### 30. Introduction to Signals and Systems (PH032IU)

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| Module designation | *Introduction to continuous- and discrete-time systems and signals, basis function representation of signals, convolution, Fourier Series, Fourier, Laplace, Z-transform theory, state space variable analysis of linear systems, basic feedback concepts.* |
| Semester(s) in which the module is taught | 1, 2 |
| Person responsible for the module | Dr. Tôn Thất Long |
| Language | English |
| Relation to curriculum | Compulsory |
| Teaching methods | Lecture, lesson, assignment. |
| Workload (incl. contact hours, self-study hours) | (Estimated) Total workload: 127.5<br><br>Contact hours (please specify whether lecture, exercise, laboratory session, etc.): lecture: 37.5<br><br>Private study including examination preparation, specified in hours: 90 |
| Credit points/ECTS | 3 credits/4.62 ECTS |
| Required and recommended prerequisites for joining the module | Previous course<br><br>General Physics 2 (PH021IU) (or Physics 3 (PH015IU), Differential Equations (PH026IU or MA024IU) |

| Module objectives/intended learning outcomes | Upon the successful completion of this course students will be able to: | |
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| | **Competency level** | **Course learning outcome (CLO)** |
| | Knowledge | CLO1. Understand the fundamentals of signals and systems in both discrete time and continuous time domains and their representatives in practice and apply knowledge of methods (Fourier transform, Laplace transform, z transform) to analyze the characteristics of signals and system. |
| | Skill | CLO2. Differentiating the nature of discrete time and continuous time systems in order to devise proper methods to solve engineering problems related to these systems |
| | Attitude | CLO3. Recognize the need of further self-learning in signals and systems. |

| Content | *The description of the contents should clearly indicate the weighting of the content and the level.* |
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| | Weight: lecture session (3 hours) |
| | Teaching levels: I (Introduce); T (Teach); U (Utilize) |

| Topic | Weight | Level |
|---|---|---|
| Introduction of signal | 1 | I, T,U |
| System & System Properties | 2 | I, T,U |
| Discrete time and Continuous time Convolution methods | 2 | I, T,U |
| Linear Time Invariant System Properties | 2 | I, T,U |
| Fourier Series and Fourier Transforms | 3 | I, T,U |
| Laplace Transform | 2 | I, T,U |
| z-Transform and its properties | 2 | I, T,U |
| Sampling | 1 | I, T,U |

| Examination forms | Short-answer questions |
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| Study and examination requirements | Attendance: A minimum attendance of 80 percent is compulsory for the class sessions. Students will be assessed on the basis of their class participation. Questions and comments are strongly encouraged. |
| | Assignments/Examination: Students must have more than 50/100 points overall to pass this course. |

| Reading list | **Textbook:** |
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| | [1] A. Poularikas, *Signals and Systems with Primer with MATLAB*, CRC Press, 2007. |
| | [2] V. Oppenheim, A. S. Willsky with S. Hamid, *Signals and Systems*, Prentice Hall, 2nd ed., 1996. |
| | **Other supplemental materials** |
| | [1] B.P. Lathi, Linear Systems and Signals, Oxford University Press Inc., 2005. |
| | [2] Lecture notes |