

Cankaya University
Faculty of Engineering
Department of Electrical Electronic Engineering

Code and Name of the Course: **EE521**
Switching Power Supplies

Objective: Learning SMPS structure and common topologies used in these systems. Learning the design of power stages, magnetic components and controllers of SMPS. Gaining experience in SMPS design.

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2021-22 Fall Semester

Contents:

- 1 General Structure of SMPS**
Block diagram. Linear supplies vs SMPS. Basic definitions.
- 2 Converter Topologies**
Non-isolated and isolated DC-DC converter topologies. Operation principles and basic design equations.
- 3 Magnetic Components**
Basic design equations of inductors and transformers
- 4 Power Semiconductor Devices**
Operation characteristics of power diodes, IGBTs, MOSFETs and SiC devices. Gate drives.
- 5 Controllers**
Closed loop controller design. Voltage and current mode controllers. Small signal models.
- 7 Practical Aspects**
Electromagnetic Interference, Filters, Protection circuits, PFC circuits.
- 8 Project**
Design and Simulation of a practical SMPS circuit.

Books:

1. **Whittington**, *Switched Mode Power Supplies*, 2nd Edition, Universities Press, 1997.
2. **Pressman, Abraham I.**; *Switching power supply design*, New York, McGraw-Hill, 2009.
3. **Brown, M.**, *Practical switching power supply design*, San Diego, Academic Press, 1990.
4. **Maniktala, S.**, *Switching power supply design & optimization*, New York, McGraw-Hill, 2005.
5. **Sandler, SM.**, *Switchmode power supply simulation with PSpice and SPICE 3*, New York, McGraw-Hill, 2006.
6. **Hurley, W.G.**, Wölfle, W.H., *Transformers and Inductors for Power Electronics*, Wiley, 2013.

Grade Calculation:

Term Average = $0.5 \times \text{Midterm Exam} + 0.5 \times \text{Project}$

Final Grade = $0.6 \times \text{Term Average} + 0.4 \times \text{Final Exam}$