



ÉCOLE POLYTECHNIQUE  
FÉDÉRALE DE LAUSANNE

# Analog Integrated Circuits Design II

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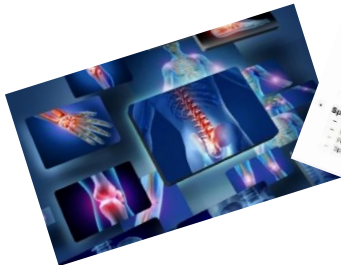
# RELEVANCE



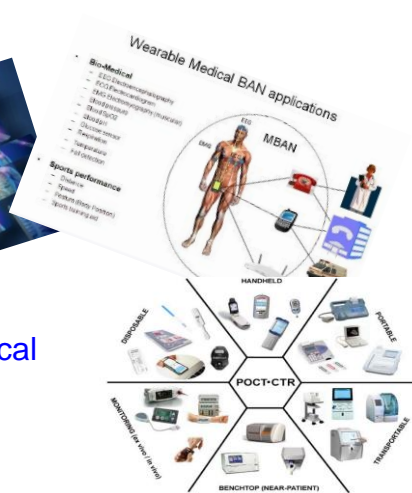
Transport, Robotic, Mechatronics



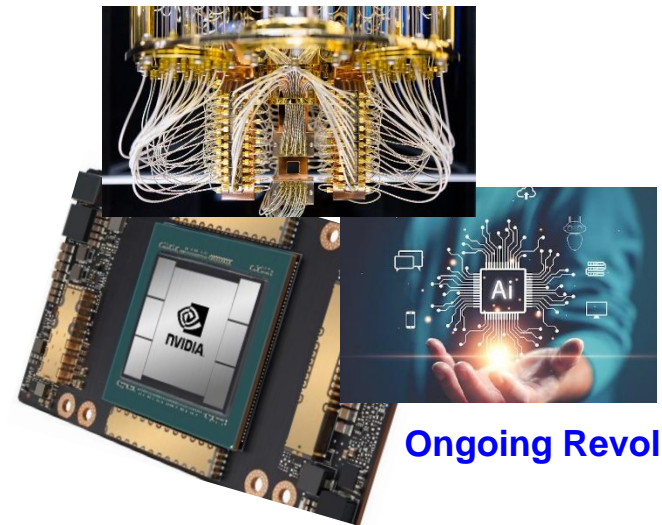
Aeronautics and space



Biomedical

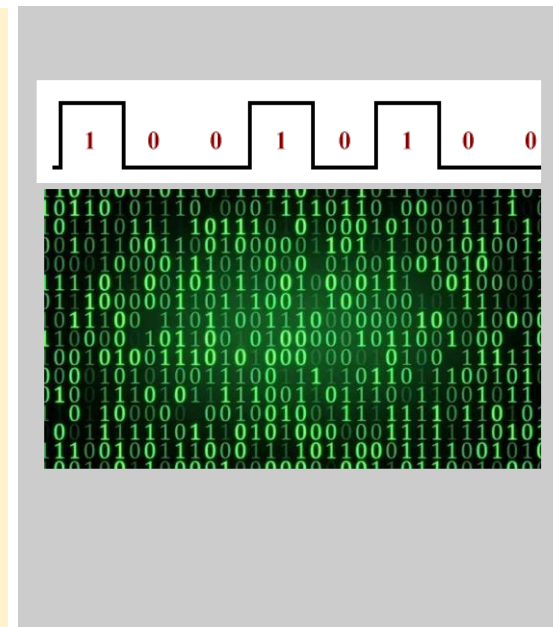
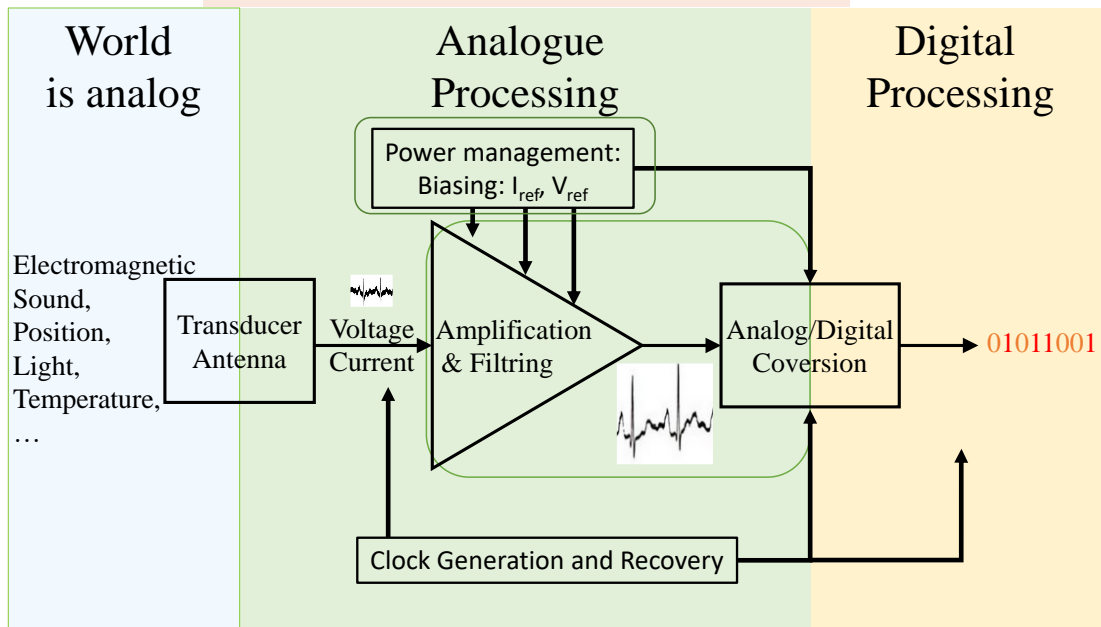
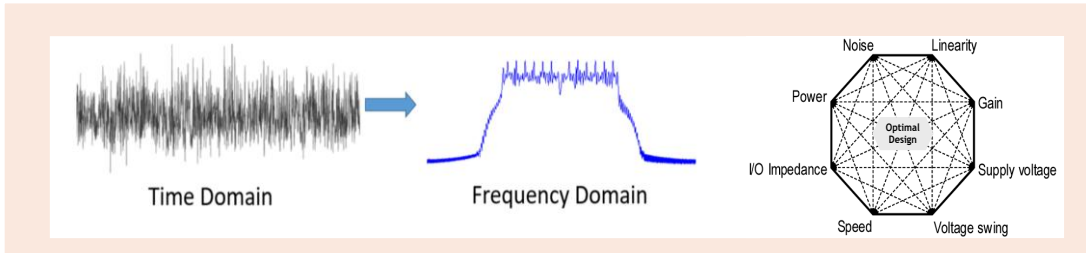


