Semmelweis Egyetem
Általános Orvostudományi Kar

TANULMÁNYI TÁJÉKOZTATÓ

Pszichobiológia MSc képzés

(végzettségi szint: mesterfokozat, szakképzettség: okleveles pszichobiológus, képzés nyelve: angol)

2026/2027.

BUDAPEST

Az Általános Orvostudományi Kar
Tanulmányi Osztály

(1089 Budapest, Nagyvárad tér 4., I. em. E/15)

Személyes ügyfélfogadás
a boros.emese@semmelweis.hu e-mail címen történt előzetes egyeztetés alapján lehetséges.

Mintatanterv

A pszichobiológia MSc szak ajánlott mintatanterve itt tölthető le.

További részletes információk

a képzésről a https://semmelweis.hu/aok/oktatas/msc-szakiranyu-tovabbkepzesek/pszichobiologia-msc/ honlapon érhetők el.

Önköltségi díj

A Semmelweis Egyetem Általános Orvostudományi Kar Egészségügyi Neuropszichológia MSc képzésen fizetendő önköltségi díj összegének mértékéről az alábbi dokumentum rendelkezik:

Szervezeti és Működési Szabályzat / **III. Könyv – Hallgatói Követelményrendszer**

- **III.4. RÉSZ – TÉRÍTÉSI ÉS JUTTATÁSI SZABÁLYZAT**
- **III.4. RÉSZ – MELLÉKLETEK**

A magyar állami ösztöndíjjal támogatott képzés feltételeiről az alábbi linken található információ:

https://www.oktatas.hu/magyar-allami-osztondij/altalanos_tajekoztatok

A jogorvoslat joga tanulmányi ügyekben

I.) A nemzeti felsőoktatásról szóló 2011. évi CCIV. törvény 57. és 58. §
II.) A Semmelweis Egyetem Szervezeti és Működési Szabályzat – III. KÖNYV Hallgatói Követelményrendszer – III.7. RÉSZ Jogorvoslati Szabályzat alapján:

3. § [A jogorvoslati kérelem]

„(1) A jogorvoslati kérelmet a hallgatói információs rendszerben (NEPTUN-EFTR) rendszeresített elektronikus űrlapon, illetve a jelen szabályzat mellékletét képező formanyomtatványon lehet előterjeszteni az elsőfokú döntés kézhezvételét vagy az elmulasztott intézkedésről való tudomásszerzést követő 15 napon belül. A formanyomtatványt az Egyetem honlapján történő közzététellel elérhetővé kell tenni, valamint azt a jogorvoslati kérelem előterjesztésére szolgáló egyetemi szervezeti egységeknek – a hallgató kérésére – papír alapon is rendelkezésre kell bocsátania."

4. § [A jogorvoslati kérelem benyújtása, a hiánypótlás, igazolási kérelem, az áttétel]

„(1) A jogorvoslati kérelmet a Felülbírálati Bizottsághoz kell címezni, és az SZMSZ III.6. részében előírt hallgatói jogviszonnyal kapcsolatos kérelmek benyújtására megjelölt szervezeti egységhez kell benyújtani. A kérelmet a hallgató személyesen vagy postai úton, ajánlott küldeményként nyújthatja be."

9. § [Az értesítés és idézés, a megkeresés]

„(5) A Felülbírálati Bizottság köteles a hallgatót legalább egy alkalommal személyesen meghallgatni. Ha a hallgató szabályos értesítés ellenére nem jelenik meg a Felülbírálati Bizottság ülésén, a személyes meghallgatásától el lehet tekinteni, továbbá ha a hallgató a Felülbírálati Bizottság felhívására nem nyilatkozik, vagy a kért adatot nem közli, a Felülbírálati Bizottság a rendelkezésére álló adatok alapján dönt. Erre a hallgatót figyelmeztetni kell."

13. § [A döntés]

„(2) A jogorvoslati kérelem tárgyában a Felülbírálati Bizottság a következő határozatokat hozhatja:
a) a kérelmet elutasítja,
b) a döntés elmulasztóját döntéshozatalra utasítja,
c) a döntést megváltoztatja,
d) a döntést megsemmisíti, és a döntéshozót új eljárás lefolytatására utasítja."

14. § [A döntés közlése]

„(1) A Felülbírálati Bizottság döntésének közlése történhet annak
a) személyes, dokumentált átadásával;
b) a hallgató NEPTUN tárhelyére feltöltve a „Hivatalos bejegyzések" közé;
c) egyetemi hivatalos e-mail címére;
d) postai szolgáltató útján;
e) elektronikus úton az E-ügyintézési törvény szerinti hivatalos elérhetőségére, amennyiben az rendelkezésre áll;
mely a) – e) pontok közül, azok egyike útján történő első értesítés szabályos, joghatás kiváltására alkalmas kézbesítésnek minősül."

A következő oldalakon a Kar és a Szenátus által jóváhagyott tantárgyi követelmények tekinthetők meg.

Kötelező tárgyak:

institute	course code	course title in English	course title in Hungarian	course title in German	instructor	course type	course credit	lecture hours per semester	practical hours per semester	seminar hours per semester	Requirement	Prerequisite courses	semester
Institute of Behavioural Sciences	AOMKPSZB001_1A	The biological bases of psychology I.	A pszichológia biológiai alapjai I.	Die biologische grundlagen der Psychologie I.	Dr. Bódizs Róbert	compulsory	3	28			examination		1 semester
Institute of Behavioural Sciences	AOMKPSZB002_1A	Research Methods in Psychobiology	Pszichobiológiai kutatási módszerek	Forschungsmethoden in der Psychobiologie	Dr. Szabados-Szalárdy Orsolya	compulsory	2	28			examination		1 semester
Institute of Behavioural Sciences	AOMKPSZB003_1A	Neuroanatomy and neurophysiology I.	Neuroanatómia és neurofiziológia I.	Neuroanatomie und Neurophysiologie I.	Dr. Farkas Kinga	compulsory	3	28			examination		1 semester
Institute of Behavioural Sciences	AOMKPSZB004_1A	Evolution of the brain and mental functions	Az agy és a mentális funkciók evolúciója	Evolution des Gehirns und der mentalen Funktionen	Dr. Szabados-Szalárdy Orsolya	compulsory	2	28			examination		1 semester
Institute of Behavioural Sciences	AOMKPSZB005_1A	Laboratory techniques in psychophysiology and cognitive neuroscience	Laboratóriumi technikák a pszichofiziológiában és a kognitív idegtudományban	Laborpraktische Methoden in der Psychophysiologie und der kognitiven Neurowissenschaft	Dr. Szabados-Szalárdy Orsolya	compulsory	2	28			examination		1 semester
Institute of Behavioural Sciences	AOMKPSZB006_1A	Entry level computer-programming for bio-medical students	Alapfokú számítógépes programozás biomedicinális hallgatók számára	Einführung in die Programmierung für biomedizinische Studierende	Dr. Farkas Kinga	compulsory	3		28		practical examination		1 semester
Institute of Behavioural Sciences	AOMKPSZB007_1A	Advanced statistics and data analysis in behavioural and biomedical sciences I.	Haladó statisztika és adatelemzés a viselkedés- és orvostudományokban I.	Fortgeschrittene Statistik und Datenanalyse in den Verhaltens- und Biomedizinischen Wissenschaften - I.	Dr. Ujma Péter	compulsory	3	14	28		examination	There is no prerequisite for course registration. The prerequisite for completion is regular attendance, active coursework, and the completion of a research project (seminars) and an oral examination (lectures).	1. semester, 3. semester
Institute of Behavioural Sciences	AOMKPSZB008_1A	Laboratory practice: Psychiatric genetics, Molecular techniques, EEG, wearables, MRI, fNIRS, Experimental cognitive psychology I.	Laboratóriumi gyakorlat: pszichiátriai genetika, molekuláris technikák, EEG, hordozható eszközök, MRI, fNIRS, kísérleti kognitív pszichológia I	Laborpraktikum: Psychiatrische Genetik, molekulare Techniken, EEG, tragbare Geräte, MRI, fNIRS, experimentelle kognitive Psychologie I.	Dr. Szabados-Szalárdy Orsolya	compulsory	4		56		practical examination		1. semester, 3. semester
Institute of Behavioural Sciences	AOMKPSZB001_2A	The biological bases of psychology II.	A pszichológia biológiai alapjai II.	Die biologische grundlagen der Psychologie II.	Dr. Bódizs Róbert	compulsory	3	28			comprehensive examination	The biological bases of psychology – I.	2. semester
Institute of Behavioural Sciences	AOMKPSZB003_2A	Neuroanatomy and neurophysiology II.	Neuroanatómia és neurofiziológia II.	Neuroanatomie und Neurophysiologie II.	Dr. Kinga Farkas	compulsory	3	28			comprehensive examination	Neuroanatomy and Neurophysiology – I.	2. semester
Institute of Behavioural Sciences	AOMKPSZB009_1A	Developmental cognitive neuroscience	A fejlődés kognitív idegtudománya	Entwicklungsbezogene kognitive Neurowissenschaft	Dr. Farkas Kinga	compulsory	2	28			examination		2. semester
Institute of Behavioural Sciences	AOMKPSZB010_1A	Behavioural genetics	Viselkedésgenetika	Verhaltangenetik	Dr. Ujma Péter	compulsory	2	28			examination		2. semester
Institute of Behavioural Sciences	AOMKPSZB011_1A	Introduction to neuropsychiatry	Bevezetés a neuropszichiátriába	Einführung in die Neuropsychiatrie	Dr. Farkas Kinga	compulsory	3	28			examination	Neuroanatomy and neurophysiology I.	2. semester
Institute of Behavioural Sciences	AOMKPSZB012_1A	Seminar in current topics in psychobiology	Szeminárium a pszichobiológia aktuális témáiból	Seminar über aktuelle Themen der Psychobiologie	Dr. Szabados-Szalárdy Orsolya	compulsory	1			14	practical examination		2. semester
Institute of Behavioural Sciences	AOMKPSZB007_2A	Advanced statistics and data analysis in behavioural and biomedical sciences II.	Haladó statisztika és adatelemzés a viselkedés- és orvostudományokban II.	Fortgeschrittene Statistik und Datenanalyse in den Verhaltens- und Biomedizinischen Wissenschaften - II	Dr. Ujma Péter	compulsory	3	14	28		comprehensive examination	Successful completion of the course "Advanced Statistics and Data Analysis in Behavioural and Biomedical Sciences – I" is required.	2. semester
Institute of Behavioural Sciences	AOMKPSZB013_1A	Biomathematics	Biomatematika	Biomathematik	Dr. Farkas Kinga	compulsory	3	28	14		examination		2. semester
Institute of Behavioural Sciences	AOMKPSZB008_2A	Laboratory practice: Psychiatric genetics, Molecular techniques, EEG, wearables, MRI, fNIRS, Experimental cognitive psychology II.	Laboratóriumi gyakorlat: pszichiátriai genetika, molekuláris technikák, EEG, hordozható eszközök, MRI, fNIRS, kísérleti kognitív pszichológia II.	Laborpraktikum: Psychiatrische Genetik, molekulare Techniken, EEG, tragbare Geräte, MRI, fNIRS, experimentelle kognitive Psychologie II.	Dr. Szabados-Szalárdy Orsolya	compulsory	4		56		practical examination	Laboratory practice: Psychiatric genetics, Molecular techniques, EEG, wearables, MRI, fNIRS, Experimental cognitive psychology I.	2. semester

Kötelezően választható tárgyak:

institute	course code	course title in English	course title in Hungarian	course title in German	instructor	course type	course credit	lecture hours per semester	requirement	prerequisite courses
Institute of Behavioural Sciences	AOMVPSZB023_1A	Sleep and chronobiology	Alvás és kronobiológia	Schlaf und Chronobiologie	Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)	compulsory elective	2	28	examination	
Institute of Behavioural Sciences	AOMVPSZB024_1A	Basics of behavioural sciences	A magatartástudományok alapjai	Grundlagen der Verhaltenswissenschaften	Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)	compulsory elective	2	28	examination	
Institute of Behavioural Sciences	AOMVPSZB026_1A	Human intelligence	Az emberi intelligencia	Die menschliche Intelligenz	Dr. Ujma Péter	compulsory elective	2	28	examination	
Institute of Behavioural Sciences	AOMVPSZB027_1A	Hormones and behaviour	Hormonok és viselkedés	Hormone und Verhalten	Dr. Szabados-Szalárdy Orsolya	compulsory elective	2	28	examination	

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet

Name of subject in Hungarian: Az emberi intelligencia
Name of subject in English: Human intelligence
Name of subject in German: Die menschliche Intelligenz

Credit value of the course: 2
Semester: 1st semester, 2nd semester, 3rd semester, 4th semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
optional

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMVPSZB026_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Purebl György (intézet igazgató)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, 06704451168
Course coordinator position: full professor
Course coordinator Date and number of habilitation: 08-06-2019, no. 05/2019

Objectives of the course, and its place in the curriculum of the medical training program:

The goal of this course is to extend the psychological instruction currently included in medical training to the domain of human intelligence and cognitive functions. This field has produced results of particularly high quality and importance, yet it is relatively unknown outside the circle of its practitioners. Students of this course will be acquainted with the way human intelligence influences somatic and mental health as well as the bio-psych-social characteristics otherwise serving as risk factors or protective factors. The course covers the basics of the methods of neuroscience, statistics

of quantitative genetics widely used in other fields of medicine, and it aims to improve the critical and ethical thinking skills of its participants.

Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Students completing this course will be acquainted with intelligence research, one of the fields of psychology with the longest history and the greatest importance. They will get acquainted with the tests most commonly used to assess human intelligence, and their similarity to and difference from other tests used in neurological and scholastic testing. They will learn about the predictive power of psychometric intelligence towards socioeconomic indicators and psychiatric as well as somatic illness, and they will get acquainted with the mechanisms implicated in these relationships. They will get acquainted with the basic methods of modern behavior genetics and their application in the field of intelligence research, they will acquire basic statistical skills and they will learn about the ethical dilemmas arising from intelligence research, as well as some possible answers to them.

Course outcome (names and NEPTUN ID of related subjects):

Prerequisites for course registration and completion: (NEPTUN ID):

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

The number of students required to start the course (minimum, maximum), method of selecting participants:

The course is launched when at least 10 students apply. Maximum capacity is set at 30 students

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Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

1. Introduction and a history of intelligence research
Intelligence research, cognitive research and neurological research.
Galton and the „hereditary genius”. Spearman and the „positive manifold”. Intelligence testing througout the 20th century. Multiple intelligences and their evaluation. Jensen and „g as the active component”. Sampling, mutualism and process overlap theories.

2. Methods and models in the science of human intelligence

A statistical primer: mean, standard deviation, variance, covariance, correlation. Multiple regression, exploratory and confirmatory factor analysis.
Statistical models of intelligence: simple g-factor model, Cattell-Horn-Carroll model, bifactor models, network models.

3. Intelligence tests, cognitive tests

A summary of the best known intelligence tests and cognitive tests used in other research and clinical domains, such as scholastic tests and tests of executive functions. Evaluation of the „indifference of the indicator".

4. The genetics of human cognitive abilities

A summary of the research describing environmental and genetic influences on individual differences in human intelligence. Classical twin studies, adoption studies, MZA studies, extended pedigree studies. Advances in molecular genetics and their effect on intelligence research: SNP heritability studies, GWA studies, polygenic scores. Genetic correlations and Mendelian randomization effects between intelligence and social, anthropometric and disease traits and their importance in medicine.

5. The neuroscience of intelligence

Non-genetic biomarkers of human intelligence: structural and functional imaging, electroencephalography, other methods and correlates.

6. Intelligence and social outcomes

The relationship between intelligence scores and the most important social outcomes in the realms of education, employment and participation in society, with a focus on prospective findings and sibling comparisons.

7. Disentangling the effects of intelligence and socioeconomic status

Is it intelligence or socioeconomic status which is related to social outcomes? An investigation of sibling/twin comparison studies, longitudinal multiple regression studies and natural experiments.

8. Cognitive epidemiology 1. – the effect of intelligence on physical health

The relationship between intelligence, physical illness and health behavior, with a focus on prospective studies.

9. Cognitive epidemiology 2. – the effect of intelligence on mental health

The relationship between intelligence mental health and psychiatric illness, with a focus on prospective studies.

10. Geniuses and other extremes of human intelligence

Intelligence and scientific/artistic contributions. Individuals and syndromes characterized by extreme intelligence profiles. The causes and consequences of extremely low intelligence.

11. Modifying human intelligence

A summary of the history of attempted environmental interventions to increase human intelligence. A history and evaluation of the Flynn effect, the secular increase in intelligence test performance.

12. Criticism and controversy in intelligence research

Critics of the intelligence/SES nexus. Critics of twin studies and other genetic methods. Intelligence,

sex, ethnicity and immigration. Fertility and intelligence. Intelligence, censorship and politics.

13. The ethics and the future of intelligence research
Ethical questions arising from advances in intelligence research: implications for social redistribution, education and family policy, the pre-implantation screening of embryos.

14. Interesting findings from the frontiers of intelligence research. Summary.
Miscellaneous, interesting findings from the field of intelligence research. Review of the semester, discussion, review of questions from students.

Lecturer: Dr. Péter P. Ujma, PhD

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOKMAG1079_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

Attendance is required at at least 50% of the lectures. As there is only a single weekly lesson from this course, making up for absences is not possible.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

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Number and type of individual assignments to be completed, submission deadlines:

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Requirements for the successful completion of the course:

Regular attendance is required for the signature.

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

According to university regulations, test exams can only be organized if test questions and possible responses are previously published and accessible to all students. Test questions and possible responses for this course are available on Moodle.

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

Students are minimally required to be familiar with the concepts published in the Glossaries that accompany each class. These are available in Moodle.

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

Students get a 5-level grade based on their performance at the written examination. Grades assigned are:
90% or higher: 5
75-90%: 4
60-74%: 3
50-59%: 2
49% or lower: 1 (failing grade)

There is no midterm examination.
Students have the option to hand in a book review about a book on human intelligence. The book review should comprise 5-10 typewritten pages (Times New Roman, font size 12, narrow margins, single row spacing). It should contain a summary of the book, an evaluation of its contents compared to the content of the lectures (points of agreement and disagreement), and the students' own evaluation of these contents. Students should argue for or against the theses presented in the book, using concrete references to the scientific literature (including findings presented during the lectures). If it is of a sufficient quality, a grade is offered based on this book review and the student is exempted from the written examination. If the book review is not of sufficient quality or the student is dissatisfied with the grade received based on it, he/she may take the written examination to receive or improve upon the grade.

Artificial intelligence systems used in the teaching of the subject and the manner of their application

AI is not used in the instruction of this subject. Students may use any AI system for study aid and to perform literature research for the optional book review. Students are responsible, however, to check and read the original sources AI provides. AI systems can not be used for writing the book review itself, or during the examination.

Printed resources:

Type	Mandatory
Author	Earl Hunt
Title	Human Intelligence
Publisher	Cambridge University Press
Year of publication	2011

Type	Mandatory
Author	Richard Haier
Title	The Neuroscience of Intelligence
Publisher	Cambridge University Press
Year of publication	2016

Type	Mandatory
Author	Stuart Ritchie
Title	Intelligence - All that matters
Publisher	Hodder&Stoughton
Year of publication	2015

Type	Mandatory
Author	Russel T. Warne
Title	In the Know: Debunking 35 Myths about Human Intelligence
Publisher	Cambridge University Press
Year of publication	2020

Other resources:

Required	pdf.igen
Other/Comment	Lecture material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika, Bioinformatika Tanszék

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Name of subject in Hungarian: Biomatematika
Name of subject in English: Biomathematics
Name of subject in German: Biomathematik

Credit value of the course: 3
Semester: 2nd semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
42.0	28.0	14.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB013_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, Nagyvárad tér 4., room 2004., H-1089 Budapest Hungary. Tel.: +36 1 210 29 30 / 56404
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014

Objectives of the course, and its place in the curriculum of the medical training program:

This course introduces biomathematical thinking and provides fundamental mathematical tools for interpreting biological and psychological phenomena. Building on students’ prior exposure to basic programming, it strengthens analytical and quantitative reasoning by linking mathematical concepts to computational applications and real-world data. The course deepens students’ ability to understand, evaluate, and implement simple models, thereby serving as a bridge between

introductory programming and more advanced studies in neuroscience, psychology, and data analysis within the curriculum.

Format of the course (lectures, group work, practical lessons, etc.):

lecture + practical lesson

Competencies acquired through completion of course:

Knowledge:
- Understand the role of mathematics in psychobiology
- Describe basic concepts of logic and set theory
- Recognize and interpret linear, exponential, logarithmic, and sigmoid relationships
- Understand the concepts of function, rate of change, and accumulation
- Describe fundamental concepts of signal processing and frequency analysis

Skills:
- Apply basic mathematical models to biological and psychological problems
- Interpret and construct graphs representing functional relationships
- Perform simple calculations involving exponential growth, logarithms, and basic probability
- Analyze and interpret empirical data using graphical and numerical methods
- Identify patterns in biological signals and distinguish signal from noise

Attitudes:
- openness toward quantitative and computational approaches in the life sciences
- respect the value and limitations of mathematical models in describing real systems
- critical thinking when interpreting data and model outputs
- curiosity toward interdisciplinary connections between mathematics, biology, and psychology
- strive for clarity and precision in reasoning and communication

Autonomy, and responsibility:
- Independently interpret basic mathematical models and graphical representations
- Apply learned methods to simple, novel problems with limited guidance
- Take responsibility for accurate data handling and interpretation
- Collaborate effectively in small groups on modelling or data-based tasks
- Reflect on the limitations of their analyses and recognize when further expertise is needed

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Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB019_1A

Prerequisites for course registration and completion: (NEPTUN ID):

None

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

1. Modelling, logic and sets (Csenge G. Horváth)
Introduction to biomathematics and the role of mathematical modelling in biology and psychology, distinction between models and real systems, basic logical operations (AND, OR, NOT), set theory concepts (elements, subsets, unions, intersections), representation of biological populations and experimental groups as sets, simple formalization of biological and behavioral systems.

2. Scales and exponential thinking (János Fekete)
Linear and logarithmic scales and their interpretation, orders of magnitude, exponential growth and decay processes, introduction to the constant *e*, logarithmic transformation and its role in data analysis, applications in biological growth processes and psychophysical scaling (e.g. stimulus–response relationships), real and complex numbers.

3. Functions and relationships (János Fekete)
Concept of a function as input–output mapping, independent and dependent variables, graphical representation of functions, interpretation of curves, domain and range, modelling relationships between biological or psychological variables (e.g. stimulus intensity vs response).

4. Basic function types (lecture: Kinga Farkas, practice: Tárek Magyar)
Linear, exponential, logarithmic and trigonometric functions, characteristic shapes and properties, parameter effects on function behavior, comparison of growth patterns, applications to learning curves, population growth, adaptation-, and periodic biological processes.

5. Change and derivatives (János Fekete)
Concept of change and rate of change, slope as a measure of change, intuitive introduction to derivatives, interpretation of increasing and decreasing trends, applications to biological growth rates and behavioral dynamics.

6. Extrema and optimization (lecture: Kinga Farkas, practice: Tárek Magyar)
Concept of maxima and minima, local vs global extrema, introduction to optimization in biological and psychological systems, interpretation of optimal points (e.g. performance, energy efficiency), qualitative understanding of inflection points.

7. Integration and accumulation (Róbert Bódizs)
Concept of accumulation and total effect, area under a curve as an integral, intuitive understanding of integration, relationship between rate and total quantity, applications to cumulative biological processes (e.g. drug concentration over time).

8. Numerical methods and approximation (Bence Schneider)
Discrete vs continuous representation, need for numerical approximation in real systems, basic numerical integration (e.g. trapezoidal rule), approximation of functions from data, introduction to computational thinking in biological data analysis.

