

REQUIREMENTS

Semmelweis University, Faculty of Medicine Name of the managing institute (and any contributing institutes): Department of Anatomy, Histology and Embryology
Name of the subject: Systems Neuroscience V. Advanced data analysis methods in English: Systems Neuroscience V. Advanced data analysis methods in German: Credit value: 2 Number of lessons per week: 28 lecture: 0 practical course: 3 seminar: 25 Subject type: compulsory course elective course <u>optional course</u>
Academic year: 2019/2020. academic year II. semester
Subject code: AOSANT560_5A <i>(In case of a new subject, it is filled by the Dean's Office, after approval)</i>
Name of the course leader: Dr. Gerber Gábor His/her workplace, phone number: 53653 Position: Vice Chairman of the dept. Date and registration number of their habilitation: 04/2019
Objectives of the subject, its place in the medical curriculum: After recapitulation the generation of the electric field in the neural system, the course will introduce useful mathematical data analysis methods to infer neural structures and dynamics by the analysis of the measured electrical potentials. We will start with the traditional ones, like correlation analysis, but some of the most advanced contemporary methods will be reached as well, including methods allowing to infer directional influences between the observed data streams. Although, our guiding lines will be the analysis of the electrophysiological signals recorded by multi-electrode systems, the learned techniques in principle will be applicable in all branches of science, and not only the sciences, everywhere, where the aim is to reveal the structure and the function of a complex system.
Place where the subject is taught (address of the auditorium, seminar room, etc.): library room, Department of Anatomy, Histology and Embryology
Successful completion of the subject results in the acquisition of the following competencies:
Course prerequisites: Medical biophysics, Biostatistics and informatics and Physiology. Grade point average (GPA) of 3.0 in the last semester.
Number of students required for the course (minimum, maximum) and method of selecting students: min. 5, max. 7; on the first-come first-served basis
How to apply for the course: Neptun
Detailed curriculum:

*(Theoretical and practical lessons shall be given separately by numbering the lessons (by weeks). Please provide the names of the teachers of the lectures and practical lessons and indicate guest lecturers. Do not use attachments!
Always attach a CV for guest lecturers!)*

Zoltán Somogyvári, PhD, guest lecturer

Theoretical lessons

1. Seminar: Generation of electric fields in the neural system I
2. Seminar: Generation of electric fields in the neural system II
3. Seminar: Generation of electric fields in the neural system III
4. Seminar: Generation of electric fields in the neural system IV
5. Seminar: Generation of electric fields in the neural system V
6. Seminar: Source reconstruction based on measurements I
7. Seminar: Source reconstruction based on measurements II
8. Seminar: Source reconstruction based on measurements III
9. Seminar: Source reconstruction based on measurements IV
10. Seminar: Source reconstruction based on measurements V
11. Seminar: Correlation analysis: linear correlation coefficient, cross correlation function, coherence I
12. Seminar: Correlation analysis: linear correlation coefficient, cross correlation function, coherence II
13. Seminar: Correlation analysis: linear correlation coefficient, cross correlation function, coherence III
14. Seminar: Correlation analysis: linear correlation coefficient, cross correlation function, coherence IV
15. Seminar: Correlation analysis: linear correlation coefficient, cross correlation function, coherence V
16. Seminar: Causality analysis: Granger-causality, Cross-Convergence Mapping I
17. Seminar: Causality analysis: Granger-causality, Cross-Convergence Mapping II
18. Seminar: Causality analysis: Granger-causality, Cross-Convergence Mapping III
19. Seminar: Causality analysis: Granger-causality, Cross-Convergence Mapping IV
20. Seminar: Causality analysis: Granger-causality, Cross-Convergence Mapping V
21. Seminar: Students' presentations, discussion I
22. Seminar: Students' presentations, discussion II
23. Seminar: Students' presentations, discussion III
24. Seminar: Written test
25. Seminar: Written test

Practical lessons:

1. course: Analysis of example multi electrode recordings by Scilab, a free mathematical software. I
2. Course: Analysis of example multi electrode recordings by Scilab, a free mathematical software. II
3. Course: Analysis of example multi electrode recordings by Scilab, a free mathematical software. III

Consultations: personally with the actual course leader

Other subjects concerning the border issues of the given subject (both compulsory and optional courses!). Possible overlaps of themes:

Special study work required to successfully complete the course:

(E.g. field exercises, medical case analysis, test preparation, etc.)

Requirements for participation in classes and the possibility to make up for absences:

Total absence allowed: 25% of the course hours

Recovering missing hours: studying the material provided by the course leaders, consultation

<p>Methods to assess knowledge acquisition during term time: (E.g. homework, reports, mid-term test, end-term test, etc., the possibility of replacement and improvement of test results) Exam on the last day of the course Additional occasions to be arranged by the teacher for improvement</p>
<p>Requirements for signature: Suscesful written test</p>
<p>Type of examination: colloquium</p>
<p>Requirements of the examination: <i>(In case of a theoretical examination, please provide the topic list; in case of a practical exam, specify the topics and the method of the exam)</i> Verbal and electronic etc. material provided by the lecturers. Syllabus is available upon opening the program on the web page.</p>
<p>Method and type of evaluation: <i>(Method of calculating the final mark based on the theoretical and practical examination. How the mid-term test results are taken into account in the final mark.)</i> Grades are given after obtaining points as follows: 0-50% fail, 51-60% pass, 61-75% fair, 76-90% good, above 90% excellent.</p>
<p>How to register for the examination?: Neptun</p>
<p>Possibilities for exam retake: 2 occasions arranged by the teacher</p>
<p>Printed, electronic and online notes, textbooks, guides and literature (URL address for online material) to aid the acquisition of the material:</p> <p>William D Penny: Signal Processing Course, https://www.fil.ion.ucl.ac.uk/~wpenny/course/course.html</p> <p>Barry Bishop: Pattern Recognition and Machine Learning, http://users.isr.ist.utl.pt/~wurmd/Livros/school/Bishop%20-%20Pattern%20Recognition%20And%20Machine%20Learning%20-%20Springer%20%202006.pdf</p> <p>Further readings will be made available at http://cneuro.rmki.kfki.hu/education</p>
<p>Signature of the habilitated instructor (course leader) who announced the subject:</p>
<p>Signature of the Director of the Managing Institute:</p>
<p>Hand-in date:</p>
<p>Opinion of the competent committee(s):</p>
<p>Comments of the Dean's Office:</p>

Dean's signature: