TNE103 Organic Electronics 1, 6 ECTS credits – course plan

Preliminary scheduled hours: 44
Recommended self-study hours: 116
Area of Education: Technology
Main field of studies: Electrical Engineering
Advancement level (G1, G2, A): A

Aim: After finishing the course, the students should be able to:

– **Explain** charge transport, energy levels, and doping in organic electronic materials, and how they compare to metals and inorganic semiconductors

– **Exemplify** specific organic electronics materials, their properties, and applications

– **Summarize** the optical properties and applications of organic electronic materials, such as in displays and photovoltaic systems.

– **Exemplify** the architecture, characterization, and utilization of electronic components based on organic electronic materials (such as conductors, resistors, capacitors, diodes, transistors).

– **Determine** fundamental parameters for the above mentioned components, and **explain** how these parameters influence the performance of the components.

– **Summarize** the electrochemical properties of organic electronic materials, and their applications in devices and systems.

– **Explain** and **motivate** the use of organic electronic materials in biological applications.

– **Summarize** device fabrication techniques, especially related to "printed electronics".

– **Compare** commercial applications for organic electronics, and **summarize** the current market.

Prerequisites: (valid for students admitted to programmes within which the course is offered) Basic skills in modern physics (primarily solid state physics), mathematics and electronics. Basic chemistry is useful but not a formal requirement.

Note: Admission requirements for non-programme students usually also include admission requirements for the programme and threshold requirements for progression within the programme, or corresponding.

Supplementary courses: Organic Electronics 2

Organisation:
Lectures, discussion sessions (lektioner), and laboratory exercises.

Course contents:
Course lectures will cover topics such as: introduction to organic electronic materials and their basic properties; charge transport and energy structure of organic electronics; case-studies on specific materials used in current research; optical properties (energy levels, color changes, light emission and absorption); organic electronic circuit components (conductors, resistors, capacitors, diodes, transistors); electrochemistry of organic electronic materials, and applications of redox properties; organic bioelectronics (motivation, applications in neuroscience and plant biology); printed electronics (methods, inks, applications); organic electronics photovoltaics (measurement techniques, solar cells); an overview of current applications and commercialization (cost, implementation, environmental consideration).

The discussion sessions (lektioner) will cover the topics above, in a more open discussion format.

The two laboratory exercises, in the Täppan Cleanroom Laboratory and the Printed Electronics Arena, will provide hands-on experience of fabrication and characterization of organic electronics.

Course literature:
Lecture notes, scientific papers

Examination:
Written examination Laboratory work