9. Probability and variability (lecture: Kinga Farkas, practice: Tárek Magyar)
Basic concepts of probability, randomness and uncertainty in biological systems, introduction to distributions, normal (Gaussian) distribution and its properties, mean and variability, interpretation of experimental and behavioral data.

10. Distributions and nonlinear responses (lecture: Kinga Farkas, practice: Tárek Magyar)
Detailed view of Gaussian and Poisson distributions, introduction to sigmoid functions and threshold phenomena, nonlinear response characteristics, applications in neural activation, population saturation and decision processes.

11. Interpolation and data fitting (Csenge G. Horváth)
Concept of interpolation and estimation between data points, linear interpolation, introduction to spline methods (intuitive), curve fitting and model selection, handling missing or sparse biological data.

12. Vectors and matrices in biological data (Áron Bartha)
Concept of vectors as multi-dimensional data representations, basic matrix operations, representation of multivariate systems, applications in biological and psychological measurements (e.g. multi-channel recordings).

13. Filtering and convolution (Bence Schneider)
Concept of signal and noise, basic filtering techniques (e.g. moving average, low-pass, high-pass, band-pass filtering), introduction to convolution as a smoothing and transformation operation, applications in biological signal processing (e.g. EEG noise reduction).

14. Fourier analysis and biological rhythms (Róbert Bódizs)

Concept of frequency and periodicity, transformation from time domain to frequency domain, intuitive introduction to Fourier analysis, identification of rhythmic patterns, applications in neural oscillations and circadian rhythms, course summary and integration of concepts.

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB007_1A, AOMKPSZB007_2A, AOMKPSZB006_1A, AOMKPSZB008_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

Students are expected to attend regularly the course and participation list will be recorded at the end of every practical lesson. Participating in at least 75% of the total number of practical lessons is a prerequisite for getting the signature to absolve the course. The maximum number of absences permitted: 3 absences from the practical lessons.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

None

Number and type of individual assignments to be completed, submission deadlines:

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Requirements for the successful completion of the course:

75% presence of the total number of practical lessons and lectures is required for course signature. Course signature and successful end-term examination (achievement of at least 50% performance on the written end-term examination) is required for successful completion of the course.

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

Written examination includes the following topics:
Modelling, logic and sets

Scales and exponential thinking
Functions and relationships
Basic function types
Change and derivatives
Extrema and optimization
Integration and accumulation
Numerical methods and approximation
Probability and variability
Distributions and nonlinear responses
Interpolation and data fitting
Vectors and matrices in biological data
Filtering and convolution
Fourier analysis and biological rhythms

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

To obtain a passing grade, students must demonstrate a basic understanding of the core concepts of the biomathematics, the ability to interpret biological/psychological phenomena using mathematical tools and basic computational skills.

Interpret and sketch basic graphs
- Linear, exponential, logarithmic, sigmoid

Read and interpret
- Log-scale plots
- Distribution curves (Gaussian)

Perform simple calculations
- Exponential growth/decay
- Logarithmic transformation
- Mean and variance (basic level)

Identify
- Increasing/decreasing trends
- Maxima/minima from graphs

Approximate
- Area under curve (trapezoidal rule – basic level)

Apply
- Linear interpolation between data points

Work with simple datasets
- Plot data
- Fit simple functions (qualitative or basic computational tools)

Interpret biological meaning of
- Growth curves
- Distributions

- Rhythmic signals

Diagrams and representations (recognize, interpret, and sketch)
- Linear vs exponential growth curves
- Logarithmic scale plots
- Sigmoid (S-shaped) curves
- Gaussian distribution
- Basic trigonometric oscillation
- Area under curve representation
- Simple vector representation
- Time vs frequency representation (conceptual)

Calculation requirements (perform)
- Basic algebraic manipulation
- Evaluation of simple functions
- Exponential and logarithmic calculations
- Mean and standard deviation (basic level)
- Simple probability calculations
- Trapezoidal approximation (guided)

Calculations may be:
- Done by hand (simple cases)
- Supported by calculator or software (for interpretation)

Failure to meet these minimum requirements results in a failing grade.

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

The evaluation will be based on the written exam as follows:
- the maximal score will be 50 points
- grade 5: 43-50 points
- grade 4: 37-42 points
- grade 3: 31-36 points
- grade 2: 25-30 points
- grade 1: 0-24 points

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students' independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and

accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Other resources:

Required	pdf.igen
Other/Comment	Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Szeminárium a pszichobiológia aktuális témáiból
Name of subject in English: Seminar in current topics in psychobiology
Name of subject in German: Seminar über aktuelle Themen der Psychobiologie

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Credit value of the course: 1
Semester: 2nd semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
14.0	0.0	0.0	14.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB012_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, Nagyvárad tér 4., room 2004., H-1089 Budapest Hungary. Tel.: +36 1 210 29 30 / 56404
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014

Objectives of the course, and its place in the curriculum of the medical training program:

Throughout the seminar, students will deepen their knowledge of traditional and current topics in psychobiology, with special emphasis on empirical research. The seminar will provide an opportunity to read and discuss papers, including reviews, methodological papers, and empirical studies. The course supports students in developing a comprehensive understanding of the biological basis of behaviour, including sensory processing, motor functions, homeostatic regulation, social behaviours,

and complex cognitive and affective processes.

Format of the course (lectures, group work, practical lessons, etc.):

seminar

Competencies acquired through completion of course:

Knowledge:
- Knowledge of the structural organization and anatomy of the central and autonomic nervous systems
- Basic developmental biology (including ontogenetic and phylogenetic aspects)
- Advanced knowledge of behavioral physiology
- Characteristics, advantages, and limitations of research methods used in psychobiology

Skills:

- Analyse and interpret neuroanatomical and neurophysiological relationships, critically examine the biological foundations of animal and human behaviour, evolutionary and genetic factors, their interactions, and adaptive functions
- Interpret and investigate the physiological background of mental and cognitive processes (e.g. mood, emotion, memory, attention, decision-making) and apply research methods critically
- Effective and systematic search of scientific literature and its critical evaluation
- Critical analysis of psychological phenomena in terms of biological mechanisms and within a biomedical context, as well as knowledge of psychology, biology, neuroscience, cognitive science, and their interconnections
- Critical thinking in the evaluation of results, recognition of patterns and relationships, formulation of hypotheses, generation of new research questions, and development of creative solutions

Attitudes:
- critical: critically evaluate scientific claims and recognize their empirical foundations, strengths, and limitations
- rational: drawing conclusions based on logical reasoning and scientifically validated evidence
- committed to renewal and continuous improvement: receptiveness to new research directions, methods, and theoretical frameworks
- curious: interest in deeper underlying mechanisms of phenomena, formulation of questions, and pursuit of scientific explanations
- self-critical and inclined toward reflection: conscious reflection on own thinking, decisions, and their scientific grounding
- open to interdisciplinary collaboration: effective communication and cooperation with experts from other scientific fields

Autonomy, and responsibility:
- Expresses opinions independently, with professional grounding and a clear sense of responsibility
- Takes responsibility for their own work and for the work of students and colleagues under their supervision

- Based on their professional knowledge and awareness, is capable of independently analyzing and interpreting emerging professional questions
- Initiates and conducts responsible, rational, and evidence-based discussions with professionals from related disciplines
- Understands the importance of science communication (presenting research results in an accessible manner) and, as a member of the scientific community, takes responsibility for addressing misconceptions, pseudoscientific theories, and misleading narratives in psychology and biology

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Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB017_1A, AOMKPSZB018_1A, AOMKPSZB020_1A

Prerequisites for course registration and completion: (NEPTUN ID):

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

The course will be held biweekly, by combining two lessons, every odd week.

Week 1. (hour 1-2) Introduction, Psychobiology, course requirements - Dr. Szabados-Szalárdy Orsolya
Week 3. (hour 3-4) Body senses: Interoception, Proprioception - Dr. G. Horváth Csenge
Week 5. (hour 5-6) Vision and audition - Dr. Szabados-Szalárdy Orsolya
Week 7. (hour 7-8) Movement - Dr. G. Horváth Csenge
Week 9. (hour 9-10) Drinking, Eating, Sleeping - Dr. Szabados-Szalárdy Orsolya
Week 11. (hour 11-12) Reproduction and parental behaviour - Dr. G. Horváth Csenge
Week 13. (hour 13-14) Aggression - Dr. Szabados-Szalárdy Orsolya

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Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN

ID(s) of courses (to be provided):
AOMKPSZB001_1A, AOMKPSZB001_2A, AOMKPSZB005_1A, AOMKPSZB002_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

Students are expected to attend regularly the course and participation list will be recorded at the end of every seminar. Participating on at least 75% of the total number of seminar is a prerequisite for getting the signature to absolve the course. Since the seminars are held every two weeks, students may miss a maximum of 2 sessions.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

An active participation in at least 75% of the total number of seminars is required. Students are requested to prepare presentations based on specific topics of the seminars. Points will be awarded for the presentation, with a maximum of 10 points in total, based on the following criteria (each worth up to 2 points): the appropriateness of the introduction, the correct presentation of the methods, the clarity of the results, the placement of the findings in a broader scientific context, and the quality of the oral presentation.

Additionally, students are requested to formulate at least one scientific question related to the current topics in each lesson. Each question is worth 1 point. In total, student can receive 10+7 points, however, considering the possible 2 missing, 15 points score 100%.

Number and type of individual assignments to be completed, submission deadlines:

One presentation before the end of the semester (last seminar, latest).

Requirements for the successful completion of the course:

Participation in at least 75% of the seminars is required, and students must obtain at least 55% of the maximum number of points (i.e., at least 8 points).

Type of assessment:
term grade

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

Not applicable

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

Attendance of at least 75% of seminars is mandatory

Delivery of one oral presentation meeting basic academic standards (clear structure, accurate description of methods and results, and relevant interpretation)

Receiving at least 8 points (presentation and questions together)

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

Students will receive points for their presentations based on a 1-10 point scale. Additionally, questions related to the others' presentations are expected reflecting active participation on the seminar. Each question counts for 1 point (one question relevant to the topic is accepted).

The evaluation will be based on the collected points during the semester as follows:
- the maximal score will be 140 points
- grade 5: 14-17 points
- grade 4: 12-13 points
- grade 3: 10-11 points
- grade 2: 8-9 points
- grade 1: 0-7 points

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students' independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Printed resources:

Type	Recommended
Author	Schmitt CM and Schoen S. (2022)
Title	Interoception: A Multi-Sensory Foundation of Participation in Daily Life.
Publisher	Front. Neurosci. 16:875200. doi: 10.3389/finisc.2022. 875200
Year of publication	2022

Type	Recommended
Author	Guido Org, Anna Dovern, Nobuhiro Hagura, Patrick Haggard, Gereon R. Fink, Peter H. Weiss
Title	Constructing Visual Perception of Body Movement with the Motor Cortex.
Publisher	Cerebral Cortex, 26, 1.
Year of publication	2016
Other/Comment	440-449. - , https://doi.org/10.1093/cercor/bhv262

Type	Recommended
Author	Daniela Tempesta, Valentina Socci, Luigi De Gennaro, Michele Ferrara
Title	Sleep and emotional processing.
Publisher	Sleep Medicine Reviews. 40.
Year of publication	2018
Other/Comment	183-195. - https://doi.org/10.1016/j.smrv.2017.12.005

Type	Recommended
Author	Kohl, j., Babayan, B.M., Rubinstein, N.D. et al.
Title	Functional circuit architecture underlying parental behaviour.
Publisher	Nature 556.
Year of publication	2018
Other/Comment	326-331 - https://doi.org/10.1038/s41586-018-0027-0

Type	Recommended
Author	Kaj Björkqvist
Title	Gender differences in aggression.
Publisher	Current Opinion in Psychology
Year of publication	2018
Other/Comment	19., 39-42. - , https://doi.org/10.1016/j.copsyc.2017.03.030

Type	Recommended
Author	V Van Wassenhove, KW Grant, D Poeppel
Title	Temporal window of integration in auditory-visual speech perception
Publisher	Neuropsychologia, 43(3)
Year of publication	2007
Other/Comment	598-607. - https://doi.org/10.1016/j.neuropsychologia.2006.01.001

Other resources:

Required	pdf.nem
Other/Comment	course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Bevezetés a neuropszichiátriába
Name of subject in English: Introduction to neuropsychiatry
Name of subject in German: Einführung in die Neuropsychiatrie

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Credit value of the course: 3
Semester: 2nd semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB011_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, Nagyvárad tér 4., room 2004., H-1089 Budapest Hungary. Tel.: +36 1 210 29 30 / 56404
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014

Objectives of the course, and its place in the curriculum of the medical training program:

This course introduces students to a neuropsychiatric understanding of mental and brain disorders, emphasizing how alterations in neural systems give rise to cognitive, emotional, and behavioural symptoms within and across traditional diagnostic boundaries. The course adopts an integrative, brain-based perspective focusing on shared mechanisms such as neural circuit dysfunction, neurotransmitter systems, neurodevelopmental and neurodegenerative processes. It covers a wide

spectrum of disorders, including mood and stress-related conditions, psychoses, neurodevelopmental conditions and neurodegenerative disorders, epilepsy, immune reactions and brain injury. Particular emphasis is placed on linking underlying neurobiological processes to clinical phenomena, such as cognitive dysfunction, alterations in consciousness, and changes in everyday functioning. Contemporary dimensional and transdiagnostic frameworks are introduced to support a unified interpretation of brain–behaviour relationships in both clinical and research contexts.

Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Knowledge:
- scope and interdisciplinary nature of neuropsychiatry
- major diagnostic systems and models of psychopathology (DSM, ICD, dimensional and transdiagnostic approaches)
- neurobiological basis of major neuropsychiatric disorders (e.g. mood disorders, psychosis, neurodevelopmental disorders, epilepsy, neurodegenerative diseases)
- key brain structures, networks, and neurotransmitter systems involved in mental functions and disorders
- basic pathophysiological mechanisms (e.g. neurotransmitter imbalance, network dysfunction, neuroinflammation, neurodegeneration)
- relationship between brain function, cognition, and behavior

Skills:
- Relate clinical symptoms to underlying neurobiological mechanisms (basic level)
- Interpret neuropsychiatric phenomena using structure–function relationships
- Identify key brain systems involved in different disorders
- Apply integrative thinking across neurological and psychiatric domains
- Interpret simplified clinical cases from a neurobiological perspective
- Communicate basic neuropsychiatric concepts clearly and coherently

Attitudes:
- Openness toward interdisciplinary approaches integrating neuroscience, psychiatry, psychology, and neurology
- Appreciate the complexity and heterogeneity of neuropsychiatric disorders
- Critical thinking toward diagnostic systems and models
- Biologically informed yet clinically sensitive perspective on mental disorders
- Curiosity toward brain–behaviour relationships

Autonomy, and responsibility:
- Apply acquired knowledge to new neuropsychiatric examples with limited guidance
- Take responsibility for accurate interpretation of neurobiological information
- Recognize the limits of their knowledge and the need for further clinical or scientific expertise
- Engage in informed discussion of neuropsychiatric topics

- Integrate knowledge from different domains in a structured and responsible manner

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Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB014_1A, AOMKPSZB015_1A

Prerequisites for course registration and completion: (NEPTUN ID):

Neuroanatomy and neurophysiology I.

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

N/A

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

1. Introduction to Neuropsychiatry + Diagnostic Classification (Farkas Kinga)
Definition and scope of neuropsychiatry. Relationship between psychiatry, neurology, psychology and neuroscience. Brain–behaviour relationships in mental disorders. Historical development of neuropsychiatric thinking. Overview of diagnostic systems (DSM and ICD). Dimensional vs categorical models of psychopathology. Transdiagnostic approaches and Research Domain Criteria (RDoC). Limitations and challenges of current classification systems.

2. Neurobiological basis of stress-related and mood disorders (Farkas Kinga)
Neurobiological mechanisms underlying anxiety disorders, obsessive–compulsive disorder, trauma-related disorders, depression, and bipolar disorder. Role of stress systems, neurotransmitters, and brain circuits. Epigenetics and lifelong molecular changes. Gene (FKBP5, BDNF, SLC6A4, NR3C1) × environment interactions, glucocorticoid receptors,early-life adversity and maladaptive stress reaction.

3. Neuropsychiatry of psychotic disorders (Farkas Kinga)
Neurobiology of psychosis and schizophrenia spectrum disorders. Secondary psychotic disorders

related to structural or neurodegenerative brain changes. Dopamine hypothesis and glutamatergic models. Excitation–inhibition imbalance, and atypical connectivity patterns. Differences in later phases of neurodevelopment: pruning. Cognitive and social dysfunction in psychosis. Genetic, molecular, histologic and macroscopic alterations in the brain.

4. Neurodevelopmental disorders (Farkas Kinga)
Autism spectrum disorder, tic disorders, Tourette syndrome, intellectual disability. Neurodevelopmental mechanisms including altered synaptic development, excitation–inhibition imbalance, and atypical connectivity patterns. Structural and functional alterations in cortical and subcortical networks (e.g. prefrontal cortex, temporal regions, basal ganglia, cerebellum). Role of genetic and environmental factors in early brain development. Neurobiological basis of social cognition deficits, repetitive behaviours, and motor symptoms.

5. Neurodevelopmental disorders (Czobor Pál)
ADHD (Attention-deficit/hyperactivity disorder (ADHD). Neurobiological background with emphasis on frontostriatal and frontoparietal networks, dopaminergic and noradrenergic modulation, and executive function deficits. Alterations in attention, inhibition, and reward processing and self-monitoring systems. Developmental aspects, cognitive and behavioral characteristics, and their neural correlates.)

6. Epilepsy I. (Fabó Dániel)
Basic mechanisms of epilepsy, classification of seizure types, neurophysiological background, introduction to EEG and epileptic activity.

7. Epilepsy II. (Fabó Dániel)
Clinical aspects of epilepsy, syndromes, cognitive and psychiatric comorbidities, treatment principles.

8. Dementias / Neurodegenerative disorders (Horváth András)
Mild cognitive impairment (MCI), Alzheimer’s disease, Lewy body dementia and related disorders, neurobiological mechanisms and clinical presentation.

9. Parkinson and other movement disorders (Horváth András)
Parkinson’s disease, Huntington’s disease and other movement disorders, basal ganglia dysfunction, motor and non-motor symptoms.

10. Acquired Brain Injury (Szűcs Anna)
Stroke, transient ischemic attack (TIA), traumatic brain injury, neuropsychiatric consequences and recovery processes. We learn about frequent types of brain injury- strokes and traumas - shortly reviewing the main anatomical/vascular regions of the brain and defining typical localisations and types (ischaemic and haemorrhagic strokes) of cerebro-vascular attacks including transient ischaemic (TIA) ones. We deal with typical neurologic symptoms and the possibilities of treatment; as well as the theoretical background of recovery: brain homeostatic plasticity. We deal with dysphasias, post-stroke depression, post-lesional epilepsy, frontal psychosyndrome, rehabilitation.

11. Autoimmune and infectious neurological disorders (Szűcs Anna)
Autoimmune disorders (e.g. multiple sclerosis, anti-NMDA receptor encephalitis), neuroinfections, neuroimmune mechanisms and psychiatric manifestations. We deal with the significance of immune

protection and its abnormality in autoimmunity, cellular and humoral mechanisms. List acute bacterial and viral encephalitis and the most frequent immune-mediated brain-conditions- MS, neuromyelitis optica Devic; limbic and NMDA encephalitis, narcolepsy, each with typical neuropsychiatric manifestations including organic psychosis and change of personality .

12. Disorders of Consciousness (Szűcs Anna)
Levels and disorders of consciousness (coma, vegetative state, minimally conscious state), neural correlates and clinical assessment. We shortly review the neural basis of consciousness and the main types of disturbances affecting vigilance - energetic side - (somnolence, spoor and coma), integrity (content) and clarity (vigilance+content). The Glasgow coma scale. Definitions and symptoms of the levels and disorders of consciousness (coma, vegetative state, minimally conscious state); hypervigilance, delirium; psychosis, epilepsy

13. Neuroplasticity, therapy and rehabilitation (Farkas Kinga)
The brain's capacity to reorganize in response to experience, illness, and intervention. Adaptive and maladaptive plastic changes shape psychiatric and neurological conditions. Therapeutic approaches (from psychotherapy, cognitive remediation, to pharmacological and neuromodulatory treatments) can harness these mechanisms. Principles of plasticity: rehabilitation, recovery, compensation, and the optimization of functional outcomes across the lifespan.

14. Integration and clinical perspectives, consultation (Farkas Kinga)
Integration of neurobiological and clinical concepts across disorders, transdiagnostic perspectives, brain–behaviour relationships in neuropsychiatry.

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB001_1A, AOMKPSZB001_2A, AOMKPSZB003_1A, AOMKPSZB003_2A, AOMKPSZB004_1A, AOMKPSZB014_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

The requirement for course signatrure is that students attend at least 50% of the lectures.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

None

Number and type of individual assignments to be completed, submission deadlines:

None

Requirements for the successful completion of the course:

end-term examination

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

The course is completed through a theoretical written examination based on the defined topic list.
1. Foundations and scope of neuropsychiatry, diagnostic systems (DSM, ICD, RDoC)
2. Neurobiology of stress-related and mood disorders
3. Neurobiology of psychotic disorders
4. Neurodevelopmental disorders: autism, tic disorders, intellectual disability
5. Neurobiology of ADHD and attention networks
6. Epilepsy: neurophysiology and clinical aspects
7. Neurodegenerative disorders and dementias
8. Movement disorders and basal ganglia dysfunction
9. Acquired brain injury and neuropsychiatric consequences
10. Autoimmune and infectious neuropsychiatric disorders
11. Disorders of consciousness

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

Foundations of Neuropsychiatry
- Scope and interdisciplinary nature of neuropsychiatry
- Brain–behaviour relationships in mental disorders
- Basic principles of diagnostic classification (DSM, ICD)
- Dimensional vs categorical models, transdiagnostic approaches (RDoC – conceptual)

Stress-related and Mood Disorders
- Neural circuits of stress (e.g. limbic system, prefrontal cortex)
- Role of neurotransmitters (e.g. serotonin, dopamine, noradrenaline)
- Basic mechanisms underlying anxiety, depression, and bipolar disorder

Psychotic Disorders
- Neurobiology of schizophrenia spectrum disorders
- Dopaminergic and glutamatergic mechanisms
- Positive, negative, and cognitive symptoms

- Basic structural and functional brain alterations

Neurodevelopmental Disorders
- Autism spectrum disorder, tic disorders, Tourette syndrome, intellectual disability
- ADHD: frontostriatal and attentional networks
- Key mechanisms: altered connectivity, excitation–inhibition balance (conceptual)
- Neurobiological basis of cognitive and social dysfunction

Epilepsy
- Basic mechanisms of seizure generation
- Classification of seizure types (conceptual level)
- EEG as a neurophysiological tool (basic understanding)
- Cognitive and psychiatric comorbidities

Neurodegenerative disorders
- Alzheimer’s disease,
- Lewy body dementia,
- Frontotemporal dementia
- mild cognitive impairment
- Basic pathophysiological mechanisms(e.g. neurodegeneration, protein aggregation – conceptual)

Movement Disorders
- Parkinson’s disease, Huntington’s disease
- Role of basal ganglia and cortical networks
- Basic pathophysiological mechanisms

Acquired Brain Injury
- Stroke, TIA,
- traumatic brain injury
- Functional consequences and recovery processes
- Basic structure–function relationships

Autoimmune and Infectious Disorders
- Multiple sclerosis,
- anti-NMDA receptor encephalitis
- Neuroinflammatory and neuroimmune mechanisms (conceptual)
- Neuropsychiatric manifestations

Disorders of Consciousness
- Levels of consciousness (coma, vegetative state, minimally conscious state)
- Basic neural correlates of consciousness
- Clinical relevance and assessment (conceptual)

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

The evaluation will be based on the written exam as follows:
- 86–100% Excellent, grade 5
- 74–85% Good, grade 4
- 60–73% Satisfactory, grade 3
- 50–59% Pass, grade 2

- <50% Fail, grade 1

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Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students' independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Other resources:

Required	pdf.igen
Other/Comment	Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Viselkedésgenetika
Name of subject in English: Behavioural genetics
Name of subject in German: Verhaltangenetik

Credit value of the course: 2
Semester: 2nd semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB010_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, Nagyvárad tér 4., room 2004., H-1089 Budapest Hungary. Tel.: +36 1 210 29 30 / 56404
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014

Objectives of the course, and its place in the curriculum of the medical training program:

The aim of the course is to introduce students to human genetic and environmental variation and the role they play in creating individual differences in behavior, cognition, and emotion. The course emphasizes the integration of classical behavioral genetics approaches (e.g., twin and adoption studies) with contemporary genomic methods (e.g., genome-wide association studies and polygenic scoring). Students will explore the nature of genetic variation and analytical designs aiming to

unravel them, such as twin studies, adoption studies, GWAS, and SNP heritability.
Students will learn about the result of such genetic studies investigating complex traits such as intelligence, personality, mental health, and risk-taking behavior.

Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Upon completing the course, students will gain foundational knowledge in the theory and practice of behavioral genetics, will become acquainted with key behavior genetic results, and develop the skills to interpret genetic findings in behavioral research. The course aims to foster scientific literacy, a sense for methodological rigor, and an appreciation for the interplay of nature and nurture in shaping human behavior.

Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB014_1A, AOMKPSZB016_1A

Prerequisites for course registration and completion: (NEPTUN ID):

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

N/A

The number of students required to start the course (minimum, maximum), method of selecting participants:

Between 5 and 30 students are allowed to take the course.

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

1. **Introduction**. DNA and the biological basis of inheritance. The genetic architecture of traits. Mendelian inheritance. Penetrance. Obtaining genetic data.
2. **Methods in behavior genetics: special family studies**. Twins reared apart, adoptee studies.
3. **Methods in behavior genetics: twin studies.** Classical and extended twin studies. Extended

pedigree designs. Bivariate genetic studies. The five laws of behavior genetics. The MaTCH website.
4. **Methods in behavior genetics: molecular genetic methods**. Candidate gene studies, SNP heritability. Genome-wide association studies. Polygenic scores. Whole-genome analyses. Missing heritability.
5. **The genetics of anthropometry and somatic disease**. The genetic of stature and body mass index. The genetics of leading causes of death. The genetics of miscellaneous diseases.
6. **The genetics of cognitive abilities.** General intelligence and its heritability. The genetics of special cognitive abilities and educational attainment.
7. **The genetics of psychological traits.** The genetics of personality, psychopathology, attachment, attitudes and behavior.
8. **Midterm examination.**
9. **Epigenetics**. The role of epigenetics in gene expression. Types of epigenetic variation. The transcriptome. The proteome. Endophenotypes. Epigenome-wide association studies.
10. **The role of the environment**. The generality and the components of the shared environment. Co-twin studies of parenting. The gloomy prospect and the role of the nonshared environment. Within-person changes after critical life events.
11. **Gene-environment interplay**. Gene-environment interactions, the Scarr-Rowe hypothesis, the Wilson effect. Gene environment correlations: passive, evocative, reactive.
12. **Causal reasoning with genetic data**. Sibling control and co-twin designs. Mendelian randomization.
13. **Ethics and the future**. Ethics and the potential for misuse in genetic research. Genetic dystopias in fiction. Current and future genetic technologies: IVF, IVG, embryo screening and selection, genetic engineering.
14. **Summary and repetition**.

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB007_1A, AOMKPSZB007_2A, AOVMAG1156_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

Attendance at 50% of lectures is compulsory. As no parallel classes are available, there is no possibility for making up missed classes. Medical notes justifying absences are accepted.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

Students must complete a midterm examination on the eighth week of the semester during the normal lecture hours. The midterm examination is an electronic, Moodle-based test consisting of multiple choice questions, and it covers the topics taught until then (lectures 1-7). Students who

miss the midterm must complete it during the last class. The midterm examination is evaluated on a five-point scale (1-5). If students fail their midterm at the regular time during the 8th week, they may improve their grade during the last class. If students don’t attend the 8th week midterm and fail during the last class, there is no way to further improve their grade.

Number and type of individual assignments to be completed, submission deadlines:

N/A

Requirements for the successful completion of the course:

Regular attendance (50%) and a successful (grade at least 2) midterm examination.

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

All topics covered during the lectures are in the final examination.

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department’s website referring to the minimum requirements of the course.

Students need to minimally be aware of the contents of the Glossary and Key concepts sections of the primary textbook (Knopik et al 2017: Behavioral Genetics), as well as the contents of the slides released for the lectures.

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

Both the midterm and the final examinations are evaluated on a five-point scale. The midterm provides 45% and the final examination 55% of the final grade, which is then rounded to the nearest integer. This effectively means that if the midterm and final examinations result in adjacent grades, the final examination grade is used as the final grade.

Artificial intelligence systems used in the teaching of the subject and the manner of their application

AI is not directly used in the instruction of the subject. Students are free to use any AI system in the synthesis and interpretation of lecture materials.

Printed resources:

Type	Mandatory
Author	Valerie S. Knopik
Title	Behavior genetics
Publisher	New York, Worth Publishers
Year of publication	2017

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: A fejlődés kognitív idegtudománya
Name of subject in English: Developmental cognitive neuroscience
Name of subject in German: Entwicklungsbezogene kognitive Neurowissenschaft

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Credit value of the course: 2
Semester: 2nd semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB009_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, Nagyvárad tér 4., room 2004., H-1089 Budapest Hungary. Tel.: +36 1 210 29 30 / 56404
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014

Objectives of the course, and its place in the curriculum of the medical training program:

The course provides an in-depth overview of brain development and cognitive processes from prenatal age through adolescence. Students will learn core research methods (e.g. EEG/ERP, MRI, neurogenetics) and key findings on how neural structure and function change over early development. Emphasis is on empirical studies across the lifespan—from prenatal/perinatal stages to teenage years—including typical development and neurodiverse populations.

Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Knowledge:
- Knowledge of the structural organization and anatomy of the central and autonomic nervous systems
- Basic developmental biology (including ontogenetic and phylogenetic aspects)
- Advanced knowledge of behavioral physiology
- Evolutionary-based behavioral physiology models and knowledge

Skills:
- Analyse and interpret neuroanatomical and neurophysiological relationships, critically examine the biological foundations of animal and human behaviour, evolutionary and genetic factors, their interactions, and adaptive functions
- Interpret and investigate the physiological background of mental and cognitive processes (e.g. mood, emotion, memory, attention, decision-making) and apply research methods critically
- Analyse developmental characteristics of the nervous system and evaluate the role of animal models in psychobiological research
- Critical analysis of psychological phenomena in terms of biological mechanisms and within a biomedical context, as well as knowledge of psychology, biology, neuroscience, cognitive science, and their interconnections

Attitudes:
- critical: critically evaluate scientific claims and recognize their empirical foundations, strengths, and limitations
- rational: drawing conclusions based on logical reasoning and scientifically validated evidence
- curious: interest in deeper underlying mechanisms of phenomena, formulation of questions, and pursuit of scientific explanations

Autonomy, and responsibility:
- Expresses opinions independently, with professional grounding and a clear sense of responsibility
- Based on their professional knowledge and awareness, is capable of independently analyzing and interpreting emerging professional questions
- Initiates and conducts responsible, rational, and evidence-based discussions with professionals from related disciplines

Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB017_1A, AOMKPSZB019_1A, AOMKPSZB019_2A

Prerequisites for course registration and completion: (NEPTUN ID):

None

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

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The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

1. Dr. Brigitta Tóth: Introduction to Developmental Cognitive Neuroscience (Keywords: scope, lifespan, methods)– Objective: Introduce the field's scope and history. Defines developmental cognitive neuroscience, outlines research questions, and provides an overview of key methods (EEG, imaging, genetics) and developmental stages covered in the course.

2. Dr. Brigitta Tóth: Research Methods (EEG, MRI, Genetics) (Keywords: EEG, fMRI, genetics) Objective: Cover core methods in developmental research. Topics include electrophysiology (EEG/ERP), structural and functional MRI, and genetic/epigenetic techniques. Emphasizes adaptations for infants/children and methodological considerations (e.g. movement, compliance).

3. Dr. Brigitta Tóth: Genes and Epigenetics (Keywords: heredity, epigenetics, environment) Objective: Examine biological influences on development. Covers genetic factors (e.g. common developmental genes), epigenetic regulation, and gene–environment interactions. Discusses how these factors shape early brain and cognitive development.

4. Dr. Brigitta Tóth: Brain Development & Plasticity (Keywords: prenatal development, synaptogenesis, critical periods) Objective: Topics include prenatal neurogenesis, synaptic pruning, myelination, and the emergence of cortical networks. Discusses neural plasticity and sensitive/critical periods in development.

5. Dr. Brigitta Tóth: Perception and Attention (Keywords: sensory development, vision, attention) Objective: Explore development of sensory systems and attention. Covers maturation of vision and audition in infants, infant attentional orienting, and development of sustained/selective attention. Includes discussion of neural mechanisms and behavioral milestones.

6. Dr. Brigitta Tóth: Social Cognition and Face Processing (Keywords: social brain, face perception, ToM) Objective: Cover the social brain's development. Topics include infant face and emotion recognition, joint attention, and theory of mind emergence. Reviews typical versus atypical

social development (e.g. autism spectrum) and related brain changes.

7. Dr. Brigitta Tóth: Language Development (Keywords: speech perception, bilingualism, learning) Objective: Examine how children acquire language. Covers early speech discrimination, vocabulary and grammar learning, and the role of social interaction. Discusses critical periods for language and how bilingual environments influence neural development.

8. Dr. Brigitta Tóth: Learning and Memory (Keywords: memory systems, hippocampus, consolidation) Objective: Topics include distinctions between implicit and explicit memory, hippocampal and cortical maturation, and how learning and recall improve with age.

9. Dr. Brigitta Tóth: Executive Functions and Numeracy (Keywords: working memory, inhibition, numeracy) Objective: Cover development of cognitive control and math skills. Discusses working memory and inhibitory control (frontal lobe development) and basic numeracy (number sense, counting). Relates these skills to classroom learning and common developmental disorders (e.g. ADHD, dyscalculia).

10. Dr. Brigitta Tóth: Neurodiversity and Clinical Populations (Keywords: atypical development, neuro disorders, brain imaging) Objective: Cover developmental trajectories in neurodiverse and clinical groups. Discusses conditions like autism, ADHD, and other neurodevelopmental disorders. Reviews findings from EEG, MRI, and behavioral studies on how these conditions alter brain development.

11. Dr. Brigitta Tóth: Global & Cross-Cultural Development (Keywords: cultural context, global perspectives, diversity) – Objective: Examine development from a worldwide perspective. Covers how cultural norms, practices, and environments shape cognitive development. Discusses cross-cultural studies and population differences, highlighting universals and variability. Emphasizes global developmental data and the influence of socio-cultural factors on brain and behavior.

12. Dr. Brigitta Tóth: Surveys and Assessment of Neurodevelopment (Keywords: standardized tests, longitudinal studies, norms) – Objective: Introduce tools for measuring developmental trajectories. Covers standardized assessments (e.g. Bayley Scales, intelligence tests) and large-scale surveys of child development. Discusses longitudinal cohort and cross-sectional studies, norms for cognitive milestones, and statistical approaches to tracking growth. Students learn how research surveys and assessments quantify neurodevelopment across populations.

13. Dr. Brigitta Tóth: Key Themes & Future Directions (Keywords: summary, research frontiers, emerging issues) – Objective: Synthesize major course themes and look ahead. Summarizes how neural, genetic, and environmental factors interact across development. Reviews emerging trends (e.g. translational research, personalized interventions, ethical issues). Highlights open questions and future research directions in developmental cognitive neuroscience.

14. Dr. Brigitta Tóth: Summary and repetition.

Other courses with overlapping topics (obligatory, optional, or elective courses) in

interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB004_1A, AOMKPSZB001_1A, AOMKPSZB001_2A, AOMVPSZB027_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

The requirement for course signatrure is that students attend at least 50% of the lectures.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

-

Number and type of individual assignments to be completed, submission deadlines:

-

Requirements for the successful completion of the course:

Course signature and achievement of at least 50% on the written end-term examination (minimum 25/50 points).

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

Written examination includes the following topics:

Introduction to Developmental Cognitive Neuroscience
Research Methods (EEG, MRI, Genetics)
Genes and Epigenetics
Brain Development & Plasticity
Perception and Attention
Social Cognition and Face Processing
Language Development
Learning and Memory
Executive Functions and Numeracy
Neurodiversity and Clinical Populations

Global & Cross-Cultural Development
Surveys and Assessment of Neurodevelopment
Key Themes & Future Directions

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

Developmental cognitive neuroscience (basic definition); typical vs. atypical development; developmental stages (prenatal, infancy, childhood, adolescence); EEG (basic principle); ERP (time-locked response); MRI (structural imaging); fMRI (functional imaging); genetics vs. epigenetics (basic distinction); neurogenesis; synaptogenesis; synaptic pruning; myelination; neural plasticity; critical vs. sensitive period; gene–environment interaction; epigenetics (basic concept); attention (basic concept); working memory; inhibitory control; Theory of Mind; joint attention; language acquisition; critical period for language; implicit vs. explicit memory; hippocampus (basic role); neurodevelopmental disorder (basic concept); autism (basic characteristics); ADHD (basic characteristics); longitudinal vs. cross-sectional design; developmental norm.

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

The evaluation will be based on the written exam as follows:
- the maximal score will be 50 points
- grade 5: 43-50 points
- grade 4: 37-42 points
- grade 3: 31-36 points
- grade 2: 25-30 points
- grade 1: 0-24 points

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students' independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.

While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Other resources:

Required	pdf.igen
Other/Comment	Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Laboratóriumi gyakorlat: pszichiátriai genetika, molekuláris technikák, EEG, hordozható eszközök, MRI, FNIRS, kísérleti kognitív pszichológia II.
Name of subject in English: Laboratory practice: Psychiatric genetics, Molecular techniques, EEG, wearables, MRI, fNIRS, Experimental cognitive psychology II.
Name of subject in German: Laborpraktikum: Psychiatrische Genetik, molekulare Techniken, EEG, tragbare Geräte, MRI, fNIRS, experimentelle kognitive Psychologie II.

Credit value of the course: 4
Semester: 2nd semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
56.0	0.0	56.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB008_2A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, Nagyvárad tér 4., room 2004., H-1089 Budapest Hungary. Tel.: +36 1 210 29 30 / 56404
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014

Objectives of the course, and its place in the curriculum of the medical training program:

This laboratory-based practical course provides comprehensive training in modern psychophysiological, neurobiological, neuroimaging and molecular methods used in psychobiological

research, experimental psychology, and cognitive neuroscience. Practical classes will introduce methods in cardiovascular psychophysiology, including electrocardiography (ECG) recording and heart rate variability (HRV) analysis. In the EEG modules, participants will learn the technical foundations of EEG recording, polysomnography, neuroimaging techniques and psychopharmacological measures. During the course, students will visit labs and acquire skills in different research techniques. Throughout the course, emphasis is placed on methodological rigor, artifact recognition, data quality control, ethical considerations, and translational relevance in psychobiology and cognitive research.

Format of the course (lectures, group work, practical lessons, etc.):

practical lesson

Competencies acquired through completion of course:

Knowledge:
- Characteristics, advantages, and limitations of research methods used in psychobiology
- Advanced knowledge of behavioral physiology
- In-depth knowledge of the effects of drugs and other active substances on behavior and psychological processes
- Basic neuropsychiatric knowledge and neuropsychological assessment methods

Skills:

- Interpret and investigate the physiological background of mental and cognitive processes (e.g. mood, emotion, memory, attention, decision-making) and apply research methods critically
- Analyse developmental characteristics of the nervous system and evaluate the role of animal models in psychobiological research
- Ability to design experiments/studies, analyze data, interpret findings, write scientific papers and reports, create data visualizations, and present research results
- Critical thinking in the evaluation of results, recognition of patterns and relationships, formulation of hypotheses, generation of new research questions, and development of creative solutions

Attitudes:
- critical: critically evaluate scientific claims and recognize their empirical foundations, strengths, and limitations
- rational: drawing conclusions based on logical reasoning and scientifically validated evidence
- committed to renewal and continuous improvement: receptiveness to new research directions, methods, and theoretical frameworks
- curious: interest in deeper underlying mechanisms of phenomena, formulation of questions, and pursuit of scientific explanations
- persistent: ability to work consistently toward long-term research goals and overcome obstacles
- self-critical and inclined toward reflection: conscious reflection on own thinking, decisions, and their scientific grounding
- open to interdisciplinary collaboration: effective communication and cooperation with experts

from other scientific fields

Autonomy, and responsibility:
- Expresses opinions independently, with professional grounding and a clear sense of responsibility
- Takes responsibility for their own work and for the work of students and colleagues under their supervision
- Based on their professional knowledge and awareness, is capable of independently analyzing and interpreting emerging professional questions
- Initiates and conducts responsible, rational, and evidence-based discussions with professionals from related disciplines
- Is committed to professional principles and takes responsibility for the reliability of the knowledge they generate (ensuring objective, reproducible scientific results)
- Is dedicated to upholding research ethics, takes responsibility for adherence to ethical standards—especially in human and animal studies—and considers the social and moral implications of research findings
- Understands the importance of science communication (presenting research results in an accessible manner) and, as a member of the scientific community, takes responsibility for addressing misconceptions, pseudoscientific theories, and misleading narratives in psychology and biology

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Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB008_3A, AOMKPSZB015_1A

Prerequisites for course registration and completion: (NEPTUN ID):

Laboratory practice: Psychiatric genetics, Molecular techniques, EEG, wearables, MRI, fNIRS, Experimental cognitive psychology I.

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

Concurrent registration with the 1st and 3rd part of this multi-semester course (Laboratory practice: Psychiatric genetics, Molecular techniques, EEG, wearables, MRI, fNIRS, Experimental cognitive psychology I. and III.) is not allowed.

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered

separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

Dr. G. Horváth Csenge -16 (SE Magtud)
Dr. Szabados-Szalárdy Orsolya - 16 (SE Magtud)
Dr. Farkas Kinga - 8 (SE Pszichiátria)
Dr. Tóth Brigitta - 8 (HUN-REN TTK)
Dr. Gyebnár Gyula - 16 (SE Neuroradiológiai Tanszék)
Dr. Czobor Pál - 8 (SE Pszichiátriai Klinika nyugd.)
Dr. Kakuszi Brigitta -8 (SE Pszichi Klinika)
Dr. Horváth András - 8 (SE Anatómiai, Szövet- és Fejlődéstani Intézet)
Dr. Dobolyi Árpád - 8 (SE Anatómiai, Szövet- és Fejlődéstani Intézet)
Dr. Sákovics Anna - 8 (SE Idegsebészeti és Neurointrvenciós Klinika)
Dr. Jordán Zsófia - 8 (SE Idegsebészeti és Neurointrvenciós Klinika)

1. Electrocardiography and HRV in practice - Dr. Kinga Farkas
Interpreting ECG recording. Major malign alarming signs and benign atypicalities (examples), ECG registration (5 min, chest strap), effects of vagal manoeuvres and/or hyperventillation. Recording preprocessing and inspection of RR intervals, calculating RMSSD, SDNN.

2. Portable monitoring devices in practice - Dr. Csenge G. Horváth
Hands-on experience with wearable physiological monitoring devices, overview of the software and manuals of the devices, signal quality assessment, participant preparation with standardised instructions, self-administered home use for experiential learning

3. Portable monitoring devices - self experience - Dr. Csenge G. Horváth
Presentation and discussion of participants' self-collected data, review of data quality and common artifacts, introduction to basic data processing and visualization, discussion of methodological considerations and the user experience.

4. Reaction time paradigms and EEG practical recording - Dr. Orsolya Szabados-Szalárdy
Introduction to reaction time paradigms in cognitive neuroscience, basic principles of stimulus–response experiments, experimental design for reaction time measurements, event markers and stimulus synchronization in EEG recordings, event-related analysis and ERPs, practical EEG recording during a reaction time task, basic inspection of EEG data and behavioral responses

5. EEG paradigms investigating cognitive functions, practical EEG recording - Dr. Orsolya Szabados-Szalárdy
Introduction to attention paradigms in EEG research, experimental investigation of selective attention, structure and design of attention tasks, recording EEG during attention-related cognitive tasks, identification of task-related EEG responses, practical training in EEG data acquisition during cognitive paradigms

6. Functional Brain Networks – EEG Connectivity Analysis – Dr. Brigitta Tóth
Overview of preprocessing steps relevant for connectivity (artifact rejection, filtering, segmentation). Demonstration of connectivity measures (coherence, phase synchronization). Construction of functional networks from EEG data. Basic visualization techniques and interpretation of connectivity

patterns.

7. Diffusion MRI of the Brain – Preprocessing and Corrections - Dr. Gyula Gyebnár
Diffusion MRI, preprocessing, motion correction, distortion correction, data quality, DTI processing

8. Diffusion MRI of the Brain – Strategies (Voxel-level, Tractography, Connectomics) - Dr. Gyula Gyebnár
Voxel-wise analysis, tractography, structural connectivity, connectomics, white matter pathways, network analysis, diffusion modeling

9. Social Cognition, Error-related potentials, Self-monitoring I. - Dr. Pál Czobor
Social cognition, error-related negativity (ERN), performance monitoring, self-monitoring, cognitive control, EEG markers, decision-making

10. Social Cognition, Error-related potentials, Self-monitoring II. - Dr. Brigitta Kakuszi
Error processing, ERPs, adaptive behavior, feedback processing, cognitive control, monitoring systems, social decision-making

11. Clinical Assessment and Monitoring of Neurodegeneration - Dr. András Horváth
Neurodegenerative diseases, clinical assessment, biomarkers, disease progression, cognitive decline, longitudinal monitoring

12. Chemogenetics in animal behavioural research - Dr. Árpád Dobolyi
Basic principles of chemogenetics and its application in neuroscience research. Overview of commonly used chemogenetic tools. Methods for targeted manipulation of neuronal activity in animal models. Experimental design considerations in behavioural studies.

13. Video-EEG monitoring and the process of epilepsy surgery evaluation - Dr. Anna Sákovics
Video-EEG, epilepsy diagnosis, seizure localization, presurgical evaluation, ictal/interictal activity, clinical neurophysiology

14. Functional mapping and neuropsychological assessment - Dr. Zsófia Jordán
Functional mapping, brain localization, neuropsychological testing, cognitive assessment, presurgical mapping, and cortical functions

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Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB001_1A, AOMKPSZB001_2A, AOMKPSZB005_1A, AOMKPSZB007_1A, AOMKPSZB007_2A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

Students are expected to attend regularly the course and participation list will be recorded at the end of every practical lession. Participating on at least 75% of the total number of practical lessions

is a prerequisite for getting the signature to absolve the course. The maximum number of absences permitted: 3 absences from the practical lessons.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

An active participation on at least 75% of the total number of practical lessons is required. On each lesson the course leader will score the activity of the students on a 1-10 point scale based on their participation in the experiments or filling a laboratory record.

Number and type of individual assignments to be completed, submission deadlines:

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Requirements for the successful completion of the course:

75% presence of the total number of lessons and at least 50 points collected

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Type of assessment:
term grade

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

No examination will be held, students will receive a term-grade based on their regular activity on the lessons.

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department’s website referring to the minimum requirements of the course.

Can perform simple physiological recordings using standard equipment with guidance (e.g., ECG, EEG, wearable devices).
Demonstrates basic understanding of signal quality, including recognizing obvious artifacts and poor recordings.
Is able to follow standardized measurement protocols and participant preparation instructions.

