

Program Summer Term 2022 for the Lecture «Bioelectromagnetics»

Tuesday 12-15 Uhr / Online (2V+1U)

Moodle: <https://moodle.uni-due.de/course/view.php?id=19973>

Date	Subject	Lecturer	Literature / Required Reading
Lectures / Inverted Classroom			
26.04.2022	1. Introduction / administrative issues EM fields, basic concepts.	Prof. Dr. D. Erni M.Sc. K. Jerbic	Chapter 1 «Electric and magnetic fields: Basic concepts», C. Furse et al. (eds.), <i>Basic Introduction into bioelectromagnetics</i> , Boca Raton: CRC Press, 2009.
03.05.2022	2. Dielectric polarization	Prof. Dr. D. Erni	Slides: 1–24
10.05.2022	2. Dielectric polarization	Prof. Dr. D. Erni	Slides: 25–47
17.05.2022	3. Dielectric function	Prof. Dr. D. Erni	Slides: 1–23
24.05.2022	3. Dielectric function	Prof. Dr. D. Erni	Slides: 24–44
31.05.2022	4. Nonhomogeneous Media	Prof. Dr. D. Erni	Slides: 1–24
14.06.2022	4. Nonhomogeneous Media	Prof. Dr. D. Erni	Slides: 25–50
21.06.2022	5. Mixing rules and effective medium theory	Prof. Dr. D. Erni M.Sc. K. Jerbic	A. Sihvola, «Mixing rules with complex dielectric coefficients», <i>Subsurface Sensing Technologies and Applications</i> , vol. 1, no. 4, pp. 393-415, 2000. J. Froehlich, S. Huclova, C. Beyer, and D. Erni, chapter 12 «Accurate multi-scale skin model suitable for determining sensitivity and specificity of changes of skin components», pp. 353-394, in <i>Computational Biophysics of the Skin</i> , Bernard Querleux (Ed.), Singapore: Pan Stanford Publishing Pte. Ltd., 2014.
28.06.2022	6. Multiscale electromagnetic tissue models at mm-Wave frequencies	Prof. Dr. D. Erni	Slides: 1-30
05.07.2022	7. Self-study: THz Diagnostics	Students (inverted classroom lecture)	K. I. Zaytsev, I. N. Dolganova, N. V. Chernomyrdin, G. M. Katyba, A. A. Gavdush, O. P. Cherkasova, G. Komandin, M. A. Shchedrina, A. N. Khodan, D. S. Ponomarev, I. V. Reshetov, V. Karasik, M. Skorobogatiy, V. N. Kurlov, and V. V. Tuchin, «The progress and perspectives of terahertz technology for diagnosis of neoplasms: A review,» <i>J. Opt.</i> , vol. 22, no. 1, pp. 1–44, 2019.
12.07.2022	8. SAR (Specific absorption rate) and electromagnetic exposure limit	Prof. Dr. D. Erni M.Sc. K. Jerbic	«For limiting exposure to time-varying electric, magnetic and electromagnetic fields (from 100 kHz up to 300 GHz)», <i>Int. Comm. on Non-Ionizing Radiation Protection, ICNIRP Publication, Health Phys.</i> , vol. 118, no. 5, (DOI: 10.1097/HP.0000000000001210), pp. 483- 524, May 2020. A. Christ, M. Douglas, J. Nadakuduti, N. Kuster, «Assessing human exposure to electromagnetic fields from wireless power transmission systems», <i>Proc. IEEE</i> , vol. 101, no. 6, pp. 1482-1493, June 2013.

Course Assessment «Bioelectromagnetics»

- Written thesis should encompass 10-15 pages on a topic of your own choice from the following fields of *Bioelectromagnetics* (electromagnetic fields, non-ionizing radiation and the biological substrate/organism)
 - Microscopic scale of BioEM: Interaction of electromagnetic fields with cells, proteins,
Starting point: <https://www.emf.ethz.ch/>
<https://doi.org/10.1016/j.proghi.2008.07.001>
<https://doi.org/10.1016/j.pbiomolbio.2010.07.003>
 - Macroscopic scale of BioEM: Epidemiological studies on EM field exposure, immission settings etc.
Starting point: <https://www.emf.ethz.ch/>
<https://www.degruyter.com/downloadpdf/j/teme.2018.85.issue-5/teme-2017-0111/teme-2017-0111.xml>
https://www.rivm.nl/en/Topics/E/Electromagnetic_Fields/EMF_dailylife
<http://dx.doi.org/10.1097/HP.0000000000001210>
http://elmar.swissth.ch/fmi/iwp/cgi?-db=Elmar_web&loadframes
<https://www.fieldsatwork.ch>
 - Risk perception and social dimension of BioEM:
Starting point: <https://www.emf.ethz.ch/>
<https://doi.org/10.3389/fpubh.2014.00289>
<https://doi.org/10.3390/ijerph14060620>
 - Diagnostics of biological tissue with EM waves:
Starting point: <https://www.emf.ethz.ch/>
<http://dx.doi.org/10.1109/MMM.2015.2394020>
<https://doi.org/10.1088/2040-8986/ab4dc3>
- The subject/field must be announced by June 28, 2022 at the latest.
- Thesis content: The thesis should contain a literature search, refer to the current discussions (i.e. the subject's state-of-the-art), and provide an own assessment of the subject together with an outlook.
- The thesis must be filed by August 31, 2022 at the latest to: daniel.erni@uni-due.de. Later submissions will be rejected.
- Adhere to good scientific practice and avoid plagiarism by any mean!
<https://www.uni-due.de/de/gute-wissenschaftliche-praxis/plagiate.php>
http://www.uni-due.de/imperia/md/content/ssc/fofoer/grundordnung_gute_wiss_praxis_juli_2004_d_3_50.pdf
- The thesis has to conform to academic integrity (no plagiarism!). Please refer to: «*Academic Integrity at MIT – A Handbook for Students*» (<https://integrity.mit.edu/handbook/print-demand>), or to «*Citation etiquette – How to handle the intellectual property of others*», ETH Zürich, (Brochure available at: <https://www.ethz.ch/students/en/studies/performance-assessments/plagiarism.html>).
- Please note: Cases of plagiarism are strictly sanctioned in accordance with the university's requirements of good scientific practice. Be careful when using online information and references from the internet. There are citation rules for the use of such information which can be found in the above brochures.
- Regarding the literature references the thesis has to conform to the *IEEE Style Manual* (please refer to: <http://ieeauthorcenter.ieee.org/create-your-ieee-article/create-the-text-of-your-article/ieee-editorial-style-manual-2017/>).