Bachelor in Electrical Engineering – Department of Electrical Engineering
Professor Aleksander S. Paterno
Center for Science and Technology – Santa Catarina State University
Centro de Ciências Tecnológicas – Universidade do Estado de Santa Catarina – CCT/UDESC

Syllabus – Digital Signal Processing

"EMENTA" - ***Main goals:***
After finishing the course, the student would be able to design algorithms to be implemented in embedded systems or to process on- or offline practical signals used in engineering or applied problems where the signals and systems theory would apply, in addition to modelling engineering problems with the help of the studied tools and programs.

This course is offered in English and has its equivalent in the EL2PDS2 course offered in Portuguese by the Department of Electrical Engineering at the Center for Science and Technology – Santa Catarina State University (CCT-UDESC) in Joinville, Brazil.

*"*METODOLOGIA" - ***Methodology***: Learning and teaching strategies will allow the development of the learning results (from now on, only LR). *Digital Signal Processing* course will be offered using *Project Based (inspired) Methodologies, when the students would gather in groups to discuss during class the problems and will be supervised by the professor to indicate and work the solutions. It is recommended that cooperative work be developed in some activities. In addition to such sessions, lectures talking about the main contents of the course will be organized and presented by the professor. Practical sessions will be organized in laboratories with computers or other systems/devices, when the students will apply their knowledge and develop it further in a programming language platform (either MATLAB, Python, or one most convenient to the student) so that the proposed project could be developed.*

"INÍCIO": ***Course begin – following the academic calendar July 31st, 2023.***
Course meeting times – at least twice a week – 150minutes of in person activities and 50minutes of activities in the computer laboratory.

***Assessment*:**
In the beginning of the course, students will be presented the list of Learning Results and what is going to be assessed during their development. *Mainly, problems and ideas for projects will be proposed and the solution, usually with the help of a computer, will be elaborated by the students as well as the theoretical aspects of the course that may be evaluated in the end of the class by an electronic questionnaire or by oral or written presentation of the response by the student.*

"PROGRAMA"
List of LR for Digital Signal Processing followed by the topics of study:
LR01 Introduction to signals and systems in discrete time and processing
LR02 Analysis and Synthesis with Fourier Analysis in the Discrete domain
LR03 Applied Fourier Analysis in discrete domain
LR04 Digital Signal Processors: architecture, memory organization, types of instructions and addressing modes
LR05 Digital Filters – FIR and IIR
LR06 Designing Digital Filters and their corresponding tools (convolution in frequency and time domain)
LR07 Practical Problems – sampling, practical filtering and Fourier transform, windowing and others

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Topics to be explored during the course
TE01 Characterization of discrete time domain systems
TE02 Representation of discrete time signals with Fourier Analysis
TE03 Algorithms for the Fourier Analysis (FFT, Goerzel, divide-and-conquer)
TE04 DSP architectures
TE05 Analysis and synthesis with the Discrete Fourier transform
TE06 Techniques to design FIR filters (windowing, frequency sampling, Parks McClelland)

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