Can perform basic data inspection, including:
- identification of key signal features (e.g., RR intervals, EEG responses)
- recognition of irregularities or noise

Understands and can calculate or interpret simple metrics at a basic level (e.g., heart rate variability).
Shows basic understanding of experimental design principles, including:
- stimulus–response relationships
- timing and event marking in recordings

Can participate in data collection and simple analysis workflows, including:
- preprocessing steps at a conceptual level
- basic visualization and interpretation of results

Is able to interpret results at a descriptive level, without requiring deep analytical or statistical knowledge.
Participates in discussion of collected data, including:
- identifying common artifacts
- reflecting on measurement limitations and user experience

Awareness of ethical and methodological considerations in human and animal research

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Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

The evaluation will be based on the collected points during the semester as follows:
- the maximal score will be 140 points
- grade 5: 100-140 points
- grade 4: 83-99 points
- grade 3: 66-82 points
- grade 2: 50-65 points
- grade 1: 0-49 points

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students’ independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.

The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Other resources:

Required	pdf.igen
Other/Comment	Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Haladó statisztika és adatelemzés a viselkedés- és orvostudományokban II.
Name of subject in English: Advanced statistics and data analysis in behavioural and biomedical sciences II.
Name of subject in German: Fortgeschrittene Statistik und Datenanalyse in den Verhaltens- und Biomedizinischen Wissenschaften - II

Credit value of the course: 3
Semester: 2nd semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
42.0	14.0	28.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB007_2A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, Nagyvárad tér 4., room 2004., H-1089 Budapest Hungary. Tel.: +36 1 210 29 30 / 56404
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014

Objectives of the course, and its place in the curriculum of the medical training program:

This course builds on Advanced Statistics and Data Analysis in Behavioural and Biomedical Sciences – I and aims to teach advanced-level statistical methods. The focus is on more complex multivariate

analytical techniques essential for quantitative analysis in modern behavioral and biomedical research. The objective is to enable students to address complex research questions through advanced statistical modelling while deepening their methodological thinking and analytical skills. Students will learn about mixed-effects models, extended forms of generalized linear models (GLM), and dimensionality reduction techniques such as principal component analysis (PCA) and factor analysis. The course also introduces the basics of nonlinear modelling and machine learning, paving the way for interdisciplinary approaches to data analysis.

Format of the course (lectures, group work, practical lessons, etc.):

lectures and practical classes

Competencies acquired through completion of course:

By the end of the course, students will be able to analyze complex, hierarchically structured data, apply tools for dimensionality reduction, and select statistical models appropriate to their research goals. Through practical examples and assignments, students will enhance their confidence in working with data, interpreting results, and placing findings in scientific context. This course provides advanced statistical knowledge essential for high-quality independent work in quantitative research.

Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB013_1A, AOMKPSZB002_1A

Prerequisites for course registration and completion: (NEPTUN ID):

Successful completion of the course “Advanced Statistics and Data Analysis in Behavioural and Biomedical Sciences – I” is required.

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

This is a multi-semester course. Because the second semester is based heavily on the first one, and because the two semesters are never concurrently taught, concurrent registration is not possible.

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered

separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

Each week, a single 3x45 minute instruction block is held, each consisting of one lecture and two seminars. The topics of these are identical, with the lecture presenting the theory of the material, and the practical classes dedicated to the class solving problems related to the topic.

1. **Non-parametric statistics**. The need for non-parametric tests, ranking. Mann-Whitney and Wilcoxon rank-sum tests. Wilcoxon signed-rank test. Kruskal-Wallis and Jonckheere-Terpstra tests. Revisiting rank correlation. Friedman ANOVA.
2. **Logistic regression**. The need for logistic transformation. Link functions. Repetition: Deviation, log-likelihood, odds ratio. R-squared analogs in logistic regression. Interpreting and diagnosing logistic regression. Multinomial logistic regression.
3. **Mixed-effects models**. The independence assumption problem, intraclass correlation. Fixed and random effects, partial pooling. Covariance structure. Within- and between-participant effects. Random intercept and random slopes models. Idiographic effects.
4. **Exploratory factor analysis**. The principle of dimension reduction. The correlation/covariance matrix. Exploratory factor analysis, principal component analysis. Loadings, eigenvalues, communality, factor matrix, scree plot, Kaiser's rule. Oblique and orthogonal rotations. KMO and Bartlett tests.
5. **Confirmatory factor analysis**. Latent and manifest variables. Path models, Wright tracing rules. Implied and residual correlation matrix. Model fitting, fit diagnostics, modification indices. Hierarchical and bifactor models. Factor scores, latent correlations, congeneric and tau-equivalent tests. Internal consistency of tests.
6. **Item response theory, measurement invariance.** The concept of bias. Factorial, partial, weak, strong and strict measurement invariance. Fitting models to item data, 1PL, 2PL models. Finding and estimating item bias.
7. **Multivariate statistics: discriminant analysis, cluster analysis.** Representing multidimensional data as spatial coordinates. Hierarchical and K-means cluster analysis. Multi-dimensional mapping. Discriminant analysis.
8. **Time-series analyses**. Examples of time-series data. Autocorrelation, cross-correlation, coherence, phase-lag indices. Fourier transformation, spectral analysis. Hilbert transformation, instantaneous amplitude, frequency and phase.
9. **Meta-analysis. Issues with narrative literature reviews**. Effect size and precision. Effect size conversions. Averaging effect sizes, calculating standard errors. Fixed and random effects meta-analysis. Multilevel meta-analysis. Heterogeneity, publication bias, meta-regression. Forest and funnel plots. Correcting effect sizes for random error.
10. **Simple learning algorithms 1 – Basics of learning algorithms.** Supervised and unsupervised learning, shallow and deep learning. Decision trees, support vector machines, neural networks. LLM-assisted creating of simple learning algorithms.
11. **Simple learning algorithms 2 – Regularized regression**. Problems with model identification and overfitting. Cross-validation, training, validation and holdout samples. The concept of regularization. Tuning alpha: ridge, elastic net and LASSO regression. Out-of-sample testing.
12. **Circular statistics**. The need for circular statistics. Angles as coordinate vectors. The van Mises distribution, circular mean, circular variance. Rose plots. Circular tests: Rayleigh, Watson/Kuiper tests. The Watson-Williams and the Mardia test.
13. **Open data: finding and using pre-existing data for your research. The philosophy of**

causal inference. Finding and accessing databases. R packages for accessing data. Randomized experiments. Genes and time as sources of identifiable causation. Causality in observational data, recall bias, jingle-jangle fallacies.
14. **Summary and repetition**.

All classes are taught by Péter Przemyslaw Ujma, PhD (associate professor at the host institute).

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):

Requirements for attendance, options for making up missed sessions, and method of absence justification:

Participation in 75% of practical classes is mandatory for obtaining a signature. As no parallel classes are organized, making up for absences is not possible. A written doctor's note about the students' illness is accepted as justification of absence.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

Students are expected to solve problems during class and will be randomly called to present their results. These are rated by the lecturer as acceptable/not acceptable by the lecturer. Not acceptable presentations can be repeated. 3 acceptable in-class presentations per student are required for a signature.
Additionally, each student is expected to design and complete a research project by the last week, in which they obtain and analyze data using statistical methods they learned. AI can be used both during project design and data analysis. This must be written up (without AI use) in 3-5 pages.
Students need to explain the rationale of the project, the source of the data, the methods (even if suggested by AI) and the results. They need to specifically explain how they used AI, how they edited and verified AI output, and how AI solutions deviate from what is learned in class. The full seminar grade is given based on this project. The novelty and scientific rationale of the project is secondary, the goal is that the students demonstrate that they can use quantitative methods to analyze data, and they can intelligently use AI in this project.

Number and type of individual assignments to be completed, submission deadlines:

3 successful in-class presentation (randomly called up during class)
1 research project (deadline: date of last class)

Requirements for the successful completion of the course:

- regular attendance (required for signature)
- 3 successful in-class presentations (required for signature)
- research project (provides seminar grade)
- oral examination (provides lecture grade)

Type of assessment:
comprehensive examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

An oral comprehensive examination takes place in the exam period. In this, students need to briefly present their research project and answer the lecturer's questions about their code, results, and display items. The principal subject of the examination is the technical details of the students' own project, but the lecturer may ask brief questions related to any other topic mentioned during the semester. As this is a comprehensive examination, students are encouraged to explicitly use methods encountered in both semesters.

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

Students must be familiar with the concepts ("Key terms that I've discovered") and be able to solve the problems ("Smart Alex's tasks") listed after each chapter of the principal coursebook ("Discovering statistics using R") covered in the course. 50% success is minimally required. Minimum criteria are published on the institute's website:
https://semmelweis.hu/admission/programs/psychobiology-msc/

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

Both seminars and examinations are graded on a five-point scale. Both are an even mix of theoretical and practical skills as students are expected to use the theory learned in class to complete a real-world assignment, and understand the assistance AI can provide for this. Seminar and examination grades are fully independent, seminar grades are not transferred to the examination in any way. No offered grade is available.

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Students may use any AI system to learn about the material, to get ideas about analyses, to write code, and to present results. The use of AI systems, as well as the proper way of double-checking AI results, is an essential part of instruction. The critical use of AI systems must be disclosed in detail for the project work. During the oral examination, students must demonstrate that they used AI systems intelligently and critically and that they are familiar with the material even without the use of AI.

Printed resources:

Type	Recommended
Author	Field A., Miles J., & Field Z.
Title	Discovering statistics using R.
Publisher	SAGE Publications
Year of publication	2012

Type	Recommended
Author	Hunter J. E., Schmidt F.I.
Title	Methods of Meta-Analysis.
Publisher	Sage Publications, Inc.
Year of publication	2004

Type	Recommended
Author	Loehlin J. C., Beaujean A. A.
Title	Latent Variable Models: An Introduction to Factor, Path and Structural Equation Analysis.
Publisher	Routledge
Year of publication	2017

Other resources:

Required	pdf.igen
Other/Comment	Slides and other custom materials released by the instructor

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Neuroanatómia és neurofiziológia II.
Name of subject in English: Neuroanatomy and neurophysiology II.
Name of subject in German: Neuroanatomie und Neurophysiologie II.

Credit value of the course: 3
Semester: 2nd semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB003_2A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, Nagyvárad tér 4., room 2004., H-1089 Budapest Hungary. Tel.: +36 1 210 29 30 / 56404
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014

Objectives of the course, and its place in the curriculum of the medical training program:

Building on the foundations of the first semester (Neuroanatomy and Neurophysiology I.), this course focuses on the functional organization of major neural systems and networks. Students study the anatomical and physiological bases of motor and sensory systems, including somatosensory, visual, auditory, and vestibular pathways, as well as key integrative structures such as the thalamus, basal ganglia, and limbic system. The course also introduces neural networks underlying higher

cognitive functions, including language, attention, and social cognition. Together with the first semester course, it provides the conceptual framework for later methodological and laboratory-based subjects.

Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Knowledge:
- Neural pathways and connectivity
- Functional organization of key neural systems, including sensory, motor, limbic, and higher cognitive networks.
- Neural basis of cognition and behavior

Skills:
- Identification of major neuroanatomical structures and systems using anatomical representations and schematic models.
- Interpretation of major neural pathways and functional circuits of the nervous system.
- Application of basic neurophysiological principles to explain neural communication and system-level functions.
- Integration of structural and functional knowledge to interpret neural mechanisms underlying behavior and cognition.

Attitudes:
- Openness to interdisciplinary approaches linking neuroscience, psychology, and biology.
- Precision and responsibility in the use of scientific terminology and neuroanatomical nomenclature.
- Analytical and integrative thinking in understanding complex neural systems.
- Commitment to evidence-based scientific reasoning.

Autonomy and responsibility:
- Ability to independently review and organize neurobiological knowledge related to brain structure and function.
- Responsible participation in learning activities and discussions related to neuroscience topics.
- Application of acquired knowledge as a foundation for further methodological, experimental, and laboratory-based courses

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Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB014_1A, AOMKPSZB015_1A

Prerequisites for course registration and completion: (NEPTUN ID):

Neuroanatomy and Neurophysiology – I.

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

Concurrent registration with the 1st part of this multi-semester course (Neuroanatomy and Neurophysiology – I) is not allowed.

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

Dr. Farkas Kinga - 8 (SE Pszichiátriai Klinika)
Dr. Szabados-Szalárdy Orsolya - 4 (SE Magtud)
Dr. Adorján István 6 (SE Anatómiai Intézet)
Dr. Fabó Dániel 4 (SE ETK)
Dr. Horváth András Attila 4 (SE Anatómiai Intézet)

1. Visual system I - Dr. Farkas Kinga
Structure of the eye and retina, phototransduction, visual pathways (optic nerve, chiasm, tract), lateral geniculate nucleus, primary visual cortex (V1) and basic visual processing.

2. Visual system II - Dr. Farkas Kinga
Higher-order visual processing, ventral (“what”) and dorsal (“where”) pathways, object and face recognition, biological motion perception, visual association areas.

3.Somatosensory system - Dr. Farkas Kinga
Proprioception, tactile systems (epicritic and protopathic sensation), nociception, gustatory and olfactory systems, integration of sensory information

4. Motor system - Dr. Farkas Kinga
Pyramidal tracts (corticospinal and corticonuclear pathways), neuromuscular junction, motor units, reflexes, basic organization of voluntary movement.

5. Extrapyramidal system - Adorján István
Structure and function of extrapyramidal motor systems, regulation of movement, interaction with cortical motor areas.

6. Limbic system - Dr. Adorján István
Components of the limbic system, emotional processing, motivation, and integration with autonomic

and endocrine functions.

7. Basal ganglia - Dr. Adorján István
Structure and functional circuits of the basal ganglia, role in movement control, habit learning, and action selection.

8.Thalamus - Dr. Fabó Dániel
Structure, nuclei, and functional organization of the thalamus, relay and integrative roles, thalamocortical connections.

9. Hippocampus and memory systems - Dr. Fabó Dániel
Anatomy of the hippocampus, memory formation and consolidation, types of memory systems, hippocampal networks.

10. Auditory and vestibular systems - Dr. Szalárdy Orsolya
Structure and function of the acoustic system, auditory pathways, vestibular system, balance and spatial orientation.

11. Speech and language systems - Dr. Szalárdy Orsolya
Neuroanatomy of speech production and comprehension, Broca's and Wernicke's areas, language networks and integration.

12. Neuroanatomy of social cognition - Dr. Horváth András
Key brain regions involved in social cognition (e.g. fusiform face area, temporoparietal junction, medial prefrontal cortex, orbitofrontal cortex), mirror neuron systems, default mode network.

13. Neuroanatomy of attention - Dr. Horváth András
Attention networks (alerting, orienting, executive control), underlying brain structures, neurotransmitter systems, functional integration.

14. Consultation (Farkas Kinga, Szalárdy Orsolya)
Summary and integration of functional systems, clinical relevance, consultation and exam preparation.

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB001_1A, AOMKPSZB001_2A, AOMVPSZB027_1A, AOMKPSZB004_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

The requirement for course signatrure is that students attend at least 75% of the lectures.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

None

Number and type of individual assignments to be completed, submission deadlines:

None

Requirements for the successful completion of the course:

Course signature and achievement of at least 50% on the comprehensive examination (minimum 25/50 points).

Type of assessment:
comprehensive examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

Topics from Neuroanatomy and neurophysiology I.
1. Organization of the nervous system: central vs peripheral divisions
2. Anatomical terminology and basic structural orientation
3. Structure and protective elements of the CNS (cranium, vertebral canal, meninges)
4. Ventricular system and cerebrospinal fluid circulation
5. Blood–brain barrier: structure and function
6. Major developmental divisions of the brain (prosencephalon, mesencephalon, rhombencephalon)
7. Structure of the telencephalon: lobes, gyri, sulci
8. Functional organization of the cerebral cortex (Brodmann areas, primary and association areas)
9. Gray and white matter: structure and functional differences
10. Types and roles of neural cells (neurons and glial cells)
11. Structure and function of synapses
12. Membrane potential and action potential generation
13. Synaptic transmission: excitatory and inhibitory processes (glutamate, GABA)
14. Synaptic plasticity: long-term potentiation (LTP) and long-term depression (LTD)
15. Organization of the peripheral nervous system: somatic and autonomic systems
16. Cranial nerves (I–XII): classification and basic functions
17. Structure and organization of the spinal cord and spinal nerves
18. Brainstem and cerebellum: main structures, nuclei, and functions
19. Major white matter pathways: association, commissural, and projection fibers
20. Neuromodulatory systems: dopamine, serotonin, norepinephrine, acetylcholine and their

functional roles

Topics from Neuroanatomy and neurophysiology II.

1. Structure and function of the eye and retina, basic principles of phototransduction
2. Visual pathways: optic nerve, chiasm, tract, lateral geniculate nucleus, primary visual cortex
3. Higher-order visual processing: ventral (“what”) and dorsal (“where”) streams
4. Neural basis of face recognition and biological motion perception
5. Organization of the somatosensory system: proprioception and tactile processing
6. Epicritic vs protopathic sensation, nociception and pain pathways
7. Gustatory and olfactory systems: structure and functional characteristics
8. Organization of the motor system: pyramidal tracts (corticospinal and corticonuclear pathways)
9. Neuromuscular junction and motor unit: structure and function
10. Reflexes: basic types and functional organization
11. Extrapyramidal motor system: structure and role in movement regulation
12. Basal ganglia: structure, circuits, and functional roles
13. Limbic system: components and role in emotion and motivation
14. Thalamus: nuclei, connections, and integrative functions
15. Hippocampus: structure and role in memory formation and consolidation
16. Auditory system: pathways and cortical processing
17. Vestibular system: structure and role in balance and spatial orientation
18. Language systems: Broca’s and Wernicke’s areas and their functional integration
19. Neural basis of social cognition (e.g. FFA, TPJ, mPFC, OFC, mirror neuron system, DMN)
20. Neuroanatomy of attention: alerting, orienting, and executive control networks

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Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department’s website referring to the minimum requirements of the course.

To obtain a passing grade, students must demonstrate a basic understanding of the core concepts of the neuroanatomy and neurophysiology, as well as the ability to interpret and apply this knowledge in a structured manner.

Basic Organization

- Divisions of the nervous system (CNS vs PNS)
- Somatic vs autonomic nervous system
- Basic anatomical terminology and orientation

Central Nervous System

- Structure of the brain and spinal cord
- Meninges, ventricular system, cerebrospinal fluid
- Blood–brain barrier

Brain Structure

- Major brain divisions (prosencephalon, mesencephalon, rhombencephalon)
- Telencephalon: lobes, gyri, sulci
- Brainstem and cerebellum: main parts and functions

Cortical Organization

- Primary motor and sensory cortices
- Association areas
- Basic understanding of Brodmann areas

Microanatomy
- Gray and white matter
- Neurons and glial cells (basic types and roles)
- Myelination
- Synapse structure

Neurophysiology
- Membrane potential and action potential (conceptual level)
- Synaptic transmission (excitatory vs inhibitory)
- Basic neurotransmitters (glutamate, GABA)
- Introduction to synaptic plasticity (LTP, LTD – conceptual)

Peripheral Nervous System
- Cranial nerves (general classification and main functions)
- Spinal cord organization and spinal nerves

Connectivity
- Basic types of white matter tracts (Association, Commissural, Projection fibers)

Neuromodulation
- Dopamine, serotonin, norepinephrine, acetylcholine (basic roles)

Support Systems
- Glial cell functions
- Neurovascular system and basic cerebral circulation

Visual System
- Structure of the eye and retina
- Basic principles of phototransduction (conceptual)
- Visual pathways: optic nerve, chiasm, tract, lateral geniculate nucleus
- Primary and higher-order visual cortices
- Ventral (“what”) and dorsal (“where”) pathways
- Basic principles of object and face recognition, biological motion perception

Somatosensory System
- Proprioception and tactile processing
- Epicritic vs protopathic sensation
- Nociception and basic pain pathways
- Gustatory and olfactory systems (basic structure and function)

Motor System
- Pyramidal tracts (corticospinal, corticonuclear pathways)
- Neuromuscular junction and motor unit (basic concept)
- Reflexes: basic types and organization

Extrapyramidal and Subcortical Systems
- Extrapyramidal system: role in movement regulation
- Basal ganglia: main structures and functional circuits
- Thalamus: basic nuclei, relay and integrative functions

Limbic and Memory Systems
- Limbic system: main components and functions
- Hippocampus: role in memory formation and consolidation

Auditory and Vestibular Systems
- Auditory pathways and cortical processing

- Vestibular system: balance and spatial orientation

Language Systems

- Broca’s and Wernicke’s areas
- Basic organization of speech production and comprehension

Higher-Order Cognitive Systems

- Neural basis of social cognition (FFA, TPJ, mPFC, OFC, mirror neuron system, DMN – conceptual understanding)
- Attention systems: alerting, orienting, executive control networks

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Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

The assessment of Neuroanatomy and Neurophysiology I–II. is based on a comprehensive end-of-term examination, which evaluates theoretical knowledge acquired across the two semesters.
The evaluation will be based on the written exam as follows:

- 86–100% Excellent, grade 5
- 74–85% Good, grade 4
- 60–73% Satisfactory, grade 3
- 50–59% Pass, grade 2
- <50% Fail, grade 1

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students’ independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Other resources:

Required	pdf.igen
Other/Comment	Course material

Required	pdf.igen
Other/Comment	Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: A pszichológia biológiai alapjai II.
Name of subject in English: The biological bases of psychology II.
Name of subject in German: Die biologische grundlagen der Psychologie II.

Credit value of the course: 3
Semester: 2nd semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB001_2A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, Nagyvárad tér 4., romm 2004, H-1089. Budapest Hungary. Tel: +36(1)210-2930/56404
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30.06.2014., - 01/2014

Objectives of the course, and its place in the curriculum of the medical training program:

Knowledge derived from a behavioural physiology-oriented approach to several core topics in biological psychology—specifically focusing on the physiological and behavioural regulatory principles and mechanisms related to food and fluid intake, sexual behaviour and parental care, sleep and biological rhythms, motivation and emotions, social cognition, and aggression.
The structure and content of the curriculum are informed by Konrad Lorenz’s human ethological

concept of the "the Relatively Entirety-Independent Component", the traditions of biological psychology (e.g., the role of oxytocin in social cognition), and fundamental concepts from medical physiology (e.g., regulation of blood glucose levels).

Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Knowledge:
- Advanced knowledge of behavioural physiology
- Behavioural physiological foundations of psychopathological phenomena.

Skills:
- Critical analysis of psychological phenomena in terms of biological mechanisms and within a biomedical context, as well as knowledge of psychology, biology, neuroscience, cognitive science, and their interconnections
- Interpret and investigate the physiological background of mental and cognitive processes (e.g. mood, emotion, memory, attention, decision-making) and apply research methods critically.

Attitudes:
- Rationality: drawing conclusions based on logical reasoning and scientifically validated evidence, committed to renewal and continuous improvement
- Receptiveness to new research directions, methods, and theoretical frameworks
- Curiosity: interest in deeper underlying mechanisms of phenomena, formulation of questions, and pursuit of scientific explanations
- Openness to interdisciplinary collaboration: effective communication and cooperation with experts from other scientific fields.

Autonomy and responsibility:
- Expressing opinions independently, with professional grounding and a clear sense of responsibility
- Based on their professional knowledge and awareness, students become capable to independently analyse and interpret emerging professional questions
- Initiating and conducting responsible, rational, and evidence-based discussions with professionals from related disciplines

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Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB014_1A, AOMKPSZB017_1A, AOMKPSZB019_1A, AOMKPSZB019_2A

Prerequisites for course registration and completion: (NEPTUN ID):

The biological bases of psychology – I.

In the case of multi-semester courses, position on the possibility of and conditions for

concurrent registration:

Concurrent registration with the 1st part of this multi-semester course (The biological bases of psychology – I) is not allowed.

