The Hong Kong University of Science and Technology

UG Course Syllabus

Integrated Power Electronics

ELEC 4430

3 Credits

Prerequisite: ELEC 3400

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Course Description

Power computation, diodes and rectifier circuits, power factor correctors, switch mode power converters, magnetic components, switch capacitor power converters, linear regulators, and integrated circuit techniques for controller design.

Intended Learning Outcomes (ILOs)

By the end of this course, students should be able to:

1. **Recognize** magnetic quantities such as magnetic flux, permeability and reluctance, and compute magnetic quantities relating to inductors and transformers.

2. **Recognize** and **compute** electrical quantities such as power and work done related to both DC and AC circuits.

3. **Compute** operating parameters and characterize the performance of power converters and regulator circuits.

4. **Analyze** and **design** component parameters for power converters and regulator circuits.

5. **Apply** software (CAD) tools to design, simulate and analyze power converters and regulator circuits.

Assessment and Grading

This course will be assessed using criterion-referencing and grades will not be assigned using a curve. Detailed rubrics for each assignment are provided below, outlining the criteria used for evaluation.

Assessments:

Assessment Task	Contribution to Overall Course grade (%)	Due date*
Homework	20%	27/09, 11/10, 18/10, 08/11, 06/12
Projects	10%	15/11/2026, 30/11/2026
Midterm	25%	28/10/2026
Final examination	45%	TBA

* Listed due dates are provisional and may be adjusted. Please refer to the due dates specified in the released homework documents and to Canvas announcements for any updates. Assessment marks for individual assessed tasks will be released within two weeks of the due date.

Mapping of Course ILOs to Assessment Tasks:

Assessed Task	Mapped ILOs	Explanation
Homework	[ILO1, ILO2, ILO3, ILO4]	Exercises for students to get familiar with the teaching materials
Projects	[ILO5]	Learn to use LTspice, a CAD tool to design electronic circuits
Midterm	[ILO1, ILO2, ILO3, ILO4]	Test the students on how well they have learned the materials up to the first half of the semester
Final Examination	[ILO1, ILO2, ILO3, ILO4]	Extensive test on how well the students have learned the materials

Grading Rubrics

Grading rubrics for each assignment is self-explanatory from reading the questions.

Final Grade Descriptors:

Grades	Short Description	Elaboration on subject grading description
A	Excellent Performance	Demonstrates a comprehensive grasp of subject matter and expertise in problem-solving.
B	Good Performance	Shows good knowledge and understanding of the main subject matter and competence in problem-solving.
C	Satisfactory Performance	Shows adequate knowledge of core subject matter, competence in dealing with familiar problems.
D	Marginal Pass	Manages threshold knowledge of core subject matter, needs more hard work to achieve key professional skills.
F	Fail	Has insufficient understanding of the subject matter and lacks the necessary problem-solving skills.

Course AI Policy

For homework and projects, students are allowed to get help from the internet and use AI tools to help with understanding and working out the material. For midterm and final examination, the students have to work out all problems all by himself/herself.

Communication and Feedback

Assessment marks for individual assessed tasks will be communicated via Canvas within two weeks of submission. Students who have further questions about the feedback including marks should consult the instructor within five working days after the feedback is received.

Resubmission Policy

Students have only one chance to submit homework late, within 72 hours or before solutions are posted, whichever comes first. Any additional late submission will not be graded. No late submission or resubmission is allowed for the projects.

Required Texts and Materials

Reference book 1: D. W. Hart, Power Electronics, McGraw-Hill.

Reference book 2: J. G. Kassakian, D. J. Perreault, G. C. Verghese, and M. F. Schlecht, Principles of Power Electronics, Cambridge University Press.

Academic Integrity

Students are expected to adhere to the university's academic integrity policy. Students are expected to uphold HKUST's Academic Honor Code and to maintain the highest standards of academic integrity. The University has zero tolerance of academic misconduct. Please refer to Academic Integrity | HKUST – Academic Registry for the University's definition of plagiarism and ways to avoid cheating and plagiarism.

Additional Resources

1. Detail lecture notes are posted on Canvas.

2. All lectures are recorded using Zoom and are made available after class.