Modulbezeichnung:	**Electronic Materials (EM)** (Electronic Materials)	**5.0 ECTS**
Modulverantwortliche/r:	Christoph J. Brabec	
Lehrende:	Christoph J. Brabec	

Startsemester: WS 2020/2021	Dauer: 1 Semester	Turnus: jährlich (WS)
Präsenzzeit: 45 Std.	Eigenstudium: 105 Std.	Sprache: Englisch

Lehrveranstaltungen:

Electronic Materials (VL und Seminar) (WS 2020/2021, Vorlesung, 3 SWS, Christoph J. Brabec)

Inhalt:

- semiconductor materials, elementary, binary, ternary and quaternary semiconductors, crystal structures
- formation of band structures, direct and indirect semiconductors, bandgap, effective mass of carriers
- carrier statistics, Ohm's low, Fermi-distribution, density of states, carrier densities
- intrinsic and extrinsic (doped) semiconductors, mechanisms of doping and limitations, carrier concentration and position of Fermi energy versus temperature, temperature dependence of carrier density and conductivity, degenerate semiconductors
- epitaxy of semiconductors, quantum wells and quantum dots, characterization of epitaxial layers
- patterning of semiconductors, lithography, etching and material deposition
- carrier transport, Drude model, scattering processes, thermal and drift velocity, mobility, conductivity
- principles, processing and application of ohmic contacts (Peltier), Shottky contacts
- diffusion, band structure in electric field
- pn-junction, doping concentration, carrier densities, depletion region, electric field and potential
- biased pn-junction, carrier transport and current-voltage characteristic
- photovoltaics, kinds of solar cells, their limits and materials demands
- organic semiconductors and their applications

Lernziele und Kompetenzen:

The lecture enables the students to understand the basic physical properties of semiconductors. The fundamentals of semiconductor devices are introduced based on a discussion of the pn-junction diode. The lecture also covers technological aspects such as growth and processing of semiconductors. The seminar enables the student to amplify their knowledge about the topics of the lectures, especially on materials demands for electronic devices, first of all for solar cells. Every student should prepare at least one talk to the selected topic.

Literatur:

- Simon M. Sze, "Semiconductor Devices: Physics and Technology", John Wiley & Sons
- S.O. Kasap, Principles of Electronic Materials and Devices (Mc Graw Hill, 3rd Edition)
- W. Callister, Materials Science and Engineering (esp. chapter 12, Wiley, 2nd Edition)

Verwendbarkeit des Moduls / Einpassung in den Musterstudienplan:

Das Modul ist im Kontext der folgenden Studienfächer/Vertiefungsrichtungen verwendbar:

[1] **Advanced Materials and Processes (Master of Science)**
(Po-Vers. 2019w | TechFak | Advanced Materials and Processes (Master of Science) | Gesamtkonto | Grundlagenfächer | Electronic Materials)

Studien-/Prüfungsleistungen:

Electronic Materials (Prüfungsnummer: 1739)
(englische Bezeichnung: Electronic Materials)

Studienleistung, Klausur, Dauer (in Minuten): 90

weitere Erläuterungen:

MAP students will additionally attend a seminar (1SWS).

Gemäß der Corona Satzung wird als alternative Prüfungsform eine mündliche Prüfung mit 30 Minuten Dauer oder eine Seminararbeit+Vortrag festgelegt

Prüfungssprache: Englisch

Erstablegung: WS 2020/2021, 1. Wdh.: SS 2021
1. Prüfer: Christoph J. Brabec

Organisatorisches:
https://www.studon.fau.de/crs2002433.html
Bemerkungen:
Lecture and seminar