Module title	Abbreviation
Basic Imaging Reconstruction and Processing	11-IRP-Int-201-m01

Module coordinator	Module offered by
Managing Director of the Institute of Applied Physics	Faculty of Physics and Astronomy

ECTS	Method of grading	Only after succ. compl. of module(s)
6	numerical grade	--

Duration	Module level	Other prerequisites
1 semester	graduate	--

Contents

This training course uses the fundamentals of modern signal processing and imaging concepts, which are introduced in the corresponding lecture. Starting with the different categories of signals and transferring them to imaging applications, the students can test Fourier transform properties first hand by developing Matlab or Python code. Image convolution and de-convolution techniques are addressed in particular with respect to image processing tasks in modern physics (e.g. denoising). The Radon-Transform, which takes an outstanding im-portance in the field of computed tomography is demonstrated by the three-dimensional image reconstruction from real CT data whereby different sources of error can be tested. The theoretical part on discrete signals and their Fourier transform properties as well as different ways of image compression will also be further developed during this course.

Intended learning outcomes

Students who attended the course are firm with the theoretical concepts of signal processing in particular with respect to imaging applications. They are able to devise a strategy /toolchain for basic and advanced imaging problems, such as image reconstruction, denoising, Fourier analysis and frequency decomposition. By using Matlab or Python they are able to calculate appropriate figures of merit from scientific images, such as SNR.

Courses (type, number of weekly contact hours, language — if other than German)

V (3) + R (1)
Module taught in: English

Method of assessment (type, scope, language — if other than German, examination offered — if not every semester, information on whether module is creditable for bonus)

a) written examination (approx. 90 to 120 minutes) or b) oral examination of one candidate each (approx. 30 minutes) or c) oral examination in groups (groups of 2, approx. 30 minutes per candidate) or d) project report (approx. 8 to 10 pages) or e) presentation/talk (approx. 30 minutes).
If a written examination was chosen as method of assessment, this may be changed and assessment may instead take the form of an oral examination of one candidate each or an oral examination in groups. If the method of assessment is changed, the lecturer must inform students about this by four weeks prior to the original examination date at the latest.
Language of assessment: English

Allocation of places

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Additional information

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Workload

180 h

Teaching cycle

Teaching cycle: every year, after announcement

Referred to in LPO I (examination regulations for teaching-degree programmes)

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Module appears in

Master's degree (1 major) Physics International (2020)
exchange program Physics (2023)