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

1. **Neuronal integration, prediction and preparation of actions**
Integration of internal and external bodily state representations as a basis for action readiness. Somatotopic organization within the primary and higher-order somatosensory cortices, and their role in constructing dynamic body maps. Fundamental perceptual and clinical phenomena of body perception. Neural processing of biological motion and the recognition of human movement patterns. Associative mechanisms supporting the anticipation, interpretation, and social understanding of body movements and actions. (Kinga Farkas)
2. **Movement**
Basic organization of motor control systems. Structure and function of the primary motor cortex, premotor cortex, and supplementary motor areas. Upper and lower motor neurons in the initiation and execution of voluntary movement. Corticospinal system and extrapyramidal motor regulation. Sensorimotor integration and feedback mechanisms in the control of movement. Illustrative clinical examples of motor system dysfunction: Parkinson’s disease, cerebellar ataxia, motor neuron disorders. (Kinga Farkas)
3. **Motivation/Emotion – I.**
From fight-flight, through the reward system to mood (Krisztina Ella)
4. **Motivation/Emotion – II.**
Basic (human) emotions. Expression and recognition of emotions (facial expressions, vocal cues, bodily signals). Role of emotions in motivation, decision-making, and social interaction.
Clinical examples related to altered emotional processing (e.g., affective disorders, Capgras and Fregoli syndrome, autism spectrum disorder). (Kinga Farkas)
5. **Learning and Memory - I.**
Basic forms and mechanisms (Krisztina Ella)
6. **Learning and Memory - II.**
From modulatory factors, through the hippocampo-neocortical dialogue to predictive processing (Róbert Bódizs)
7. **Aggression**
From the death instinct, through the 'so gennante böse' to the neurobiology of aggression (Róbert Bódizs)
8. **Parental behaviour**: Biological functions of parental care. Hormonal regulation of parental

behavior: roles of sex steroids, prolactin, oxytocin. Neural mechanisms underlying parental responses, including hypothalamic and limbic circuits involved in caregiving and motivation. Sensory cues from offspring that trigger parental responses (olfactory, auditory, visual, tactile signals). Behavioral components of parental care. Interaction between reproductive physiology and caregiving behavior.
(Orsolya Szabados-Szalárdy)

9. **Individual differences in behaviour**

The psychobiology of personality (Róbert Bódizs)

10. **Human communication I.**

Non-verbal communication (Csenge G. Horváth)

11. **Human communication II.**

Verbal communication: speech perception and production. Acoustic and linguistic structure of speech signals (phonemes, syllables, prosody). Mapping acoustic signals onto linguistic representations. Categorical perception of phonemes and phonetic boundaries. Temporal processing and segmentation of continuous speech. Models of speech perception (motor theory, direct realist approaches, computational and predictive models). (Orsolya Szabados-Szalárdy)

12. **Attention:** Covert and overt orienting, selective and divided attention. How attention is implemented in the brain. Dorsal and ventral attentional networks. Attentional effects on sensory processing. Inattentional blindness. Perceptual load and neural correlates. The premotor theory of attention. Physiological states and clinical disorders affecting attentional functions.
(Orsolya Szabados-Szalárdy)

13. **Thinking**

Spontaneous and goal-directed thought, Heuristics versus Formal/Universal Processes, Conflict Detection/Inhibition, III-Structured and Well-Structured Situations, Default Mode Network, Salience Network and Executive Network (Csenge G. Horváth)

14. **Playing**

Issues regarding the definition of play, basic features of play behaviour, the ethology and neurobiology of play, developmental and functional aspects, play, art and culture (Csenge G. Horváth)

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):

AOMKPSZB003_1A, AOMKPSZB003_2A, AOMVPSZB027_1A, AOMKPSZB004_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

The requirement for course signatrure is that students attend at least 75% of the lectures.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):

(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

Written tests consisting of a few items focusing exclusively on the information presented in the last week’s lecture at the beginning of the actual lectures (starting from the second lecture) will be implemented. During the end-of-semester examination period, students demonstrate their knowledge in an oral exam. During this exam, they must present on two randomly selected topics. In case of achieving an overall study period test-performance of 75% or greater students are allowed to skip one of the randomly selected topics during the oral exam without any further consequences.

Number and type of individual assignments to be completed, submission deadlines:

13 short 5-minute quizzes (starting from the second week) at the beginning of the classes. Completing the quizzes is optional, and skipping them has no negative consequences. Students who achieve 75% of the total quiz points receive an exam benefit.

Requirements for the successful completion of the course:

Course signature and successful comprehensive examination (oral exam, min. grade 2).

Type of assessment:
comprehensive examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

Neuronal integration, prediction and preparation of actions
Movement: Preparation, perception and sensorimotor integration
Motivation/Emotion I: Fight or flight, reward system, and mood
Motivation/Emotion II: Emotion perception and expression, and the role of emotions
Learning and Memory I: Basic forms and mechanisms
Learning and Memory II: Modulatory factors, hippocampo-neocortical dialogue, and predictive processing
Aggression: Neurobiological basis, functions, theories
Parental behaviour: Forms, functions and neurobiological bases
Individual differences in behaviour: The psychobiology of personality
Human communication: Non-verbal communication
Human communication: Verbal communication
Attention: Forms, functions, and neurobiological bases
Thinking: Features, functions, and underlying brain structures
Playing: Definition, features, and functions

Body senses: Internal and external representations, receptors, somatosensory perception.
Vision I: Basic anatomy and optics of the eye, early cortical processing of visual information.
Vision II: Higher-level visual perception.
Audition I: Sound features, sound perception and the underlying brain structures and functions.

Audition II: Temporal auditory processing, object formation, and higher-order auditory functions.
Vestibular system: Vestibular perception and underlying brain structures and functions.
Volume and osmoregulation: Biological bases of drinking behaviour and sweating
Ingestive behaviour: The regulation of food intake
Behavioural activity and rest I: Rest-activity cycles, sleep and other dormant states
Behavioural activity and rest II: Chronobiology and circadian rhythms
Consciousness I: The psychobiology of conscious states
Consciousness II: Subliminal perception, awareness, and these neural correlates
Reproductive behaviour: Neural and hormonal control of reproductive behaviour
Executive functions: Goal-directed behavior, inhibition, working memory, cognitive flexibility

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Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

Functions of primary motor cortex, premotor cortex, and supplementary motor area
Concept of sensorimotor integration
Role of feedback mechanisms in movement control
Definition of motivation
Concept of fight-or-flight response
Basic idea of the reward system
Definition of mood
Definition of basic emotions
Modes of emotional expression: facial, vocal, bodily
Role of emotions in decision-making and social behavior
Definition of learning and memory
Basic forms of learning (e.g. associative, non-associative)
Concept of memory encoding, storage, retrieval
Hippocampus and its role in memory
Concept of systems consolidation (hippocampo–neocortical interaction)
Definition of modulatory factors (e.g. emotion, sleep) in memory
Basic idea of predictive processing
Definition of aggression
Basic biological and psychological explanations of aggression
Concept of neurobiological basis of aggressive behavior
Definition and function of parental care
Role of key hormones: oxytocin, prolactin, sex steroids
Basic neural circuits involved (hypothalamus, limbic system)
Types of sensory cues triggering caregiving behavior
Basic behavioral components of parental care
Definition of personality
Basic idea of biological bases of personality
Definition of non-verbal communication

Types: facial expressions, gestures, posture
Definition of speech perception and speech production
Basic units: phoneme, syllable, prosody
Concept of categorical perception
Definition of speech segmentation
Awareness of basic models of speech perception
Definition of attention
Types: selective, divided, overt, covert attention
Basic brain networks: dorsal and ventral attention systems
Definition of thinking
Distinction between automatic (heuristic) and controlled (analytical) processes
Concept of cognitive conflict and inhibition

Definition of interoception and exteroception
Basic functions of the autonomic nervous system (ANS) and distinction between sympathetic and parasympathetic divisions
Types and roles of visceral receptors (mechanoreceptors, baroreceptors, chemoreceptors)
Modalities of somatosensation: touch, proprioception, temperature, pain
Definition of nociception
Basic perceptual qualities: pressure, vibration, temperature, pain, body position
Concept of somatotopy and its representation in primary somatosensory cortex (S1)
Examples of basic disturbances of body perception (e.g. loss of sensation, altered body awareness)
Concept of receptive field
Definition of retinotopic organization
Basic idea of feature selectivity in primary visual cortex (V1)
Distinction between ventral (“what”) and dorsal (“where/how”) visual streams
Role of attention in visual perception
Definition of predictive coding
Definition of pitch, loudness, and timbre
Basic principles of sound localization (binaural cues)
Definition of complex tones
Definition of temporal envelope and fine structure
Concept of auditory scene analysis
Basic grouping principles (e.g. similarity, common onset)
Definition of auditory streaming
Role of attention and learning in auditory perception
Function: detection of angular and linear acceleration
Definition of vestibulo-ocular reflex (VOR)
Concept of multisensory integration
Definition of osmoregulation
Biological basis of thirst and fluid balance
Role of physiological signals in regulating drinking behavior
Definition of homeostatic regulation of food intake
Basic role of hunger and satiety signals
Definition of sleep and sleep stages
Concept of rest–activity cycle
Definition of circadian rhythm

Role of biological clocks in regulating daily cycles
Definition of consciousness
Basic distinction between different states of consciousness
Definition of subliminal perception
Concept of threshold of awareness
Basic idea of priming and unconscious processing
Distinction between sensory processing and conscious awareness
Basic concept of hormonal regulation of reproductive behaviour
Role of neural systems in reproduction
Definition of executive functions
Role of the prefrontal cortex
Core components: working memory, inhibition (self-control), cognitive flexibility

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Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

Oral examination on five-scale grading

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students' independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Printed resources:

Type	Mandatory
Author	Carlson Nr, Birkett MA
Title	Physiology of Behavior 13Th edition. Global edition.
Publisher	Harlow: Pearson.
Year of publication	2022

Type	Recommended
Author	Elizabeth D. Kirby, Melissa J. Glenn, Noah J. Sandstrom and Christina L. Williams
Title	Instroduction to Behavioral Neuroscience
Publisher	OpenStax, Chapter 19.
Year of publication	2024
Other/Comment	Attention and Executive function pages 833-882, course material

Type	Recommended
Author	Goel V.
Title	Cognitive Neuroscience of Thinking. In Handbook of Neuroscience for the Behavioral Sciences
Publisher	eds G.G. Berntson and J.T. Cacioppo
Year of publication	2009

Type	Recommended
Author	Andrews-Hanna, Jessica R., and others
Title	The Neuroscience of Spontaneous Thought: An Evolving Interdisciplinary Field
Publisher	---
Year of publication	2018

Type	Recommended
Author	Kalina Christoff and Kieran C. R. Fox (eds)
Title	The Oxford Handbook of Spontaneous Thought: Mind-Wandering, Creativity and Dreaming
Publisher	Oxford Library of Psychology - Oxford Academic
Year of publication	2018

Type	Recommended
Author	Canepa ME and Ramenghi LA
Title	The neurobiology of play: a narrative review of evidence from mice and humens for advancing neurorehabilitation
Publisher	Front. Neuroschi. 19. 1729411
Year of publication	2026
Other/Comment	doi:10.3389/fnins.2025.1729411

Other resources:

Required	pdf.igen
Other/Comment	coures material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Hormonok és viselkedés
Name of subject in English: Hormones and behaviour
Name of subject in German: Hormone und Verhalten

Credit value of the course: 2
Semester: 2nd semester, 3rd semester, 4th semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
optional

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMVPSZB027_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, Nagyvárad tér 4., room 2004., H-1089 Budpest, Hungary, Tel.: +36(1)2010-2930/56404
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30.06.2014., 01/2014.

Objectives of the course, and its place in the curriculum of the medical training program:

This course introduces the neuroendocrine system through which hormones influence the brain functions and behaviour. The course outline includes the organization of the neuroendocrine system, with particular emphasis on the hypothalamus–pituitary axes and their role in regulating physiological and behavioural processes. Students will explore how hormones affect key behavioural domains, including stress responses, feeding, reproduction, parental care, aggression and circadian

rhythms. The course also addresses the role of metabolic, thyroid and neuropeptide signalling systems in behavioural regulation. Special attention is given to hormonal modulation of emotional and cognitive functions, as well as the influence of hormones on brain development across the lifespan. Finally, the course discusses interactions between the endocrine and immune systems and their relevance for health and disease.

Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Knowledge:
- Knowledge of the structural organization and anatomy of the central and autonomic nervous systems
- Basic developmental biology (including ontogenetic and phylogenetic aspects)
- Advanced knowledge of behavioral physiology
- Behavioral physiological foundations of psychopathological phenomena
- Basic neuropsychiatric knowledge and neuropsychological assessment methods

Skills:

- Analyse and interpret neuroanatomical and neurophysiological relationships, critically examine the biological foundations of animal and human behaviour, evolutionary and genetic factors, their interactions, and adaptive functions
- Interpret and investigate the physiological background of mental and cognitive processes (e.g. mood, emotion, memory, attention, decision-making) and apply research methods critically
- Analyse developmental characteristics of the nervous system and evaluate the role of animal models in psychobiological research
- Critical analysis of psychological phenomena in terms of biological mechanisms and within a biomedical context, as well as knowledge of psychology, biology, neuroscience, cognitive science, and their interconnections

Attitudes:
- critical: critically evaluate scientific claims and recognize their empirical foundations, strengths, and limitations
- rational: drawing conclusions based on logical reasoning and scientifically validated evidence
- committed to renewal and continuous improvement: receptiveness to new research directions, methods, and theoretical frameworks
- curious: interest in deeper underlying mechanisms of phenomena, formulation of questions, and pursuit of scientific explanations
- open to interdisciplinary collaboration: effective communication and cooperation with experts from other scientific fields

Autonomy, and responsibility:

- Expresses opinions independently, with professional grounding and a clear sense of responsibility
- Based on their professional knowledge and awareness, is capable of independently analyzing and interpreting emerging professional questions
- Initiates and conducts responsible, rational, and evidence-based discussions with professionals from related disciplines

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Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB014_1A, AOMKPSZB017_1A

Prerequisites for course registration and completion: (NEPTUN ID):

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

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The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

Magtud:
Dr. Bódizs Róbert - 4 (2 ea)
Dr. Szabados-Szalárdy Orsolya - 6 (3 ea)

egyetemről kérünk:
Dr. Dobolyi Árpád (SE Anatómiai Intézet) - 6 (3 ea)
Dr. Nagy Géza - 2 (1 ea)

külsős
Dr. Tóth Attila (ELTE TTK) - 4 (2 ea)
Dr. Mikics Éva (KOKI) - 6 (3 ea)

1. Introduction to behavioural endocrinology and neuroanatomical basis of the neuroendocrine system. - Dr. Árpád Dobolyi
Hypothalamus–pituitary system overview. Hypothalamic control of neuroendocrine functions. Basic hypothalamic nuclei relevant to behaviour.

2. Neuropeptides and oxytocin - Dr. Árpád Dobolyi
Neuropeptide signaling, oxytocin system, social bonding, attachment, trust, maternal behaviour

3. Stress Hormones and Behavior - Dr. Mikics Éva
HPA axis, glucocorticoid mechanism of action, glucocorticoid dynamics, acute vs. chronic stress, allostasis and behavioral outcomes (e.g. stress coping, decision making, cognition)

4. Feeding Behaviour and Metabolic Hormones - Dr. Géza Nagy
Appetite, eating, insulin and diabetes

5. Parental behaviour and prolactin - Dr. Árpád Dobolyi
Prolactin function, parental care, paternal behaviour, lactation, neuroendocrine regulation, offspring interaction, caregiving circuits

6. Circadian Rhythms and Hormonal Timing. - Dr. Attila Tóth
Circadian regulation of endocrine systems. Melatonin rhythms and sleep behaviour. Daily fluctuations in mood and cognition.

7. Melatonin and sleep in humans - Dr. Róbert Bódizs
Hypothermic, soporific and chronobiotic effects of melatonin in humans, light-induced melatonin suppression in humans, age, melatonin and dementia, exogenous melatonin as treatment of various medical conditions

8. Neuroendocrine control of gonadotropin release - Dr. Róbert Bódizs
Gonadal hormones and their behavioural relevance, developmental programming of the brain (e.g. critical periods, sexual differentiation of the brain, prenatal hormone exposure)

9. Neuroendocrine control of thyroid hormone release - Dr. Orsolya Szabados-Szalárdy
Thyroid hormones (T3, T4), TRH and TSH regulation, metabolism, energy balance, brain development, cognitive function and behavioral outcomes, hypothyroidism/hyperthyroidism

10. Neuroendocrine control of growth hormone release - Dr. Orsolya Szabados-Szalárdy
GH axis, GHRH and somatostatin, IGF-1, growth regulation, metabolism, sleep-related GH secretion, developmental effects, anabolic processes

11. Hormones and Affective Behaviour. - Dr. Attila Tóth
Hormones and fear circuits, modulation of amygdala functions. Anxiety disorders and stress-related psychopathologies.

12. Hormones and Mental Health - Dr. Éva Mikics
(e.g. stress vulnerability, depression and HPA dysregulation, postpartum mood disorders, hormone-linked mood disorders)

13. Endocrine regulation of social behaviour and aggression - Dr. Éva Mikics
Aggression, dominance, social hierarchy, territorial behaviour, serotonin interaction, stress-aggression link, social decision-making

14. Neuroendocrine-immune interaction - Dr. Orsolya Szabados-Szalárdy
Psychoneuroimmunology, cytokines, inflammation, HPA axis–immune crosstalk, stress-immune interaction, sickness behaviour, neuroinflammation, immune modulation by hormones

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB001_1A, AOMKPSZB001_2A, AOMKPSZB003_1A, AOMKPSZB003_2A, AOMKPSZB004_1A, AOMKPSZB011_1A, AOMKPSZB014_1A, AOMKPSZB015_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

The requirement for course signatrure is that students attend at least 50% of the lectures.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

None

Number and type of individual assignments to be completed, submission deadlines:

-

Requirements for the successful completion of the course:

Achievement of at least 50% on the written end-term examination (minimum 25/50 points).

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

The evaluation will be based on the written test exam.

Topics and concepts are the following:
Neuroanatomical basis of the neuroendocrine system
Neuropeptides and oxytocin
Stress Hormones and Behavior
Feeding Behaviour and Metabolic Hormones
Parental behaviour and prolactin

Circadian Rhythms and Hormonal Timing
Melatonin and sleep in humans
Neuroendocrine control of gonadotropin release
Neuroendocrine control of thyroid hormone release
Neuroendocrine control of growth hormone release
Hormones and Affective Behaviour
Hormones and Mental Health
Endocrine regulation of social behaviour and aggression
Neuroendocrine-immune interaction

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

Neuroendocrine system – foundations:
- Neuroendocrine system (basic definition: neural–hormonal integration)
- Hypothalamus (basic role in homeostasis and hormone control)
- Pituitary gland (anterior vs. posterior – basic distinction)
- Releasing hormone (basic concept)
- Negative feedback (basic principle)

Hypothalamus–pituitary axes:
- HPA axis (basic structure: hypothalamus–pituitary–adrenal)
- HPG axis (basic structure: hypothalamus–pituitary–gonadal)
- HPT axis (basic structure: hypothalamus–pituitary–thyroid)
- Hormone cascade (basic concept)

Neuroendocrine system – foundations:
- Neuroendocrine system (basic definition: neural–hormonal integration)
- Hypothalamus (basic role in homeostasis and hormone control)
- Pituitary gland (anterior vs. posterior – basic distinction)
- Releasing hormone (basic concept)
- Negative feedback (basic principle)

Hypothalamus–pituitary axes:
- HPA axis (basic structure: hypothalamus–pituitary–adrenal)
- HPG axis (basic structure: hypothalamus–pituitary–gonadal)
- HPT axis (basic structure: hypothalamus–pituitary–thyroid)
- Hormone cascade (basic concept)

Gonadal hormones and development:
- Testosterone / estrogen (basic behavioural relevance)
- Sexual differentiation of the brain (basic concept)
- Critical period (basic developmental concept)

Thyroid hormones:
- T3 and T4 (basic role in metabolism)
- TRH and TSH (basic regulatory role)
- Hypothyroidism vs. hyperthyroidism (basic distinction)

Growth hormone axis:
- Growth hormone (GH) (basic function)
- GHRH vs. somatostatin (basic opposition)
- IGF-1 (basic role in growth)

Hormones and affective behaviour:
- Amygdala (basic role in fear and emotion)
- Hormonal modulation of emotion (basic concept)
- Anxiety (basic neuroendocrine link)

Hormones and mental health:
- HPA axis dysregulation (basic concept)
- Stress vulnerability
- Depression (basic hormonal association)

Social behaviour and aggression:
- Aggression (basic neurobiological concept)
- Social hierarchy (basic concept)
- Hormone–behaviour interaction (basic idea)
- Serotonin (basic modulatory role in behaviour)

Neuroendocrine–immune interaction:
- Cytokine (basic definition)
- Inflammation (basic concept)
- Psychoneuroimmunology (basic definition)
- Sickness behaviour (basic concept)
- Stress–immune interaction (basic concept)

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

The evaluation will be based on the written exam as follows:
- the maximal score will be 50 points
- grade 5: 43-50 points
- grade 4: 37-42 points
- grade 3: 31-36 points
- grade 2: 25-30 points
- grade 1: 0-24 points

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students’ independent work and critical thinking.

AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Printed resources:

Type	Recommended
Author	Valery Grinevich, Árpád Dobolyi
Title	Neuroanatomy of Neuroendocrine Systems
Publisher	Springer Nature Seitzerland AG. ISBN:9783030866303
Year of publication	2022

Type	Recommended
Author	Ursin H.
Title	The psychology in psychoneuroendocrinology. Psychoneuroendocrinology.
Publisher	Aug;23(6):555-70. doi: 10.1016/s0306-4530(98)00036-5.
Year of publication	1998

Type	Recommended
Author	GonzálezDiaz, S.n., Arias-Cruz, A., Elizondo-Villarreal B. et al.
Title	Psychoneuroimmunoendocrinology: clinical implications.
Publisher	World Allergy Organ J. 10. 19
Year of publication	2017
Other/Comment	https://doi.org/10.1186/s40413-017-0151-6

Other resources:

Required	pdf.nem
Other/Comment	Handbook of Research Methods in Social and Personality Psychology , pp. 427 - 452. https://doi.org/10.1017/9781009170123.019

Required	pdf.igen
Other/Comment	Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: A pszichológia biológiai alapjai I.
Name of subject in English: The biological bases of psychology I.
Name of subject in German: Die biologische grundlagen der Psychologie I.

Credit value of the course: 3
Semester: 1st semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB001_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, Nagyvárad tér 4., room 2004., H-1089 Budapest Hungary. Tel.: +36 1 210 29 30 / 56404
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30.06.2014., 01/2014.

Objectives of the course, and its place in the curriculum of the medical training program:

Knowledge derived from a behavioural physiology-oriented approach to several core topics in biological psychology—specifically focusing on the physiological and behavioural regulatory principles and mechanisms related to food and fluid intake, sexual behaviour and parental care, sleep and biological rhythms, motivation and emotions, social cognition, and aggression.
The structure and content of the curriculum are informed by Konrad Lorenz’s human ethological

concept of the "the Relatively Entirety-Independent Component", the traditions of biological psychology (e.g., the role of oxytocin in social cognition), and fundamental concepts from medical physiology (e.g., regulation of blood glucose levels).

Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Knowledge:
- Advanced knowledge of behavioural physiology
- Behavioural physiological foundations of psychopathological phenomena.

Skills:
- Critical analysis of psychological phenomena in terms of biological mechanisms and within a biomedical context, as well as knowledge of psychology, biology, neuroscience, cognitive science, and their interconnections
- Interpret and investigate the physiological background of mental and cognitive processes (e.g. mood, emotion, memory, attention, decision-making) and apply research methods critically.

Attitudes:
- Rationality: drawing conclusions based on logical reasoning and scientifically validated evidence, committed to renewal and continuous improvement
- Receptiveness to new research directions, methods, and theoretical frameworks
- Curiosity: interest in deeper underlying mechanisms of phenomena, formulation of questions, and pursuit of scientific explanations
- Openness to interdisciplinary collaboration: effective communication and cooperation with experts from other scientific fields.

