3bmra30 Signals, systems and tools

Nom de l'UE	3bmra30 Signals, systems and tools		Obligatoire
Cursus	Bachelier en sciences de l’ingénieur industriel - électromécanique Bachelier en sciences de l’ingénieur industriel - ingénierie de la santé	**Bloc**	3
Crédits	4	**Heures**	Q1 47.5
Prérequis	2baom20	**Corequis**	3bmrg30 3bsau30
Responsable	Franky DE BRUYNE	**Langue**	EN FR

Contribution au programme

This teaching unit introduces the student to the study of signals and systems and the good use of Matlab in engineering problems in general.

Code	**Activité**	**Heures**		**%**	**Type d'évaluation**			**Enseignants**	**Langue**	
		Q1	**Q2**		**Q1**	**Q2**	**Q3**		**Ens.**	**Eval.**
M307A	Introduction to MATLAB	10.5		25%	E		E	KPR ROU	FR	FR
M307B	Signals and systems	37		75%	E		E	DBR RCH VCH	FR+EN	FR+EN

Acquis d’apprentissage spécifiques

(AAS3.1) The student applies the theoretical (Laplace transform and z-transform) course to new application exercises.

(AAS11.1) The student is able to solve simple engineering problems involving programming, signal processing and system analysis using MATLAB.

(AAS14.1) The student explains the different concepts related to a signal (properties, operations, type of signals) or a system (representation, response, pole and zero configuration, stability, etc.) in continuous or discrete time.

(AAS14.2) The student explains the theory and practical aspects of the sampling and reconstruction of a signal (Shannon's theorem, frequency folding, zero order hold, selection of the sampling period).

(AAS14.3) The student explains the theory underlying the various transforms (Laplace transform, Fourier transforms, z-transform) studied in the theoretical course as well as the application of these to the analysis of a signal or a system.

Description du contenu

3bmra3L Introduction to MATLAB:

3 **Introductory sessions** (Kimplaire David and Rousseau Jean-Michel) meant to familiarize the students with the use of MATLAB as a prototyping tool for engineering problems.

The participation to the laboratory sessions is **not mandatory**. Nevertheless, we encourage the student to attend as these sessions are accompanied by a formative evaluation, i.e. feedback from the lecturers.

Important notice: **a virtual presentation using Teams will be organized before the start of the activity to outline the organizational arrangements. More details will be communicated through the CLACO web page dedicated to the course at the start of the quadrimester. The participation in this virtual presentation is strongly recommended.**

3bmra3C Signals and systems:

Outline of the **theoretical course** (De Bruyne Franky):

1. Introduction
2. Continuous-time signals
3. Continuous-time systems
4. Laplace transform
5. Fourier frequency analysis
6. Sampling theory
7. Discrete-time signals and systems
8. Z-transform
9. Discrete-time frequency Fourier analysis (DFT, FFT)

The related video-course is available online:
https://www.youtube.com/playlist?list=PLKqQa2b_GjJI-6GNFPAQe2EP3b-pELlJn

Subscribe to the channel in order to get the latest updates.

2 Laboratory sessions (Rouchard David and Verlant-Chenet Jonathan) dedicated to the application of MATLAB on **signals and systems**. These sessions are meant to reinforce the learning of the theoretical part of the course outlined above.

The participation to the laboratory sessions is **not mandatory**. Nevertheless, we encourage the student to attend as these sessions are accompanied by a formative evaluation, i.e. feedback from the lecturers.

General info:

The use of a **personal laptop with a working and preinstalled MATLAB installation** is **mandatory** during the laboratory sessions. All the necessary toolboxes for the MATLAB laboratory are covered by the “MATLAB and SIMULINK Student Suite” (https://nl.mathworks.com/academia/student_version.html). Add the “System Identification Toolbox” if you plan to attend the course 5aumd50 “System identification” in the future (master in automation).

OCTAVE can usually be used as a freeware alternative but compatibility with the MATLAB live scripts used in the course is then lost. There will therefore be **no support** for OCTAVE if it is used.

The MATLAB sessions in **3bmra3L and 3bmra3C** are based on MATLAB live scripts. To benefit from the MATLAB sessions, **the students must go through the live scripts and understand them before attending the associated sessions**. The sessions are an opportunity to answer any questions related to the live scripts and to solve new exercises. Note that these sessions will be organized using virtual means.

Méthodes d'enseignement

Video course alternating with 5 regularly spaced Q&A class-room sessions. If the health measures do not allow class-room sessions, these will be organized using virtual means.

Laboratory MATLAB sessions organized using virtual means.

Méthodes d'évaluation

3bmra3L Introduction to MATLAB:

1. Laboratory examination at ECAM on personal PC with MATLAB. This examination will take place during the **first quadrimester**. The Laboratory examination can only be revaluated in September.

3bmra3C Signals and systems. Two examinations organized on the **same day**:

1. Written closed-book examination: exercises on the Laplace transform and/or Z-transform and questions related to theory course.
2. Laboratory examination at ECAM on personal PC with MATLAB.

Important notice: The student will keep himself/herself informed about the arrangements for the laboratory examinations. A detailed procedure will be communicated through the CLACO web page dedicated to the course.

Weighting:

3bmra3L Introduction to MATLAB: 25% (n1)

3bmra3C Signals and systems: 75% (n2)

Support de cours

Slides, exercise assignments are available online on the CLACO web page dedicated to the course.

Video course

“MATLAB: tutorial for practical engineering problems” available online on the CLACO web page dedicated to the course.

One master solution for each exercise.

Bibliographie

Luis F. Chaparro, « Signals and Systems using MATLAB », Academic Press, Elsevier, 2011.