

<b>Modultitel</b>	<b>Modulcode</b>
Principles of Power Electronics	etit-017
<b>Modulverantwortliche(r)</b>	
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<b>Veranstalter</b>	
Institut für Elektrotechnik und Informationstechnik - Leistungselektronik	
<b>Fakultät</b>	
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<b>Prüfungsamt</b>	
Prüfungsamt Elektrotechnik und Informationstechnik	

<b>Leistungspunkte</b>	4
<b>Bewertung</b>	Benotet
<b>Dauer</b>	Ein Semester
<b>Angebotshäufigkeit</b>	Findet nur im Wintersemester statt
<b>Arbeitsaufwand pro Leistungspunkt</b>	30 Stunden
<b>Arbeitsaufwand insgesamt</b>	120 Stunden
<b>Präsenzstudium</b>	45 Stunden
<b>Selbststudium</b>	75 Stunden
<b>Lehrsprache</b>	Deutsch

<b>Modulveranstaltung(en)</b>			
<b>Veranstaltungsart</b>	<b>Lehrveranstaltungstitel</b>	<b>Pflicht/Wahl</b>	<b>SWS</b>
Vorlesung	Principles of Power Electronics	Pflicht	2
Übung	Principles of Power Electronics	Pflicht	1
<b>Weitere Bemerkungen zu den Lehrveranstaltungen</b>			
Die Lehrveranstaltungen stimmen überein mit denen zum Modul "etit-120 Principles of Power Electronics" und sind unter dem Modulcode etit-120 im UnivIS zu finden.			

<b>Prüfung(en)</b>				
<b>Prüfungstitel</b>	<b>Prüfungsform</b>	<b>Bewertung</b>	<b>Pflicht/Wahl</b>	<b>Gewicht</b>
Klausur: Principles of Power Electronics	Klausur	Benotet	Pflicht	-

**Lehrinhalte**

1. Introduction: Power Electronics as part of power and automation engineering
2. Power Semiconductors
  - pn-Junction and signal Diodes
  - Power Diodes
  - Power Bipolar transistors
  - Power MOSFET
  - Power IGBT
  - Thyristors
  - Wide-Band-Gap Power Devices
  - Packaging of power semiconductors
3. Self-commutated power converters: DC/DC Converters
  - Quasi-stationary operation
  - Buck converter
  - Boost converter
  - Buck-boost converter
  - Choice of the output capacity
  - Extension to multi-quadrant operation
  - Control methods
4. Self-commutated power converters: Inverters
  - Single-phase voltage source inverter
  - Square-wave operation
  - Basic principles of the Pulse Width Modulation (PWM)
  - Bipolar and Unipolar modulations
  - Sinusoidal modulation
  - Control characteristic and Overmodulation
  - Deadtime
  - Three-phase voltage source inverters
  - Overmodulation (up to six-steps operation)
  - Spacevector modulation
  - Applications of inverters in electric drives and smart grid
5. Line-commutated power converters and power quality issues
  - One-pulse power converter
  - Single Phase Full-bridge converter
  - Commutation between Thyristors
  - Star-connected three-phase converter
  - Three-phase full bridge converter
  - 12-pulses power converters for High Voltage DC (HVDC) Applications
  - Not-sinusoidal voltages and currents, distorted power
  - Propagation of harmonics and power quality factors

**Lernziele**

Power electronics are used in the majority of electrical energy applications, such as the power generation. Due to its interdisciplinary character, it is an example of system-oriented work. The module imparts knowledge and skills on the basic processes, circuits and components such as self-commutated power converters, line-commutated power converters, grid perturbations and power semiconductors. These topics have to be seen from the students in the optic that today more than 60% of the electrical energy is converted electronically before consumption.

The students should acquire a basic understanding of power electronics, know the essential state of the art and be able to independently assess the operation of known and unknown circuits.

The use of power semiconductor to control the voltage amplitude and frequency waveforms in power converters is an essential new learning content. In addition, the function of power semiconductors is taught.

Literatur
<ul style="list-style-type: none"> <li>• Mohan, N.; Undeland, T.M., Robbins, W.P.: Power Electronics – Converters, Application and Design, John Wiley, New York, 3. Auflage, 2003</li> <li>• Michel, M.: Leistungselektronik – Eine Einführung, Springer-Verlag, Berlin, Heidelberg, New York, 1996</li> </ul>

Verwendung	Pflicht/Wahl	Fachsemester
Bachelor, 1-Fach, Betriebswirtschaftslehre, (Version 2014)	Wahl	5.
Bachelor, 1-Fach, Chemie, (Version 2016)	Wahl	5.
Bachelor, 1-Fach, Chemie, (Version 2007)	Wahl	5.
Bachelor, 1-Fach, Geowissenschaften, (Version 2007)	Wahl	5.
Bachelor, 1-Fach, Sozio-Ökonomik, (Version 2016)	Wahl	5.
Bachelor, 1-Fach, Volkswirtschaftslehre, (Version 2014)	Wahl	5.
Bachelor, 1-Fach, Volkswirtschaftslehre, (Version 2007)	Wahl	5.
Bachelor, 1-Fach, Wirtschaftschemie, (Version 2014)	Wahl	5.
Bachelor, 1-Fach, Wirtschaftschemie, (Version 2008)	Wahl	5.
Bachelor, 1-Fach mit Nebenfach, Profil Fachergänzung, Profil Fachergänzung, (Version 2007)	Wahl	5.
Bachelor, 2-Fächer, Profil Fachergänzung, Anglistik / Nordamerikanistik, (Version 2007)	Wahl	5.
Bachelor, 2-Fächer, Profil Fachergänzung, Profil Fachergänzung, (Version 2017)	Wahl	5.
Bachelor, 2-Fächer, Profil Fachergänzung, Profil Fachergänzung, (Version 2007)	Wahl	5.
Master, 1-Fach, Materialwissenschaft/Materials Science and Engineering, (Version 2018)	Wahl	5.