Autonomy and responsibility:
- Expressing opinions independently, with professional grounding and a clear sense of responsibility
- Based on their professional knowledge and awareness, students become capable to independently analyse and interpret emerging professional questions
- Initiating and conducting responsible, rational, and evidence-based discussions with professionals from related disciplines

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Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB001_2A, AOMVPSZB027_1A, AOMKPSZB011_1A, AOMKPSZB009_1A, AOMKPSZB014_1A

Prerequisites for course registration and completion: (NEPTUN ID):

None

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

Concurrent registration with the 2nd part of this multi-semester course (The biological bases of psychology – II) is not allowed.

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

1. Body senses

Internal and external bodily state representations. Interoception and the perception of internal physiological signals. Functional organization of the autonomic nervous system: sympathetic and parasympathetic divisions and central regulation. Peripheral receptors monitoring bodily states (visceral mechanoreceptors, baroreceptors, chemoreceptors). Somatosensory perception: tactile, proprioceptive, thermal, and nociceptive signals. Types of peripheral receptors, basic perceptual qualities of touch (pressure, vibration, texture), temperature, pain, and body position. Somatotopic organization of the body in the primary somatosensory cortex (S1) and higher somatosensory areas. Basic perceptual and clinical phenomena related to body perception. (Kinga Farkas)

2. Vision – I.

Basic anatomy and optics of the eye (cornea, lens, retina). Structure and function of retinal cells (photoreceptors, bipolar cells, ganglion cells). Phototransduction and retinal processing (receptive fields, contrast detection). Transmission of visual information via the optic nerve to the lateral geniculate nucleus. Early cortical processing in the primary visual cortex: retinotopic organization and feature selectivity. (Kinga Farkas)

3. Vision – II.

Processing of visual information in extrastriate visual areas. Functional specialization of visual pathways (ventral “what” and dorsal “where/how” streams). Neural mechanisms of motion, color, and depth perception. Integration of visual information in higher-order association cortices. Role of attention, experience, and learning in visual perception. Predictive coding in visual perception. Basic perceptual phenomena and visual illusions illustrating cortical visual processing. Clinical and perceptual examples illustrating cortical visual processing: visual agnosia, prosopagnosia, achromatopsia, akinetopsia, and hemispatial neglect. (Kinga Farkas)

4. Audition – I. : The function of audition and auditory perception, and underlying structures. Basic acoustic properties of sound (frequency, amplitude, phase, spectra). Complex tones and harmonic structure. Tonotopic representation and frequency selectivity. Perceptual correlates of physical sound properties (pitch, loudness, timbre). Spatial hearing and sound localization cues (binaural and spectral cues). Loudness perception. (Orsolya Szabados-Szalárdy)

5. Audition – II. : Temporal representations of sounds and encoding of temporal structure (temporal envelope, fine structure, auditory memory). Auditory object formation and auditory scene analysis: grouping principles (harmonicity, common onset, temporal coherence), streaming and segregation of sound sources. Top-down influences on auditory perception: attention, expectation, learning, and experience-dependent plasticity. Individual differences in auditory perception (musical training, absolute hearing, aging, and disabilities).
(Orsolya Szabados-Szalárdy)
6. The vestibular system: Basic anatomy of the vestibular apparatus: semicircular canals, otolith organs (utricle, saccule), hair cells, and vestibular nerve. Functional organization of the vestibular system: detection of angular and linear acceleration, head position relative to gravity. Central vestibular processing and integration with visual and proprioceptive information. Vestibulo-ocular reflex and stabilization of gaze. Perception of self-motion, orientation, and balance. Multisensory integration in spatial orientation. Adaptation, learning, and plasticity of vestibular responses. Basic perceptual and clinical phenomena: motion sickness, vertigo, and sensory conflicts in balance perception.
(Orsolya Szabados-Szalárdy)
7. Volume and osmoregulation
Biological bases of drinking behaviour and sweating (Krisztina Ella)
8. Ingestive behaviour
The regulation of food intake (Krisztina Ella)
9. Behavioural activity and rest – I.
Rest-activity cycles, sleep and other dormant states (Róbert Bódizs)
10. Behavioural activity and rest – II.
Chronobiology and Circadian rhythms (Csenge G. Horváth)
11. Consciousness – I.
The psychobiology of conscious states (Róbert Bódizs)
12. Consciousness – II.: Subliminal perception: operational definitions, masking paradigms, and thresholds of awareness. Experimental studies investigating unconscious processing, and evidences for the processing of stimuli without conscious awareness (priming, implicit knowledge, affective influences). Neural correlates of visual awareness and the distinction between sensory processing and conscious access. (Orsolya Szabados-Szalárdy)
13. Reproductive behaviour
Neural and hormonal control of reproductive behaviour (Róbert Bódizs)
14. Executive functions
The prefrontal cortex and other biological bases of goal-directed behavior, inhibition (Self-Control), working memory, cognitive flexibility(Csenge G. Horváth)

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB003_1A, AOMKPSZB003_2A, AOMVPSZB027_1A, AOMKPSZB004_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

The requirement for course signatrure is that students attend at least 75% of the lectures.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

Written tests consisting of a few items focusing exclusively on the information presented in the last week's lecture at the beginning of the actual lectures (starting from the second lecture) will be implemented. During the end-of-semester examination period, students demonstrate their knowledge in an oral exam. During this exam, they must present on two randomly selected topics. In case of achieving an overall study period test-performance of 75% or greater students are allowed to skip one of the randomly selected topics during the oral exam without any further consequences.

Number and type of individual assignments to be completed, submission deadlines:

13 short 5-minute quizzes (starting from the second week) at the beginning of the classes. Completing the quizzes is optional, and skipping them has no negative consequences. Students who achieve 75% of the total quiz points receive an exam benefit.

Requirements for the successful completion of the course:

Course signature and successful oral end-term examination (min. grade 2).

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

Body senses: Internal and external representations, receptors, somatosensory perception.
Vision I: Basic anatomy and optics of the eye, early cortical processing of visual information.
Vision II: Higher-level visual perception.
Audition I: Sound features, sound perception and the underlying brain structures and functions.
Audition II: Temporal auditory processing, object formation, and higher-order auditory functions.
Vestibular system: Vestibular perception and underlying brain structures and functions.
Volume and osmoregulation: Biological bases of drinking behaviour and sweating
Ingestive behaviour: The regulation of food intake
Behavioural activity and rest I: Rest-activity cycles, sleep and other dormant states
Behavioural activity and rest II: Chronobiology and circadian rhythms
Consciousness I: The psychobiology of conscious states
Consciousness II: Subliminal perception, awareness, and these neural correlates
Reproductive behaviour: Neural and hormonal control of reproductive behaviour
Executive functions: Goal-directed behavior, inhibition, working memory, cognitive flexibility

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

Definition of interoception and exteroception
Basic functions of the autonomic nervous system (ANS) and distinction between sympathetic and parasympathetic divisions
Types and roles of visceral receptors (mechanoreceptors, baroreceptors, chemoreceptors)
Modalities of somatosensation: touch, proprioception, temperature, pain
Definition of nociception
Basic perceptual qualities: pressure, vibration, temperature, pain, body position
Concept of somatotopy and its representation in primary somatosensory cortex (S1)
Examples of basic disturbances of body perception (e.g. loss of sensation, altered body awareness)
Concept of receptive field
Definition of retinotopic organization
Basic idea of feature selectivity in primary visual cortex (V1)
Distinction between ventral ("what") and dorsal ("where/how") visual streams
Role of attention in visual perception
Definition of predictive coding
Definition of pitch, loudness, and timbre
Basic principles of sound localization (binaural cues)
Definition of complex tones
Definition of temporal envelope and fine structure
Concept of auditory scene analysis
Basic grouping principles (e.g. similarity, common onset)
Definition of auditory streaming
Role of attention and learning in auditory perception
Function: detection of angular and linear acceleration
Definition of vestibulo-ocular reflex (VOR)
Concept of multisensory integration
Definition of osmoregulation
Biological basis of thirst and fluid balance
Role of physiological signals in regulating drinking behavior
Definition of homeostatic regulation of food intake
Basic role of hunger and satiety signals
Definition of sleep and sleep stages
Concept of rest–activity cycle
Definition of circadian rhythm
Role of biological clocks in regulating daily cycles
Definition of consciousness
Basic distinction between different states of consciousness
Definition of subliminal perception
Concept of threshold of awareness

Basic idea of priming and unconscious processing
Distinction between sensory processing and conscious awareness
Basic concept of hormonal regulation of reproductive behaviour
Role of neural systems in reproduction
Definition of executive functions
Role of the prefrontal cortex
Core components: working memory, inhibition (self-control), cognitive flexibility

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Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

Oral examination on five-scale grading

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students' independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Printed resources:

Type	Recommended
Author	Warren RM.
Title	Auditory Perception: A New Synthesis.
Publisher	Pergamon Press
Year of publication	2013
Other/Comment	Pages: 31-119., 119-138.

Type	Recommended
Author	Cullen K.E.

Title	Vestibular processing during natural self-motion: implications for perception and action.
Publisher	Nature Reviews Neuroscience volume 20.
Year of publication	2019
Other/Comment	pages 346-363

Type	Recommended
Author	Tononi G, Boly M, Cirelli C.
Title	Consciousness and slepp
Publisher	Neuron
Year of publication	2024
Other/Comment	112(10): 1568-94. - https://doi.org/10.1016/j.neuron.2024.04.011

Type	Recommended
Author	Carlson NR, Birkett MA
Title	Sleep and Biological Rhythms. In: Carlson NR, Birkett Ma: Physiology of Behavior 13 th. edition
Publisher	Global edition. Harlow: Pearson
Year of publication	2022
Other/Comment	page: 266-292 and 301-330

Other resources:

Required	pdf.igen
Other/Comment	Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: A magatartástudományok alapjai
Name of subject in English: Basics of behavioural sciences
Name of subject in German: Grundlagen der Verhaltenswissenschaften

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Credit value of the course: 2
Semester: 1st semester, 3rd semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
optional

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMVPSZB024_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, Nagyvárad tér 4. room 2004. H-1089 Budapest Hungary. Tel: +36(1)210-2930/56404
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30.06.2014., 01/2014

Objectives of the course, and its place in the curriculum of the medical training program:

This course, which promotes multidisciplinarity and disciplinary pluralism, aims to provide an in-depth insight into the medical aspects of behavioural sciences and the fundamental issues that determine this field. The central component of this approach is the representation of the bio-psycho-social unity of the human being and bridging natural sciences and social sciences at postgraduate level with a research-focused approach. The sub-disciplines represented are medical sociology,

medical communication, medical anthropology, health psychology, psychosomatics, and psychophysiology.

Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Knowledge:
- Integrated understanding of the biopsychosocial determinants of health and disease, including behavioural, psychological, social, and cultural factors
- Knowledge of how individual differences (e.g. personality, coping, intelligence) influence health outcomes and medical practice
- Understanding of ethical principles and their application in research and clinical contexts
- Insight into the interaction between mind and body, including stress, psychosomatics, and chronic conditions
- Awareness of the social context of medicine, including health inequalities and the evolving role of physicians

Skills:
- Ability to apply a biopsychosocial approach in analysing health-related problems
- Identification and evaluation of psychosocial risk factors and health inequalities
- Use of ethical reasoning in evaluating research and healthcare situations
- Ability to integrate biological, psychological, and social perspectives in problem-solving
- Critical interpretation of scientific literature in behavioural and social sciences

Attitudes:
- critical: critically evaluate scientific claims and recognize their empirical foundations, strengths, and limitations
- rational: drawing conclusions based on logical reasoning and scientifically validated evidence
- committed to renewal and continuous improvement: receptiveness to new research directions, methods, and theoretical frameworks
- curious: interest in deeper underlying mechanisms of phenomena, formulation of questions, and pursuit of scientific explanations
- ethical awareness: commitment to ethical principles in research and patient care

Autonomy, and responsibility:
- Expresses opinions independently, with professional grounding and a clear sense of responsibility
- Based on their professional knowledge and awareness, is capable of independently interpreting emerging professional questions
- Initiates and conducts responsible, rational, and evidence-based discussions with professionals from related disciplines
- Understands the importance of science communication (presenting research results in an accessible manner) and, as a member of the scientific community, takes responsibility for addressing misconceptions, pseudoscientific theories, and misleading narratives in behavioural sciences
- Demonstrates independent, ethically grounded decision-making

Course outcome (names and NEPTUN ID of related subjects):
AOMVPSZB025_1A

Prerequisites for course registration and completion: (NEPTUN ID):

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

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The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

1. Dr. Csenge G. Horváth: Behavioural aspects of sleep-wake regulation
2. Dr. József Kovács: Ethical questions of human research
3. Dr. Péter Ujma: Social science aspects of intelligence
4. Dr. Imre Lázár: Medical anthropology
5. Dr. Tamás Szalai: Interpretations and manifestation of psychosomatics
6. Dr. János Major: Pain medicine
7. Dr. Adrienne Stauder: Perceived stress, personality and coping
8. Dr. Piroska Balog: Psychosocial risk factors for cardiovascular disease
9. Dr. Edmond Girasek / Bence Döbrössy: Main factors contributing to the development of health inequalities
10. Dr. Róbert Bódizs: Timing of activity and rest: From physical through biological to social factors
11. Dr. Imre Szebik: Behavioural sciences aspects of obstetrics
12. Dr. Zsuzsa Győrffy: What is the 21st century doctor like?
13. Dr. László Nemes: Narrative medicine: personal identity and the ethics of physician-patient relationship
14. Dr. György Purebl: The role of animal-assisted therapies in improving quality of life

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):

Requirements for attendance, options for making up missed sessions, and method of absence justification:

The requirement for course signatrure is that students attend at least 50% of the lectures.

In case of absence, the student will catch up with the course based on the written materials. Missing a few sessions is acceptable if justified.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

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Number and type of individual assignments to be completed, submission deadlines:

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Requirements for the successful completion of the course:

Course signature and achievement of at least 50% on the end-term examination.

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

Written examination includes the topics of the lectures.

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department’s website referring to the minimum requirements of the course.

Students are expected to be able to define and explain key concepts and basic theoretical frameworks related to sleep–wake regulation; research ethics; psychological and social theories of intelligence; fundamental concepts of medical anthropology; basic definitions of psychosomatic processes; mechanisms of pain perception; perceived stress, personality traits and coping strategies;

major psychosocial cardiovascular risk factors; determinants of health inequalities; biological and social timing of behaviour; behavioural aspects of obstetrics; characteristics of contemporary medical professionalism; narrative medicine and physician–patient communication; and the principles and applications of animal-assisted therapies.

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

The evaluation will be based on the written exam as follows:
- the maximal score will be 50 points
- grade 5: 43-50 points
- grade 4: 37-42 points
- grade 3: 31-36 points
- grade 2: 25-30 points
- grade 1: 0-24 points

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students' independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Printed resources:

Type	Recommended
Author	Alan J. Christensen, Brian Oldenburg, Edwin B. Fisher, Frank J. Snoek, Linda D. Cameron, Ulrike Ehlert, Yan Guo (Eds.)
Title	Principles and Concepts of Behavioral Medicine: A Global Handbook
Publisher	Springer New York
Year of publication	2018

Type	Recommended
Author	Steptoe, Andrew and Freedland, Kenneth E.,

Title	Handbook of Behavioral Medicine: Methods and Applications.
Publisher	Egyesült Királyság - UK - Springer New York
Year of publication	2010

Type	Recommended
Author	Gidron, Yori
Title	Behavioral Medicine: An Evidence-Based Biobehavioral Approach.
Publisher	Németország (Deutschland) - Springer International Publishing
Year of publication	2019

Type	Recommended
Author	Marc D. Gellman (Ed)
Title	Encyclopedia of Behavioral Medicine
Publisher	Springer Nature Switzerland AG
Year of publication	2020

Other resources:

Required	pdf.igen
Other/Comment	course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet

Name of subject in Hungarian: Alvás és kronobiológia
Name of subject in English: Sleep and chronobiology
Name of subject in German: Schlaf und Chronobiologie

Credit value of the course: 2
Semester: 2nd semester, 3rd semester, 4th semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
optional

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMVPSZB023_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, +36203454245
Course coordinator position: University professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014

Objectives of the course, and its place in the curriculum of the medical training program:

Aim of the course: providing up-to-date, scientifically grounded knowledge on the physiological, behavioural, psychological and clinical aspects of sleep-waking states and related chronobiological phenomena. Multidisciplinarity, integrative approaches and the emphasis of rhythmic processes are the defining features of the course. Theoretical lectures are always completed with clinical corners, exemplifying the biomedical relevance of the mechanisms and processes detailed in the presentation. In turn, clinical topics are accompanied by sections termed theoretical relevance,

unravelling the modelling consequences of the respective disorders.

Format of the course (lectures, group work, practical lessons, etc.):

Lectures plus optional individual practical work consisting of involvement in laboratory and/or field chronobiology research.

Competencies acquired through completion of course:

Understanding the core features of biological rhythms and sleep, ability of using chronobiological concepts in understanding medical and behavioural phenomena, knowledge on the defining EEG features of different sleep-waking states, recognizing the main sleep and circadian rhythm disorders, getting involved in sleep and chronobiology research studies.

Course outcome (names and NEPTUN ID of related subjects):

Prerequisites for course registration and completion: (NEPTUN ID):

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

The number of students required to start the course (minimum, maximum), method of selecting participants:

10-50

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

1. What is sleep? The definition of sleep, rest and sleep, chronobiology, circadian rhythms, nocturnality-diurnality, chronopathology, chronomedicine, chronotherapy. Clinical corner: sleepwalking, subjective (paradoxical) insomnia, sleep paralysis (Róbert Bódizs)

2. When we sleep? The circadian molecular clock, clock genes and proteins, biological days and nights, social jetlag, central and peripheral oscillators. Clinical corner: clock gene polymorphisms, chronotypes and circadian rhythm disorders (Krisztina Káldi)

3. How and why we sleep? Circadian, homeostatic and permissive factors in sleep regulation.

Ultradian sleep cycles. Sleep phases and sleep stages, sleep regulatory networks in the brain. Clinical corner: sleep homeostasis, neural plasticity and depression (Róbert Bódizs)

4. Zoom in on sleep: sleep EEG microstructure and oscillations. Infra(slow), delta, theta, alpha, sigma, beta, gamma and ripple oscillations. EEG spectral profiles of sleep waking states. Thalamocortical system and conscious awareness. Clinical corner: measuring consciousness by EEG analysis, sleep EEG oscillations, cognitive abilities and dementia (Róbert Bódizs, Péter P. Ujma).

5. What is wakefulness? Wakefulness, arousal, and attention, ARAS, alpga, beta and gamma oscillations and their role in vigilance. The default Mode Network of the brain. Sleepiness and its measurement (pupillometry, alpha attenuation, etc). Clinical corner: ADHD, sleep and sleepiness (Orsolya Szalárdy)

6. What is the role of sleep? The function(s) of sleep. Ecological, restorative, detoxification, memory consolidation, network reorganization and immunological functions. Clinical corner: vaccination and sleep, from circadian desynchronization through sleep loss to weight gain (Róbert Bódizs)

7. On the inability to get sleep. Insomnia and its treatment. Chronic and short-term insomnia, secondary insomnia, insomnia and circadian rhythm disorder, insomnia as insufficient sleep homeostasis, insomnia and hyperarousal. Pharmacotherapy and cognitive behavioural therapy of insomnia, sleep hygiene. Theoretical consequences: learning-dependent and emotional regulation of sleep (György Purebl).

8. Breathing space. Sleep-related breathing disorders. Obstructive and central sleep apnoea disorders, hypoventilation, hypoxemia. Sleep depth, time-of-day and breathing during sleep. Theoretical consequences: sleep fragmentation vs sleep loss: the detrimental effects of sleep fragmentation (Gábor Horváth)

9. Getting too much sleep. Hypersomnia: narcolepsy and its forms, idiopathic hypersomnia, Kleine-Levin syndrome, hypersomnia caused by other disorders. Theoretical consequences: orexin and flip-flop regulation of sleep (Anna Szűcs)

10. Sleeping at the wrong time. Circadian rhythm disorders. Delayed and advanced sleep phase disorder, non-24-hour sleep phase disorder, irregular sleep phase disorder, shift work. Chronotherapy: jet-lag, light therapy, exogenous melatonin. Theoretical consequences: inclusion of external light and physical activity in sleep-wake modelling (György Purebl, Róbert Bódizs)

11. State dissociation and other peculiarities during sleep. Parasomnias: NREM parasomnias and REM sleep behaviour disorder, nocturnal frontal lobe epilepsy, aggressive behaviour during sleep, sexsomnia, somniloquy. Theoretical consequences: local sleep, sleepwalking and consciousness

(Anna Szűcs)

12. Why and how we dream? Dreams, and dream disorders. The neurobiology and psychology of dreaming, overall formal and content features of dreams, chronobiological features of dreaming, dreaming and mind wandering. Sleep paralysis, nightmares and nightmare disorder, nightmares and psychopathology. Theoretical consequences: lucid dreaming and consciousness (Péter Simor)

13. Moving while you sleep. Sleep-related movement disorders. Restless leg syndrome, periodic leg movements during sleep, sleep bruxism, rhythmic movements during sleep, leg cramps during sleep, benign sleep myoclonus in infants. Theoretical consequences: movements during wakefulness and sleep (Zoltán Szakács)

14. Sleep like a baby. Sleep-related phenomena and sleep disorders in infants, toddlers, and children. Solitary sleeping and co-sleeping. The slow emergence of the diurnal activity profile, maturation of circadian rhythms, limit setting issues, sudden infant death, other sleep disorders in infancy and childhood. Theoretical consequences: on the anthropology of sleep in infants (Lilla Szeifert).

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):

Requirements for attendance, options for making up missed sessions, and method of absence justification:

Students are expected to attend the lectures regularly. Students must be present on min. 50% of the lectures. There will be tasks on the lectures and students' achievement will be assessed by the lecturers. The signature will be based on carrying out the tasks on the lectures. A student can be offered plus points based on her/his good achievement, which can make the final exam easier for her/him.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

Written tests consisting of a few items focusing exclusively on the information presented in the last week's lecture at the beginning of the actual lectures (starting from the second lecture) will be implemented. An overall study period test-performance of 75% or greater makes up 25% of the final evaluation.

Number and type of individual assignments to be completed, submission deadlines:

Participation in sleep and chronobiology research studies (laboratory or field investigations), data analysis, essay writing. Deadline for submitting individual work (reports or essays): end of the exam period.

Field exercises in sleep research for at least 8 hours in total (students have to participate in one of the activities detailed below):
- sleep research by using mobile devices (polysomnography headbands, actigraphy)
- sleep research or sleep medicine in a laboratory setting
- data analysis/digital signal processing in the field of chronobiology and/or sleep research
- cognitive testing of alertness by using specific tools

Requirements for the successful completion of the course:

In total a minimum of 8 filled study period tests are required for obtaining the teacher's signature.

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

1. The definition of sleep and chronobiology
2. The circadian molecular clock
3. Circadian, ultradian, homeostatic and permissive factors of sleep regulation
4. Sleep EEG microstructure and oscillations
5. Wakefulness, arousal, attention
6. The functions of sleep
7. Insomnia and its treatment
8. Sleep-related breathing disorders
9. Hypersomnia
10. Circadian rhythm disorders
11. Parasomnia
12. Dreaming and its disorders
13. Sleep-related movement disorders
14. Sleep and its disorders in infants, toddlers and children

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as

an exam.) A link published on the department’s website referring to the minimum requirements of the course.