Telecom, Connectivité, Mobilité et Haut débit:  
IoT, 5G ...



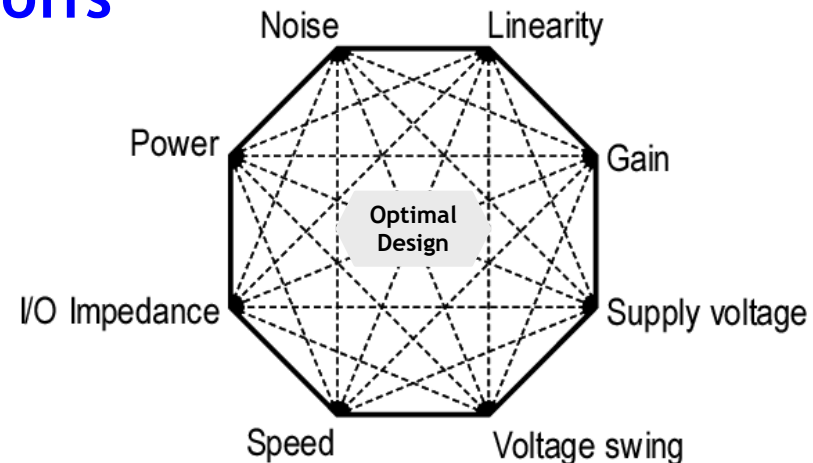
Ongoing Revolutions

# Electronic Systems: *Analogue vs Digital design*



# Analog Circuits and systems

- Research, Teaching, and Learning analog design is quite challenging:
  - Unique blend of scientific precision and creative intuition
  - **Customize** the solutions for the targeted application
  - **Extremely sensitive** to process variations, parasitic, and environmental factors
  - Check and Balance several **trade-offs**
- Full automation remains impossible (Unlike Digital)
  - Active research is exploring AI-driven solutions to enhance productivity, but **human expertise remains crucial.**



- **MOST Operation, Modelling**
  - [12-16 Sep](#) MOSFETs: Operation and Modelling
  - [19-23 Sep](#) Noise1 : (in time and frequency domains)
  - [26-30](#) Noise-2 : (Analog circuits noise analysis)
- **Voltage references and regulators**
  - [03 Oct](#) Current Sources and Mirrors
  - [07 Oct](#) Voltage and Temperature independent References
  - [10 Oct](#) Exercises
- **OTA and Op-Amp Design**
  - [14 Oct](#) OTA Analysis and Design (DC, AC, Stability ...) (1)
  - [17 Oct Lab1: Technology parameters extraction \(C05\)](#)
  - [20-24 Oct](#) Vacation
  - [28 Oct](#) OTA Analysis and Design (DC, AC, Stability ...) (2)
  - [31 Oct](#) OTA Structural Design ( $g_m/I_D$  Methodology)
  - [04 Nov Lab2: OTA Structural Design \( \$g\_m/I\_D\$  Methodology\) Lab \(C05\)](#)
  - [07 Nov](#): Multistage OTA (Stability and Frequency Compensation)
  - [11 Nov](#): Fully-Diff Amplifiers & CMFB
  - [14 Nov](#): Variability, offset, and noise in OpAmp (1)
  - [18 Nov Lab3: Variability, offset, and noise in OpAmp \(C05\)](#)
  - [21 Nov](#): Variability, offset, and noise in OpAmp (2)
  - [25 Nov](#): Rail-to-Rail input and output amplifiers
- **Mixed-signal design**
  - [28 Nov](#): Comparators
  - [02 Dec Lab4: Comparators \(C05\)](#)
  - [05-09 Dec](#): AD and DA converters (introduction)
  - [12 Dec](#): Digital calibration of analog circuits
- [19 Dec](#) General revision (zoom)

- Reference books (*electronic version available at [epfl.library.ch](http://epfl.library.ch)*):
  - **Analog Design Essentials (Willy Sansen)**
  - **CMOS Circuit Design, Layout, and Simulation (Jacob Baker)**
  - **Design of Analog CMOS Integrated Circuits (Behzad Razavi)**