Sensor Array Systems

Sensorsystem
6 credits

Programme course

TSKS17

Valid from:

Determined by	**Main field of study**	
	Electrical Engineering	
Date determined	**Course level**	**Progressive specialisation**
	Second cycle	A1N
Revised by	**Disciplinary domain**	
	Information missing	
Revision date	**Subject group**	
Offered first time	**Offered for the last time**	
2026		
Department	**Replaced by**	
Institutionen för systemteknik		

Course offered for

- Master of Science in Applied Physics and Electrical Engineering - International
- Master of Science in Applied Physics and Electrical Engineering
- Master's Programme in Data Science and Information Engineering
- Master of Science in Electronics Design Engineering

Prerequisites

Linear algebra, basic probability theory, a related course on signals and systems, programming skills.

Intended learning outcomes

After passing the course, students should be able to:

- Explain, describe, or summarize fundamental concepts related to sensor array systems, including principles of radar systems and advanced topics on MIMO radars and SARs, and techniques related to array signal processing.
- Critically think, interpret, and apply the concepts related to sensor array systems to fictional or real-world problems and perform related calculations.
- Formulate original algorithmic solutions for problems related to the course contents and implement those in conventional programming language and be able to explain and report.

Course content

Part I: Sensor array systems

- Introduction to sensor array systems and applications.
- Radar system principles: The radar concept, basic radar configurations and waveforms, basic radar measurements and functions, the radar range equation.
- Propagation effects and mechanisms, characteristics of clutter, target reflectivity, and fluctuating models.
- Radar subsystems: Antennas, transmitters, receivers, exciters, and signal processor.
- Radar measurements: Time delay and range estimation, angle estimation, and angle-Dopppler estimation using array measurements.
- Advanced topics: MIMO radar and synthetic aperture radar (SAR).

Part II: Array signal processing

- Overview of wavefields and wave propagation
- Spatial processing techniques: Aperture and arrays, parametric and nonparametric, beamforming, subspace-based methods.
- Adaptive array processing techniques.

Teaching and working methods

Teaching is given as lectures, tutorials, and laboratory project.

Examination

TEN1	Written examination	4 credits	U, 3, 4, 5
LAB1	Laboratory work	2 credits	U, G

Grades

Four-grade scale, LiU, U, 3, 4, 5