The definition of sleep and chronobiology
The circadian molecular clock
Circadian, ultradian, homeostatic and permissive factors of sleep regulation
Sleep EEG microstructure and oscillations
Wakefulness, arousal, attention
The functions of sleep
Insomnia and its treatment
Sleep-related breathing disorders
Hypersomnia
Circadian rhythm disorders
Parasomnia
Dreaming and its disorders
Sleep-related movement disorders
Sleep and its disorders in infants, toddlers and children

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

There will be no mid-term tests. The evaluation will be based on the written exam as follows:
- the maximal test score will be 50 points
- grade 5: 40-50 points
- grade 4: 30-40 points
- grade 3: 20-30 points
- grade 2: 10-20 points
- grade 1: 0-10 points

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students’ independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the

task explicitly requires the knowledge or application of AI tools.

Printed resources:

Type	Recommended
Author	Allada R, Bass J.
Title	Circadian Mechanisms in Medicine
Publisher	N Engl J Med 2021;384:550-61
Year of publication	2021
Other/Comment	http://dx.doi.org/10.1056/NEJMra1802337

Type	Recommended
Author	Samson DR
Title	Taking the sleep lab to the field: Biometric techniques for quantifying sleep and circadian rhythms in humans
Publisher	Am J Hum Biol
Year of publication	2020
Other/Comment	https://doi.org/10.1002/ajhb.23541

Type	Recommended
Author	Koukkari WL, Sothern RB
Title	Introducing Biological Rhythms: A Primer on the Temporal Organization of Life, with Implications for Health, Society, Reproduction and the Natural Environment
Publisher	New York: Springer
Year of publication	2006
Other/Comment	http://dx.doi.org/10.1007/978-1-4020-4701-5

Type	Recommended
Author	Refinetti R
Title	Circadian Physiology. 3rd ed
Publisher	CRC Press
Year of publication	2001

Type	Recommended
Author	Bassetti C, McNicholas W, Paunio T (eds).
Title	European Sleep Medicine Textbook, 2nd ed
Publisher	European Sleep Research Society
Year of publication	2021

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Laboratóriumi gyakorlat: pszichiátriai genetika, molekuláris technikák, EEG, hordozható eszközök, MRI, fNIRS, kísérleti kognitív pszichológia I
Name of subject in English: Laboratory practice: Psychiatric genetics, Molecular techniques, EEG, wearables, MRI, fNIRS, Experimental cognitive psychology I.
Name of subject in German: Laborpraktikum: Psychiatrische Genetik, molekulare Techniken, EEG, tragbare Geräte, MRI, fNIRS, experimentelle kognitive Psychologie I.

Credit value of the course: 4
Semester: 1st semester, 3rd semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
56.0	0.0	56.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB008_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, +36203454245
Course coordinator position: university professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014 (Semmelweis University)

Objectives of the course, and its place in the curriculum of the medical training program:

This laboratory-based practical course provides comprehensive training in modern psychophysiological, neurobiological, neuroimaging and molecular methods used in psychobiological

research, experimental psychology, and cognitive neuroscience. Practical classes will introduce methods in cardiovascular psychophysiology, including electrocardiography (ECG) recording and heart rate variability (HRV) analysis. In the EEG modules, participants will learn the technical foundations of EEG recording, polysomnography, neuroimaging techniques and psychopharmacological measures. During the course, students will visit labs and acquire skills in different research techniques. Throughout the course, emphasis is placed on methodological rigor, artifact recognition, data quality control, ethical considerations, and translational relevance in psychobiology and cognitive research.

Format of the course (lectures, group work, practical lessons, etc.):

practical lesson

Competencies acquired through completion of course:

Knowledge:
- Characteristics, advantages, and limitations of research methods used in psychobiology
- Advanced knowledge of behavioral physiology
- In-depth knowledge of the effects of drugs and other active substances on behavior and psychological processes
- Basic neuropsychiatric knowledge and neuropsychological assessment methods

Skills:

- Interpret and investigate the physiological background of mental and cognitive processes (e.g. mood, emotion, memory, attention, decision-making) and apply research methods critically
- Analyse developmental characteristics of the nervous system and evaluate the role of animal models in psychobiological research
- Ability to design experiments/studies, analyze data, interpret findings, write scientific papers and reports, create data visualizations, and present research results
- Critical thinking in the evaluation of results, recognition of patterns and relationships, formulation of hypotheses, generation of new research questions, and development of creative solutions

Attitudes:
- critical: critically evaluate scientific claims and recognize their empirical foundations, strengths, and limitations
- rational: drawing conclusions based on logical reasoning and scientifically validated evidence
- committed to renewal and continuous improvement: receptiveness to new research directions, methods, and theoretical frameworks
- curious: interest in deeper underlying mechanisms of phenomena, formulation of questions, and pursuit of scientific explanations
- persistent: ability to work consistently toward long-term research goals and overcome obstacles
- self-critical and inclined toward reflection: conscious reflection on own thinking, decisions, and their scientific grounding
- open to interdisciplinary collaboration: effective communication and cooperation with experts

from other scientific fields

Autonomy, and responsibility:
- Expresses opinions independently, with professional grounding and a clear sense of responsibility
- Takes responsibility for their own work and for the work of students and colleagues under their supervision
- Based on their professional knowledge and awareness, is capable of independently analyzing and interpreting emerging professional questions
- Initiates and conducts responsible, rational, and evidence-based discussions with professionals from related disciplines
- Is committed to professional principles and takes responsibility for the reliability of the knowledge they generate (ensuring objective, reproducible scientific results)
- Is dedicated to upholding research ethics, takes responsibility for adherence to ethical standards—especially in human and animal studies—and considers the social and moral implications of research findings
- Understands the importance of science communication (presenting research results in an accessible manner) and, as a member of the scientific community, takes responsibility for addressing misconceptions, pseudoscientific theories, and misleading narratives in psychology and biology

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Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB008_2A, AOMKPSZB008_3A

Prerequisites for course registration and completion: (NEPTUN ID):

None

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

Concurrent registration with the 2nd and 3rd part of this multi-semester course (Laboratory practice: Psychiatric genetics, Molecular techniques, EEG, wearables, MRI, fNIRS, Experimental cognitive psychology II. and III.) is not allowed.

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

Dr. G. Horváth Csenge -16 (SE Magtud)
Dr. Szabados-Szalárdy Orsolya - 8 (SE Magtud)
Dr. Farkas Kinga -16 (SE Pszichiátria)
Magyar Tárek Zoltán - 8 (SE Magtud)
Dr. Gyebnár Gyula - 16 (SE Neuroradiológiai Tanszék)
Dr. Czobor Pál - 8 (nyugd. SE Pszichiátriai Klinika)
Dr. Kakuszi Brigitta Pszichi Klinika (SE Pszichiátriai Klinika) - 8
Dr. Koncz Szabolcs-16 (SE Gyógyszerhatástani Intézet)

külsős:
Dr. Tóth Brigitta - 16 (HUN-REN TTK)

1. Cardiac electrophysiology and electrocardiography (ECG) - Dr. Kinga Farkas
Basic concepts of electrophysiological recording. Cardiac action potential. Electrical conduction system of the heart. Electrode functions, classical electrode positions (limb and chest leads, e.g. 12-lead Precordial lead placement), rate (calculation), rhythm (tachy- and bradycardy, irregular rhythms), axis. Waves (P, QRS, T, U), intervals. Recording. Clinical use of ECG.

2. Electrocardiography II - Dr. Kinga Farkas
Respiratory sinus arrhythmia and vagal manoeuvres (Valsalva maneuver, carotid sinus massage etc.). Holter ECG. Extrasystole. Heart rate variability meaning and interpretation. Metrics, effects of sympathetic and parasympathetic tone. Tools (from smartwatch to sensor chest straps, arm bands). Factors affecting HRV.

3. EEG Fundamentals I – Technical Basics of EEG Recording - Dr. Orsolya Szabados-Szalárdy
Basic concepts of electroencephalography, principles of EEG signal generation, electrode positions and the international 10–20 system, recording sites and referencing, preparation of the participant, skin preparation and impedance reduction, electrode attachment and fixation (gel/paste), EEG cap placement and setup

4. EEG Fundamentals II – EEG Recording Parameters: Filters, Referencing, Signal-to-Noise Ratio, and Hands-on Practice - Magyar Tárek Zoltán

EEG recording settings and acquisition parameters, signal filtering (high-pass, low-pass, notch filters), referencing methods, signal-to-noise ratio in EEG recordings, basic signal quality assessment, hands-on practice with EEG recording setup

5. Polysomnography - Dr. Csenge G. Horváth
Basic concepts and clinical relevance of polysomnography, overview of sleep stages (NREM, REM) and their physiological characteristics, components of PSG recording (EEG, EOG, EMG, ECG), standard electrode placement for sleep staging, respiratory (airflow, thoracic and abdominal effort), oxygen saturation (pulse oximetry), body position and movement monitoring, video-PSG, introduction to sleep stage scoring, identification of common artifacts

6. Wearables and Portable Monitoring Devices - Dr. Csenge G. Horváth
Measurement of physiological changes in real-world settings, advantages and limitations of portable

monitoring, wearable EEG systems, Holter ECG, core body temperature measurement, rest–activity rhythm assessment (accelerometry), device setup and sensor placement.

7. Neonatal EEG – Dr. Brigitta Tóth
Basic principles of neonatal EEG recording. Developmental aspects of brain activity in newborns and infants. Differences between neonatal and adult EEG patterns. Electrode placement and recording considerations in neonates. Normal neonatal EEG features (e.g. discontinuity, trace alternant). Recognition of common artifacts. Clinical applications of neonatal EEG.

8. Event-related brain potentials in auditory system assessment – Dr. Brigitta Tóth
Basic concepts of auditory event-related potentials and their physiological basis. Types of auditory ERPs. Stimulation methods and recording setup. Electrode placement and signal acquisition. Signal averaging and noise reduction. Identification and interpretation of characteristic waveforms. Clinical and research applications in hearing assessment.

9. Resting-state EEG and ERP investigations in mental disorders – Dr. Czobor Pál
Recording and analyzing techniques in resting-state EEG. Neural activity patterns in various mental disorders, insight into the neurophysiological basis of cognitive and emotional dysfunctions. ERPs commonly measured in mental disorders such as schizophrenia.

10. Methodology of High-Density EEG (HD-EEG) in Clinical Practice: Paradigms and Signal Processing - Dr. Kakuszi Brigitta
Methodological aspects of high-density EEG (HD-EEG) in clinical practice, including experimental paradigms and recording strategies. Advanced signal processing techniques such as preprocessing, artifact correction, and source localization. Interpretation of high-resolution brain activity patterns to support clinical diagnostics and research applications.

11. Structural brain MRI analysis – Volumetry, morphometry – Preprocessing - Dr. Gyebnár Gyula
Introduction and the basic steps of preprocessing structural MRI data. Volumetric and morphometric analyses. Quantifying brain structures and examining structural differences.

12. Structural brain MRI analysis – Volumetry, morphometry – Quality control, statistics - Dr. Gyebnár Gyula
Quality control procedures and statistical analysis in structural MRI studies. Data reliability and basic statistical methods to evaluate volumetric and morphometric differences.

13. Rodent behavioural experiments - Dr. Szabolcs Koncz

Basic animal handling techniques and behavioral experiments, demonstration of drug administration methods. Demonstration of commonly used behavioural tests and introduction to automated behavioural analysis software (Noldus EthoVision XT): operation and basic use.

14. Rat EEG and sleep experiments - Dr. Szabolcs Koncz
Introduction to the surgical room, equipment used for surgical anaesthesia, presentation of surgical procedures (videos/images), demonstration of the EEG recording system, introduction to sleep analysis software, real-time EEG recording from implanted animals.

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB001_1A, AOMKPSZB001_2A, AOMKPSZB007_1A, AOMKPSZB007_2A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

Students are expected to attend regularly the course and participation list will be recorded at the end of every practical lession. Participating on at least 75% of the total number of practical lessions is a prerequisite for getting the signature to absolve the course. The maximum number of absences permitted: 3 absences from the practical lessions.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

An active participation on at least 75% of the total number of practical lessons is required. On each lesson the course leader will score the activity of the students on a 1-10 point scale based on their participation in the experiments or filling a laboratory record.

Number and type of individual assignments to be completed, submission deadlines:

-

Requirements for the successful completion of the course:

75% presence of the total number of lessons and at least 50 points collected.

Type of assessment:
term grade

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

No examination will be held, students will receive a term-grade based on their regular activity on the lessons

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

Understands the basic concept of the cardiac action potential
Knows the main elements of the cardiac conduction system
Recognizes the standard 12-lead ECG setup (limb and chest leads)
Can identify the main ECG waves: P, QRS, T (U)
Interprets at a basic level:
heart rate (normal, tachycardia, bradycardia)
rhythm (regular vs. irregular)
Understands the basic clinical purpose of ECG
Understands the concept of respiratory sinus arrhythmia
Knows what a Holter ECG is
Understands the basic meaning of heart rate variability (HRV)
Can give examples of wearable devices (e.g., smartwatch)
Understands the basic principle of EEG recording
Knows the international 10–20 system
Understands the role and placement of electrodes
Has basic knowledge of:
filtering (high-pass, low-pass)
signal-to-noise ratio
Can distinguish between good and poor signal quality
Understands that PSG records multiple physiological signals simultaneously (EEG, EOG, EMG, etc.)
Knows the main sleep stages: NREM and REM
Is aware of the presence of artifacts
Understands that neonatal EEG differs from adult EEG
Understands the concept of event-related potentials
Knows that signal averaging is required
Recognizes their use in auditory system assessment
Understands that EEG is used in studying mental disorders
Can give one example (e.g., schizophrenia)
Recognizes that brain activity patterns may differ
Understands the concepts of volumetry and morphometry
Knows that preprocessing is required
Understands that statistical analysis is used to detect differences
Knows basic principles of animal handling
Can give examples of behavioral tests
Recognizes the use of automated analysis software
Knows that EEG can be recorded in animals
Understands the general role of anesthesia and surgical preparation
Recognizes the purpose of sleep experiments in animal models

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

The evaluation will be based on the collected points during the semester as follows:
- the maximal score will be 140 points
- grade 5: 100-140 points
- grade 4: 83-99 points
- grade 3: 66-82 points
- grade 2: 50-65 points
- grade 1: 0-49 points

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students' independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Other resources:

Required	pdf.igen
Other/Comment	1-14. Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Haladó statisztika és adatelemzés a viselkedés- és orvostudományokban I.
Name of subject in English: Advanced statistics and data analysis in behavioural and biomedical sciences I.
Name of subject in German: Fortgeschrittene Statistik und Datenanalyse in den Verhaltens- und Biomedizinischen Wissenschaften - I.

Credit value of the course: 3
Semester: 1st semester, 3rd semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
42.0	14.0	28.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB007_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, +36203454245
Course coordinator position: university professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014 (Semmelweis University)

Objectives of the course, and its place in the curriculum of the medical training program:

The aim of the course is to provide an introduction to inferential statistical methods used in behavioral and biomedical research. Throughout the semester, students will become familiar with

the principles of statistical hypothesis testing and will acquire essential analytical techniques that allow for the quantitative investigation of scientific questions. Special emphasis is placed on critical interpretation of data and methodological rigor.
Students will progress step by step through various levels of statistical inference. The curriculum is practice-oriented, demonstrating analytical methods using real-life examples and research data to support application in students' own fields of research. The use of LLMs is explicitly encouraged and is a part of instruction.

Format of the course (lectures, group work, practical lessons, etc.):

lectures and practical classes

Competencies acquired through completion of course:

Upon completing the course, students will develop practical and theoretical competencies such as data preparation, analysis, interpretation, and scientific communication of results. The course fosters critical thinking and methodological awareness, both of which are essential in modern behavioural and biomedical research. This course serves as a prerequisite for the follow-up course, Advanced Statistics and Data Analysis in Behavioural and Biomedical Sciences – II, which focuses on more complex statistical models. Together, the two courses offer a comprehensive statistical training foundation for active and independent participation in quantitative research.

Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB007_2A, AOMKPSZB013_1A, AOMKPSZB002_1A

Prerequisites for course registration and completion: (NEPTUN ID):

There is no prerequisite for course registration. The prerequisite for completion is regular attendance, active coursework, and the completion of a research project (seminars) and an oral examination (lectures).

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

This is a multi-semester course. Because the second semester is based heavily on the current one, and because the two semesters are never concurrently taught, concurrent registration is not possible.

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

Each week, a single 3x45 minute instruction block is held, each consisting of one lecture and two seminars. The topics of these are identical, with the lecture presenting the theory of the material, and the practical classes dedicated to the class solving problems related to the topic.

1. Basic concepts in statistics 1. Data collection, hypothesis generation, variables, variable types. Scales of measurement, validity, reliability. Types of research methods. Software to do statistics with: Excel, R.
2. The RStudio software. Installing R and RStudio. Installing and using packages. Scripts, workspace, directory. Dataframes and variables. Operators and basic function calls. Basic function syntax. Importing, selecting and saving data. Long and wide formats, manipulating data format.
3. Basic concepts in statistics 2. Mean, median, range, dispersion, standard deviation. Histograms and distributions, standard error, Z-scores, central limit theorem. Modelling data.
4. Hypothesis testing. Population vs. sample. Test statistics, one- and two-tailed tests, p-values. Type I and II errors. Effect sizes. Statistical power.
5. Questionable research practices and how to avoid them. Model specification, p-hacking, multiple comparisons and correcting for them. Specification curve analysis.
6. Using graphs. The ggplot2 package. Chart elements. Scatterplots, fit lines, histograms, kernel density plots, boxplots, bar and error bar plots, line plots. Pie charts, surface plots, circular histograms, word clouds.
7. Correlation. Covariance, Pearson, Spearman and Kendall correlation. Point-biserial correlation, partial and semi-partial correlation. Fisher r-to-z method, comparing correlations. Correlation and causality.
8. Comparing two means: t-tests. One-sample t-test, independent-samples t-test, dependent-samples t-test. Levene test. Welch test.
9. Regression 1. Basics of regression analysis. Sum of squares, variance explained, F statistics. Least squares fit. Interpreting regression model output. Types of sum of squares (Type I-Type VI). Types of regression model construction (hierarchical, forced entry, stepwise).
10. Regression 2. Regression assumptions and testing them. Regression diagnostics, identifying outliers. Homoskedasticity, error distributions, independence assumption, multicollinearity, linearity. Cross-validation.
11. Regression 3. Cross-validated models. Comparing models, maximum likelihood regression, likelihood ratio tests. Dummy coding.
12. Regression 4. Practice using both continuous and categorical predictors. ANOVA, ANCOVA, general linear model. Contrasts and interactions.
13. Categorical data. Contingency tables, chi-squared test, Fisher’s exact test. Loglinear analysis.
14. Summary and repetition.

All classes are taught by Péter Przemyslaw Ujma, PhD (associate professor at the host institute).

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):

Requirements for attendance, options for making up missed sessions, and method of absence justification:

Participation in 75% of practical classes is mandatory for obtaining a signature. As no parallel classes are organized, making up for absences is not possible. A written doctor's note about the students' illness is accepted as justification of absence.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

Students are expected to solve problems during class and will be randomly called to present their results. These are rated by the lecturer as acceptable/not acceptable by the lecturer. Not acceptable presentations can be repeated. 3 acceptable in-class presentations per student are required for a signature.
Additionally, each student is expected to design and complete a research project by the last week, in which they obtain and analyze data using statistical methods they learned. AI can be used both during project design and data analysis. This must be written up (without AI use) in 3-5 pages.
Students need to explain the rationale of the project, the source of the data, the methods (even if suggested by AI) and the results. They need to specifically explain how they used AI, how they edited and verified AI output, and how AI solutions deviate from what is learned in class. The full seminar grade is given based on this project. The novelty and scientific rationale of the project is secondary, the goal is that the students demonstrate that they can use quantitative methods to analyze data, and they can intelligently use AI in this project.

Number and type of individual assignments to be completed, submission deadlines:

3 successful in-class presentation (randomly called up during class)
1 research project (deadline: date of last class)

Requirements for the successful completion of the course:

- regular attendance (required for signature)
- 3 successful in-class presentations (required for signature)
- research project (provides seminar grade)
- oral examination (provides lecture grade)

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

An oral examination takes place in the exam period. In this, students need to briefly present their research project and answer the lecturer's questions about their code, results, and display items. The principal subject of the examination is the technical details of the students' own project, but the lecturer may ask brief questions related to any other topic mentioned during the semester.

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

Students must be familiar with the concepts ("Key terms that I've discovered") and be able to solve the problems ("Smart Alex's tasks") listed after each chapter of the principal coursebook ("Discovering statistics using R") covered in the course. 50% success is minimally required. Minimum criteria are published on the institute's website: https://semmelweis.hu/admission/programs/psychobiology-msc/

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

Both seminars and examinations are graded on a five-point scale. Both are an even mix of theoretical and practical skills as students are expected to use the theory learned in class to complete a real-world assignment, and understand the assistance AI can provide for this. Seminar and examination grades are fully independent, seminar grades are not transferred to the examination in any way. No offered grade is available.

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Students may use any AI system to learn about the material, to get ideas about analyses, to write code, and to present results. The use of AI systems, as well as the proper way of double-checking AI results, is an essential part of instruction. The critical use of AI systems must be disclosed in detail for the project work. During the oral examination, students must demonstrate that they used AI systems intelligently and critically and that they are familiar with the material even without the use of AI.

Printed resources:

Type	Recommended
Author	Field, A., Miles, J., & Field, Z.
Title	Discovering statistics using R.
Publisher	SAGE Publications
Year of publication	2012

Type	Recommended
Author	Hunter, J.E., Schmidt, F.L.
Title	Methods of Meta-Analysis
Publisher	Sage Publications, Inc.
Year of publication	2004

Other resources:

Required	pdf.igen
Other/Comment	Slides and other custom materials released by the instructor

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Alapfokú számítógépes programozás biomedicinális hallgatók számára
Name of subject in English: Entry level computer-programming for bio-medical students
Name of subject in German: Einführung in die Programmierung für biomedizinische Studierende

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Credit value of the course: 3
Semester: 1st semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	0.0	28.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB006_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, +36203454245
Course coordinator position: university professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014 (Semmelweis University)

Objectives of the course, and its place in the curriculum of the medical training program:

This course introduces fundamental concepts of computer programming with a focus on biomedical data analysis. Using the R programming language, students develop basic skills in data handling, visualization, and reproducible research, while also acquiring core programming logic such as conditional statements, iteration, and function use. Positioned early in the curriculum, following

introductory coursework, the course provides a practical foundation for subsequent studies in statistics, neuroscience, and research methodology, enabling students to work with real-world biological and psychological data in a structured and reproducible manner.

Format of the course (lectures, group work, practical lessons, etc.):

practical lesson

Competencies acquired through completion of course:

Knowledge:
- Basic principles of computer programming and their role in biomedical research
- Fundamental data types, data structures, and data handling in R
- Logic of conditional statements, iteration, and function-based programming
- Basic workflow of data analysis, including data import, transformation, and visualization
- Principles of reproducible research and script-based analysis
- Common sources of error and limitations in data processing

Skills:
- Import, clean, manipulate, and transform biomedical datasets
- Create informative visualizations using standard plotting tools
- Apply conditional logic and logical operators in practical problems
- Implement simple loops and use functions for repeated operations
- Write and use basic custom functions
- Interpret and debug simple code and error messages
- Apply programming logic to solve basic biomedical data problems

Attitudes:
- openness toward computational approaches in biomedical sciences
- appreciate the importance of reproducibility and transparency in data analysis
- problem-solving mindset when working with data and code
- precision, clarity, and structure in programming and documentation
- curiosity toward interdisciplinary applications of programming

Autonomy, and responsibility:
- Independently perform basic data analysis tasks using scripts
- Organize and document their work in a reproducible manner
- Apply learned programming techniques to new, simple problems with limited guidance
- Take responsibility for the correctness and transparency of their code and results
- Collaborate in small groups and contribute to shared coding tasks
- Recognize when additional expertise or support is needed

Course outcome (names and NEPTUN ID of related subjects):

AOMKPSZB019_1A, AOMKPSZB019_2A

Prerequisites for course registration and completion: (NEPTUN ID):

None

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

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The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

1. Introduction to R and RStudio (Kinga Farkas)
- open and reproducible research
- script vs manual data analysis
- data pipeline
- prepare and install R & RStudio
- introduction of DataCamp platform and assignments

2. Reproducible research basics (Kinga Farkas)

- RMarkdown /notebook - html + pdf output
- script documentation

3. Data types and objects (Csenge G. Horváth)
- numeric
- character
- logical
- vector
- matrix
- dataframe
- list

4. Dataframes and importing data (Csenge G. Horváth)
- indexing, rows and columns, subset
- data import & export
- load and inspect data,
- data structures
- arrange

5. Data manipulation (dplyr, tidyverse) (Csenge G. Horváth)
- filter
- select
- mutate
- group_by
- summarise
- summaries (mean, sum, count etc.)

