



---

**Course Description:** This course will cover hardware, architecture, software, and networking aspects of energy efficiency. Students will review the recent literature on energy-aware computing and work on an energy-aware software project.

**Prerequisites:** Students should be familiar with computer architecture, basic networking, and low-level programming. MC404 (or an equivalent course) is strongly recommended. MC504, and MC602/MO632 are recommended but not required.

**Program:** • Measurement, sensing, and modeling of energy consumption • Process, Voltage, and Temperature (PVT) variations • Hardware-level techniques • Dynamic power management • Energy proportionality • Duty cycling • Energy and Power-Aware Scheduling • Energy bugs • Low-Power networking • Battery modeling and management

**Office Hours:** Wednesdays 8am. The session will be closed after 30 minutes if there are no participants. Additional office hours may be scheduled, upon demand and in advance, on Mondays 8am.

**Meeting URL:** <https://meet.google.com/lookup/gqd4n4jkzu>

**Website:** <https://classroom.google.com/>. **Access code:** mgcitjh.

**E-mail:** [wanner@unicamp.br](mailto:wanner@unicamp.br)

**Methods and Format:** The course will feature required reading of recent papers in the energy efficient literature every week. Slide presentations for each topic in the program will be made available for self-directed study. Orientation for project preparation will be offered every week during office hours.

**Course components:**

*Literature review: (L)* Students will write a one-page summary and review of selected papers.

*Take-home exams: (E)* including theoretical, analytical, and practical (implementation) problems.

*Project (P):* practical implementation project, including implementation, evaluation, presentation and paper describing the results.

**Grading:** Final grade  $F$  will be given by:

$$F = L \times 0.3 + E \times 0.3 + P \times 0.4$$

where  $L$  is the arithmetic mean of the grades for the literature review assignments,  $E$  is the arithmetic mean of the grades for the take home exams,  $P$  is the grade for the project. MO632 students will be awarded letter grades according to the following criteria: A:  $F \geq 8.5$ , B:  $8.5 > F \geq 7.0$ , C:  $7.0 > F \geq 5.0$ , D:  $5.0 > F$ . No makeup or supplementary exams will be offered.

**Bibliography:**

- Jan Rabaey. Low Power Design Essentials. Springer, 2009.
- Massoud Pedram and Jan Rabaey. Power Aware Design Methodologies. Springer, 2002.
- Ishfaq Ahmad and Sanjay Ranka (editors). Handbook of Energy-Aware and Green Computing. Chapman and Hall/CRC, 2012.
- Brian Otis and Jan Rabaey. Ultra-Low Power Wireless Technologies for Sensor Networks. Springer, 2007.
- Recent papers from the energy-aware computing literature.

**Academic integrity:** Any attempts at plagiarism and receiving or giving aid on assignments will result in a final grade of zero in the course.