

## EITM120A Switched Mode Power Supplies

Studiengang	Elektro- und Informationstechnik (Master)
Modulname	EITM120A Switched Mode Power Supplies
Zugeordnete Lehrveranstaltungen	EITM120A Switched Mode Power Supplies
Studiensemester	1st Semester
Modulverantwortlicher	Prof. Dr. Alfons Kloenne
Dozenten	Prof. Dr. Alfons Kloenne
Sprache	English or German; the course language will be announced at the beginning of the semester
Lehrform, SWS und Gruppengröße	Course, 4h/week
Modus	Mandatory in the study field automation technology, elective in the other study fields of the program
Turnus	Winter semester
Arbeitsaufwand	On-campus program 60 h, self study 90 h
Kreditpunkte	5 CP
Empfohlene Vorkenntnisse	Electronics, Power Electronics, Control Engineering
Voraussetzungen nach Prüfungsordnung	none
Lernziele / Kompetenzen	<p><i>Allgemein:</i> The module provides a theoretical understanding of DC-DC converter principles, their application and design. It takes into consideration not only typical steady state continuous conduction mode (CCM), but also the partial load operating point in discontinuous conduction mode (DCM).</p> <p><i>Zusammenhänge / Abgrenzung zu anderen Modulen:</i> Switched Mode Power Supplies focusses on calculation and design of power supplies. Starting from basic, not galvanically isolated, DC-DC converters and lossless switching the theory behind power supplies is presented. Thereafter, the main principles are transferred to more complex galvanically isolated dc/dc power supplies regarding also parasitic effects. As a typical DC-DC converter normally uses a wide-range input, it is also point of interest to determine the maximum point of converter stress during a particular design step.</p> <p><i>Kenntnisse, Fertigkeiten, Kompetenzen:</i> Upon successful completion the student,</p> <ul style="list-style-type: none"> <li>• understand the functionality and the components of switching power supplies</li> <li>• has an overview of non-isolated and isolated power supplies</li> <li>• is able to design and calculate switching power supplies in DCM and CCM</li> <li>• can efficiently design power inductors and high-frequency magnetics for switching power supplies</li> <li>• can apply control strategies to stabilize the output voltage</li> </ul>
Inhalt	<p>Contents of lecture</p> <ul style="list-style-type: none"> <li>• Principles of Switching Power Conversion</li> <li>• Role of Power Supply within power system</li> <li>• Fundamentals of Pulsewidth Modulated Switching Power Supplies</li> <li>• Basic Switching Circuits in CCM and DCM (Charge Pumps, Buck Converter, Boost Converter, Inverting Boost Converter, Buck-Boost Converter, Transformer Isolated Converters)</li> </ul>

	<ul style="list-style-type: none"> <li>• Transformer-Isolated Circuits in CCM and DCM (Feedback Mechanism, Flyback Circuit, Forward Converter, Push-Pull Circuits, Half Bridge Circuits, Full Bridge Circuits)</li> <li>• Quasi Resonant Converters</li> <li>• Magnetic Components</li> <li>• Power Stage Transfer Function</li> <li>• Compensation in Switching Regulator Design</li> <li>• Voltage and Current Control</li> </ul>
Studien- und Prüfungsleistungen	Assessment is done by either a written exam (90 minutes) or an oral examination (20 minutes). The form of examination will be announced at the beginning of the semester.
Medienformen	<ul style="list-style-type: none"> <li>• Lecture notes</li> <li>• Course manuscript</li> <li>• Slides (Powerpoint, PDF)</li> <li>• Matlab simulation programs</li> <li>• Exercises</li> </ul>
Literatur	<p>Pressman, A; Billings, K.; Morey, T: <i>Switching Power Supply Design</i>, Verlag McGraw-Hill, 2009</p> <p>Billings, K.: <i>Switchmode Power Supply Handbook</i>, McGraw-Hill, 1999</p> <p>Maniktala, S.; <i>Switching Power Supplies: A to Z</i>, Verlag Newnes, 2006</p> <p>Erickson, R.W.; Maksimovic, D.: <i>Fundamentals of Power Electronics</i>, Verlag Springer, 2001</p> <p>Mohan N., Undeland, T., Robbins, W.: <i>Power Electronics, Converters, Application and Designs</i>, Wiley Verlag, 2002</p> <p>Sandler, St.: <i>Switchmode Power Supply Simulation</i>, Verlag MCGraw-Hill, 2006</p> <p>Brown, M.: <i>Power Supply Cookbook</i>, Verlag Newnes, 2002</p> <p>Schlienz, U.: <i>Schaltnetzteile und ihre Peripherie: Einsatz, Dimensionierung, EMV</i>, Vieweg Verlag, 2012</p>