreting, analysing, forming a synthesis and relationships between the main fields of physics and/or other sciences, | | | X | | |
| 3 | Obtains the education required for the measurements in scientific and technological areas and the contribution of physics in the industrial applications and on the macroscopic scale such as the society, | | | | | X |
| 4 | Follows the up-to-date scientific developments, makes the analysis/synthesis for the new ideas and evaluates them, | | | | X | |
| 5 | Uses the academic sources, the computer technology and the related devices, | | | | X | |
| 6 | Joins the working and research groups, also the scientific meetings, communicates well at the national and international level, | | X | | | |
| 7 | Gets the ability of creative and critical thinking, problem solving, researching, producing a new and original work, improving himself/herself in his/her own fields of interest, | | | | | X |
| 8 | Gains the concepts of ethics and responsibility. Undertakes the responsibility for the solutions to the problems related with his/her field as required for having an intellectual identity. | | X | | | |

| **ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION** |
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| Activities | Quantity | Duration (Hour) | Total Workload (Hour) |
|---|---|---|---|
| Course Duration (Excluding the exam week: 14x Total course hours) | 14 | 3 | 42 |
| Hours for off-the-classroom study (Pre-study, practice) | 14 | 8 | 112 |
| Mid-terms | 2 | 3 | 6 |
| Home works and presentations | 4 | 7 | 28 |
| Final examination | 1 | 3 | 3 |
| **Total Work Load** | | | 191 |
| **Total Work Load / 25 (h)** | | | 7.64 |
| **ECTS Credit of the Course** | | | 8 |