

COURSE TITLE: POWER ELECTRONICS FOR POWER QUALITY IMPROVEMENT

Institute / Division: Institute of Circuit Theory and Metrology / Faculty of Electrical and Computer Engineering

Course code: E1-PQual

Number of contact hours: 45

Duration: 1 semester

ECTS credits: 5

Programme description: This course comprises lectures and computer simulations. It covers basic aspects of electric power quality improvement with the use of power electronic converters. Modern non-active powers compensation techniques are discussed. All subjects are clarified and made familiar using exercises and computer simulations. Subjects of the course are listed below:

- Electric power definitions
- Evolution of electric power theory
- Components of load current and power
- Detection of non-active load current and power components
- Principles of active compensation
- Introduction to power electronic converters used for power quality improvement
- Single- and three-phase shunt active power filter
- PFC rectifier

Course type: lectures (20h), computer simulations (20h), project (5h)

Literature:

Books: H. Akagi, E. Watanabe, M. Aredes, *Instantaneous Power Theory and Applications to Power Conditioning*, Wiley & Sons, 2007, ISBN 978-0-470-10761-4.

M. H. Rashid, *SPICE for Power Electronics and Electric Power*, CRC Press, 2012, ISBN 978-1-4398-6046-5.

M. P. Kazmierkowski, R. Krishnan, F. Blaabjerg, *Control in Power Electronics*, Academic Press, 2002, ISBN 0-12-402772-5.

E. F. Fuchs, M. A. Masoum, *Power Quality in Power Systems and Electrical Machines*, Academic Press, 2008, ISBN 978-0-12-369536-9.

Journal papers: L. Asimionaei, F. Blaabjerg, S. Hansen, *Detection is key. Harmonic detection methods for active power filter applications*, IEEE Industrial Application Magazine, July/Aug 2007, pp 22-33.

A. Szromba, *Energy controlled shunt active power filter*, COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering, Volume 26, Issue 4, 2007, pp. 1142-60.

A. Szromba, *A shunt active power filter: development of properties*", COMPEL: The International Journal for Computation and Mathematics in Electrical and Electronic Engineering, Volume 23, Issue 4, 2004, pp. 1146-62.

A. Szromba, *Shunt Power Electronic Buffer as Active Filter and Energy Flow Controller*", Archives of Electrical Engineering, vol. 62(1), 2013, pp. 55-75.

Prerequisites: Basic Circuit Theory

Assessment method: Project and computer simulations

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