6. Data visualization I (ggplot) (Áron Bartha)
- scatterplot
- histogram
- boxplot
- line plot
- error bar (etc.)

7. Data visualization II. (Shiny) (Áron Bartha)
- facets
- ggarrange or cowplot (combining subplots)
- build interactive web apps in R

Mid-term project I. deadline for students: end of week 7th

8. Project presentation (Kinga Farkas)

9. Programming basics (János Fekete)
- logical operations and comparisons
- if, else

10. Iterations and repeated operations (János Fekete)
- for and while loops
- repeated calculations
- apply() family

11. Functions and code reuse (Tárek Magyar)
- built-in functions,
- custom functions,
- arguments,
- return values

12. Programming logic, problem solving, and debugging (Tárek Magyar)
- programming logic

- pseudocode,
- task decomposition,
- simple algorithms,
- debugging, common errors

13. Biomedical data example (Tárek Magyar)
- EEG / HRV, students’ own dataset
- loading (inspect)
- cleaning (tidy the data)
- transforming
- visualization

14. Consultation + project II. presentation (Kinga Farkas)

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB007_1A, AOMKPSZB007_2A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

Students are expected to attend regularly the course and participation list will be recorded at the end of every practical lesson. Participating in at least 75% of the total number of practical lessons is a prerequisite for getting the signature to absolve the course.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

The course signature is based on continuous practical assessment, consisting of two project-based assignments completed during the semester.

Mid-term project (Project I)
- Topic: Basic data handling and visualization using R (data import, cleaning, transformation, and graphical representation)

Final project (Project II)
- Topic: Application of programming logic and simple algorithms to a biomedical dataset (e.g. EEG, HRV, or other structured data)

Students who fail to submit or fail one project may complete a make-up assignment during the designated make-up week (Week 15)
Both projects may be retaken or improved

The improved grade replaces the original score

Number and type of individual assignments to be completed, submission deadlines:

2 assignments
Submission deadline: End of week 7, Presentation / consultation: Week 8
Submission deadline: Week 14, Presentation / consultation: Week 14

Requirements for the successful completion of the course:

- 75% presence of the total number of practical lessons is required for course signature.
- Submission of both projects
- Minimum 50% average performance across the two projects
- No project score below 40%
- Achievement of at least 50% overall and
- Completion of the required XP (on DataCamp) are required for course signature

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Type of assessment:
term grade

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

Continuous Learning Requirement: Students are required to complete a minimum of 10,000 Experience Points (XP) on the DataCamp platform by the end of the semester
Assigned courses and exercises are aligned with the weekly topics of the course
The DataCamp activity supports the development of practical programming skills through guided exercises

Mid-term project (Project I)
- Topic: Basic data handling and visualization using R (data import, cleaning, transformation, and graphical representation)
- Requirements: Loading and inspecting a dataset; Basic data cleaning and transformation; At least one appropriate visualization; Submission of a well-documented R script or R Markdown file

Final project (Project II)
- Topic: Application of programming logic and simple algorithms to a biomedical dataset (e.g. EEG, HRV, or other structured data)
- Requirements: Use of conditional statements and/or iteration, Implementation of at least one simple algorithm; Data visualization and interpretation; Clear, reproducible code (script or R Markdown)

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

To obtain a passing grade, students must demonstrate a basic understanding of the core concepts of computer programming, the ability to use R and R studio in an introductory level and completion of the required XP is necessary for obtaining the course signature.

Students must demonstrate basic understanding of:
- Data types and structures in R (vector, data frame)
- Data handling (import, subsetting, transformation)
- Basic data visualization
- Logical operations and conditional statements (if, else)
- Iteration or repeated operations (loops or apply functions)
- Functions (use of built-in and simple custom functions)
- Principles of reproducible, script-based analysis

A project is accepted as fulfilling course requirements if it includes:
- Data Component: Use of a real or simulated biomedical dataset
- Data Processing: Data import, inspection, and basic cleaning
- Analysis: At least one transformation or manipulation step, At least one visualization
- Programming Component: Use of conditional logic and/or iteration, Use of at least one function (built-in or custom)
- Reproducibility: Submission as a well-structured script or R Markdown file

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Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

Each project is graded on a 0–100% scale
The final practical grade is the average of the two project scores
The course grade is based entirely on these project assignments (term grade)

The evaluation will be the following:
- the maximal score will be 50 points
- grade 5: 86-100 %
- grade 4: 74-85 %
- grade 3: 61-73 %
- grade 2: 50-60 %
- grade 1: 0-49 %

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students' independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Other resources:

Required	pdf.igen
Other/Comment	Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Laboratóriumi technikák a pszichofiziológiában és a kognitív idegtudományban
Name of subject in English: Laboratory techniques in psychophysiology and cognitive neuroscience
Name of subject in German: Laborpraktische Methoden in der Psychophysiologie und der kognitiven Neurowissenschaft

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Credit value of the course: 2
Semester: 1st semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB005_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, +36203454245
Course coordinator position: university professzor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014 (Semmelweis University)

Objectives of the course, and its place in the curriculum of the medical training program:

The aim of the course is to provide an in-depth overview of the laboratory techniques used in psychobiology to investigate the biological bases of behavior and mental processes. Students will

learn the most important research techniques, core principles, and the specific features of various methodological approaches. The course focuses on empirical studies in the field and covers fundamental techniques such as behavioral paradigms in humans and animal models, microscopy, neuromodulation and neuroimaging, genetic and molecular methods, and pharmacological manipulations. Attention is also given to ethical considerations, translational relevance, and the integration of findings across methods and model systems.

Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Knowledge:
- Advanced knowledge of behavioral physiology
- Characteristics, advantages, and limitations of research methods used in psychobiology
- Behavioral physiological foundations of psychopathological phenomena
- In-depth knowledge of the effects of drugs and other active substances on behavior and psychological processes

Skills:
- Analyse and interpret neuroanatomical and neurophysiological relationships, critically examine the biological foundations of animal and human behaviour, evolutionary and genetic factors, their interactions, and adaptive functions
- Interpret and investigate the physiological background of mental and cognitive processes (e.g. mood, emotion, memory, attention, decision-making) and apply research methods critically
- Analyse developmental characteristics of the nervous system and evaluate the role of animal models in psychobiological research
- Integrate and apply knowledge related to the biological background, diagnostic approaches, and therapeutic options of neurological and psychiatric disorders
- Critical analysis of psychological phenomena in terms of biological mechanisms and within a biomedical context, as well as knowledge of psychology, biology, neuroscience, cognitive science, and their interconnections
- Critical thinking in the evaluation of results, recognition of patterns and relationships, formulation of hypotheses, generation of new research questions, and development of creative solutions

Attitudes:
- critical: critically evaluate scientific claims and recognize their empirical foundations, strengths, and limitations
- rational: drawing conclusions based on logical reasoning and scientifically validated evidence
- committed to renewal and continuous improvement: receptiveness to new research directions, methods, and theoretical frameworks
- curious: interest in deeper underlying mechanisms of phenomena, formulation of questions, and pursuit of scientific explanations

Autonomy, and responsibility:
● Expresses opinions independently, with professional grounding and a clear sense of responsibility
● Initiates and conducts responsible, rational, and evidence-based discussions with professionals from related disciplines
● Is committed to professional principles and takes responsibility for the reliability of the knowledge they generate (ensuring objective, reproducible scientific results)
● Is dedicated to upholding research ethics, takes responsibility for adherence to ethical standards—especially in human and animal studies—and considers the social and moral implications of research findings

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Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB001_2A, AOMKPSZB012_1A, AOMKPSZB015_1A, AOMKPSZB011_1A, AOMKPSZB001_1A, AOMKPSZB014_1A

Prerequisites for course registration and completion: (NEPTUN ID):

None

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

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The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

Magtud:
Dr. G. Horváth Csenge - 3 (SE Magtud jelenleg pályázatos, felvételét kérjük teljes állású oktatóként)
Dr. Szabados-Szalárdy Orsolya - 2 (SE Magtud)

egyetemről:
Dr. Czobor Pál - 2 (nyugd. SE Pszichiártiai Klinika)
Dr. Gyebnár Gyula - 1 (SE Neuroradiológiai Tanszék)

Dr. Kozák Lajos - 1 (SE Neuroradiológiai Tanszék)
Dr. Kakuszi Brigitta -1 (SE Pszichiátriai Klinika)
Dr. Sákovics Anna - 1 (SE Idegsebészeti és Neurointervenciós Klinika)
Dr. Dobolyi Árpád - 1 (SE Anatómiai, Szövet- és Fejlődéstani Intézet)

Külsős:
Dr. Tóth Brigitta - 2 (HUN-REN TTK)

1. Introduction: Electrical activity in the cells and tissues, and the origin of electrical signals. Resting membrane potential, ion channels and ion gradients, action potentials, postsynaptic potentials, pyramidal cells, single cell and multiunit recording, dipoles, volume conduction, scalp EEG. – Dr. Orsolya Szabados-Szalárdy

2. Technical aspects of EEG recording: Electrode placement, the international 10–20 system, electrode types, active vs passive electrodes, impedance, referencing methods, amplifiers, sampling rate, artifacts (EOG, EMG, ECG) – Dr. Csenge G. Horváth

3. Polysomnography and other methods of sleep EEG analysis: Polysomnography, video-EEG, sleep stages, sleep spindles, k-complexes, slow-wave activity, spectral analysis, arousal detection – Dr. Csenge G. Horváth

4. The use of evoked potentials in psychobiology: Sensory evoked potentials, time-locking, averaging techniques, event-related potentials (ERPs), components (p100, n170, p300), latency, amplitude, cognitive paradigms – Dr. Orsolya Szabados-Szalárdy

5. EEG in clinical practice and high-density EEG: HD EEG (64–256 channels), source localization, clinical biomarkers – Dr. Pál Czobor

6. High-resolution EEG studies in psychiatry: psychiatric disorders, neural oscillations, biomarkers, cognitive dysfunction, clinical EEG applications – Dr. Brigitta Kakuszi

7. Neonatal EEG specificities and experimental paradigms: Neonatal brain activity, sensory paradigms, what babies can do, clinical risk markers – Dr. Brigitta Tóth

8. Neuroimaging techniques in psychobiological research: different brain imaging techniques, PET, CT, MRI – Dr. Gyula Gyebnár

9. Wearable devices in psychobiology: Actigraphy, mobile polysomnography, circadian rhythms, home monitoring, data processing, ecological validity, clinical applications, limitations – Dr. Csenge G. Horváth

10. Invasive electrophysiology in clinical practice: Intracranial EEG (iEEG), depth electrodes, subdural grids, single-unit recordings, clinical indications, epilepsy surgery and monitoring – Dr. Sákovics Anna

11. Optogenetics, chemogeetics, in vivo calcium imaging - Dr. Dobolyi Árpád

12. Theoretical and practical foundations of EEG connectivity: Coherence, phase synchronization, network theory, functional connectivity – Dr. Brigitta Tóth

13. Hyperscanning and inter-brain synchronization: Simultaneous EEG recording, social interaction paradigms, inter-brain coherence, synchronization indices – Dr. Pál Czobor

14. fMRI paradigms and analysis specificities: BOLD signal, block design, event-related design, preprocessing, ROI vs whole-brain analysis – Dr. Kozák Lajos

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Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB001_1A, AOMKPSZB001_2A, AOMKPSZB002_1A, AOMKPSZB008_1A, AOMKPSZB008_2A, AOMKPSZB008_3A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

The requirement for course signatrure is that students attend at least 50% of the lectures.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

None

Number and type of individual assignments to be completed, submission deadlines:

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Requirements for the successful completion of the course:

Course signature and achievement of at least 50% on the written end-term examination (minimum 25/50 points).

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics

accepted as an exam)

Written examination includes the following topics:

Electrical activity in the cells and tissues, and the origin of electrical signals.
Technical aspects of EEG recording.
Polysomnography and other methods of sleep EEG analysis.
The use of evoked potentials in psychobiology.
EEG in clinical practice and high-density EEG.
Neonatal EEG specificities and experimental paradigms.
EEG Paradigms.
Neuroimaging techniques in psychobiological research.
fMRI paradigms and analysis specificities.
Invasive electrophysiology in clinical practice.
Animal Experiments, Immunohistochemistry, Enzyme Histochemistry.
Theoretical and practical foundations of EEG connectivity.
Hyperscanning and inter-brain synchronization.
Wearable devices in psychobiology.

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department’s website referring to the minimum requirements of the course.

Resting membrane potential
Action potential
Postsynaptic potential (EPSP/IPSP – basic distinction)
Electrical dipole (basic concept)
Volume conduction
EEG
Pyramidal neurons (role in EEG generation – basic idea)
Scalp EEG vs. intracranial recording (basic difference)
International 10–20 system
Electrode (basic function)
Impedance
Reference electrode (basic concept)
Sampling rate (basic importance)
Amplification (basic idea)
Eye movement artifact (EOG)
Muscle artifact (EMG)
Cardiac artifact (ECG)
Noise vs. signal distinction
Polysomnography
Sleep stages (basic distinction: REM vs. non-REM)
Sleep spindle (basic recognition)

Slow-wave activity
Time-locking
Averaging
ERP component (basic idea)
Latency
Amplitude
MRI (structural imaging – basic concept)
fMRI (functional imaging – BOLD signal basic idea)
PET (basic principle: metabolic activity)
CT (basic structural imaging concept)
BOLD signal
Block design vs. event-related design
ROI (region of interest)
Intracranial EEG (iEEG)
Depth electrode
Single-unit recording (basic concept)
Functional connectivity
Coherence
Phase synchronization (basic idea)
Network (basic concept in brain function)
Animal model (basic definition)
In vivo vs. in vitro
Microscopy (basic role in neural tissue analysis)
Actigraphy
Ecological validity
Laboratory vs. real-world measurement
EEG paradigm (stimulus–response structure)
Sensory stimulation (basic concept)
Social interaction paradigm (basic idea, e.g. hyperscanning)
Translational validity
Human vs. animal research (basic distinction)
Basic ethical considerations in human and animal studies

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

The evaluation will be based on the written test exam as follows:
- the maximal score will be 50 points
- grade 5: 43-50 points
- grade 4: 37-42 points
- grade 3: 31-36 points
- grade 2: 25-30 points
- grade 1: 0-24 points

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students' independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Other resources:

Required	pdf.igen
Other/Comment	Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Az agy és a mentális funkciók evolúciója
Name of subject in English: Evolution of the brain and mental functions
Name of subject in German: Evolution des Gehirns und der mentalen Funktionen

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Credit value of the course: 2
Semester: 1st semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB004_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, +36203454245
Course coordinator position: university professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014 (Semmelweis University)

Objectives of the course, and its place in the curriculum of the medical training program:

The aim of the course is to explore the evolution of the brain and mental functions from a psychobiological perspective. The subject integrates the results of evolutionary biology, neurobiology, anatomy, ethology, anthropology and cognitive psychology. Students will gain a comprehensive picture of the most important stages of the development of the nervous system, moving from simpler nervous system functions to increasingly complex brain structures and

functions. The course details the nervous system properties of individual animal groups based on anatomical and functional aspects, and describes the specifics of the functioning of the human brain.

Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Knowledge:
- Knowledge of the structural organization and anatomy of the central and autonomic nervous systems
- Basic developmental biology (including ontogenetic and phylogenetic aspects)
- Evolutionary-based behavioral physiology models and knowledge

Skills:
- Analyse and interpret neuroanatomical and neurophysiological relationships, critically examine the biological foundations of animal and human behaviour, evolutionary and genetic factors, their interactions, and adaptive functions
- Interpret and investigate the physiological background of mental and cognitive processes (e.g. mood, emotion, memory, attention, decision-making) and apply research methods critically
- Analyse developmental characteristics of the nervous system and evaluate the role of animal models in psychobiological research
- Critical analysis of psychological phenomena in terms of biological mechanisms and within a biomedical context, as well as knowledge of psychology, biology, neuroscience, cognitive science, and their interconnections

Attitudes:
- rational: drawing conclusions based on logical reasoning and scientifically validated evidence
- committed to renewal and continuous improvement: receptiveness to new research directions, methods, and theoretical frameworks
- curious: interest in deeper underlying mechanisms of phenomena, formulation of questions, and pursuit of scientific explanations
- open to interdisciplinary collaboration: effective communication and cooperation with experts from other scientific fields

Autonomy, and responsibility:
- Expresses opinions independently, with professional grounding and a clear sense of responsibility
- Initiates and conducts responsible, rational, and evidence-based discussions with professionals from related disciplines
- Understands the importance of science communication (presenting research results in an accessible manner) and, as a member of the scientific community, takes responsibility for addressing misconceptions, pseudoscientific theories, and misleading narratives in psychology and biology

Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB001_2A, AOMKPSZB003_2A, AOMKPSZB009_1A, AOMKPSZB012_1A, AOMKPSZB017_1A, AOMKPSZB010_1A

Prerequisites for course registration and completion: (NEPTUN ID):

None

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

Dr. Szabados-Szalárdy Orsolya - 16 (SE Magtud)
Dr. Bódizs Róbert - 4 (SE Magtud)
Dr. Farkas Kinga - 8 (SE Pszichiátriai Klinika)

1. Concept and history of evolutionary psychology - Dr. Kinga Farkas
Darwinism, Evolution of behavior, Sociobiology and ethology, theory of selfish genes, cultural evolution (memes)

2. Evolution of neurons and neuronal communication and the first nervous systems (Diffuse nerve nets, radial vs. bilateral organization) - Dr. Kinga Farkas
Evolutionary origins of neurons, electrical excitability, and synaptic transmission. The emergence of chemical and electrical signaling and diversification across early life forms. The functional advantages of neuronal specialization in an evolutionary context. Types of earliest nervous systems, including diffuse nerve nets and simple reflex circuits. Basic sensory–motor integration in early multicellular animals. The relationship between body symmetry and neural organization.

3. Centralization in invertebrates (Ganglia, cephalization, arthropods, mollusks) - Dr. Kinga Farkas

Centralized nervous system in invertebrates, evolution of ganglia and cephalization. Comparison of neural architectures in major invertebrate groups, such as arthropods and mollusks. Functional and behavioral consequences of neural centralization.

4. The evolution of the vertebrate nervous system (Spinal cord, brain divisions, basic vertebrate plan) - Dr. Kinga Farkas
Basic organization of the vertebrate nervous system, including the spinal cord and major brain divisions. Evolutionary innovations distinguishing vertebrate brains from invertebrate systems. Comparative examples illustrating increasing neural complexity and specialization.

5. Comparing brains: homology, analogy, and evolutionary constraints - Dr. Orsolya Szabados-Szalárdy
The concepts of homology and analogy in brain evolution, similarities and differences across species. Evolutionary constraints and developmental aspects on brain structures and functions.

6. Forebrain evolution and development in vertebrates (Telencephalon, pallium, cortex, basal ganglia) - Dr. Orsolya Szabados-Szalárdy
Midterm test I.
Evolution and development of the vertebrate forebrain. The origins of major forebrain structures and their functional diversification. Evolutionary pathways leading to the mammalian cortex. Brain size scales with body size across species. Allometric principles and theories of brain arealization. Adaptive explanations for variation in brain structure and regional specialization.

7. Brain development, plasticity, and experience-dependent change - Dr. Orsolya Szabados-Szalárdy
Brain development shaped by genetic programs and environmental input. Neural plasticity as an evolutionary adaptation. Critical periods and lifelong plasticity in comparative context.

8. Evolution of learning and memory: comparative perspectives - Dr. Orsolya Szabados-Szalárdy
Learning and memory systems across animals. Associative and non-associative learning mechanisms from an evolutionary perspective. Habituation, sensitization, classical conditioning, operant conditioning, and complex learning. The adaptive value of different memory systems.

9. Evolution of sleep and biological rhythms - Dr. Róbert Bódizs
Evolutionary origins and functions of sleep across species. Comparative evidence for sleep stages, circadian rhythms, and their neural regulation. Hypotheses about the adaptive value of sleep.

10. Evolution of communication systems (Signals, language precursors, multimodal communication) - Dr. Orsolya Szabados-Szalárdy
The evolution of communication from simple signaling to complex systems. Visual, auditory, chemical, and multimodal communication across species. Evolutionary precursors of human language.

11. Comparative aspects of social organization and coordination - Dr. Orsolya Szabados-Szalárdy
Social behavior and group coordination. Social systems across animal species, from insects to primates. The neural and cognitive foundations of cooperation and competition. Evolutionary roots of social cognition, including the ability to attribute mental states to others. Comparative studies of empathy and altruism. The origin of human social behavior. Theory of mind.

12. Sexual selection and mating systems - Dr. Róbert Bódizs
Reproduction, family and fertility, sexual strategies, mate choice, physical attractiveness, attachment.

13. Parental strategies - Dr. Orsolya Szabados-Szalárdy
Midterm test II.
Attachment, favoritism, conflicts and competition in parental care; reproductive decisions: theoretical overview; mother–infant relationship; paternal care; menopause: the institution of grandmothers; parent–offspring conflict; alternative paternal roles.

14. The human brain in evolutionary perspective (What is unique, what is conserved, evolutionary trade-offs, cultural evolution) - Dr. Orsolya Szabados-Szalárdy
Integrating anatomical, cognitive, and social aspects of brain evolution. Features of the human brain evolution. Tool use, causality, self-recognition, deception. The implications of brain evolution for understanding human behavior and cognition. Psychiatric disorders in evolutionary perspectives.

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB001_1A, AOMKPSZB001_2A, AOMKPSZB003_1A, AOMKPSZB003_2A, AOMKPSZB009_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

The requirement for course signatrure is that students attend at least 50% of the lectures.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

The course signature requires 50% attendence and the achievement of a minimum overall performance of 50% in two midterm in-class tests organized during the semester to be eligible for

the final exam. The combined score of both tests will be calculated, and at least 50% is required to obtain the course signature.

Each midterm test will include 20 questions (either simple-choice or True/False), with each question counting 1 point. The total score of both tests is 40 points, and at least 20 points are required to receive the course signature. Students will receive 10 minutes to complete the test.

The midterm in-class tests will be held in the 6th and 13th weeks. A make-up session will be offered in the following week for students who were unable to attend the originally scheduled test dates in the 7th and 14th weeks.

Number and type of individual assignments to be completed, submission deadlines:

Requirements for the successful completion of the course:

Course signature and successful end-term examination.
Achievement of at least 50% on the combined midterm tests (minimum 20/40 points) required for course signature.
Achievement of at least 50% on the written end-term examination (minimum 25/50 points).

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

Written examination includes the following topics:

Concept and history of evolutionary psychology
Evolution of neurons and neuronal communication and the first nervous systems
Centralization in invertebrates
The evolution of the vertebrate nervous system
Comparing brains: homology, analogy, and evolutionary constraints
Forebrain evolution and development in vertebrates
Brain development, plasticity, and experience-dependent change
Evolution of learning and memory: comparative perspectives
Evolution of sleep and biological rhythms
Evolution of communication systems
Comparative aspects of social organization and coordination
Sexual selection and mating systems
Parental strategies
The human brain in evolutionary perspective

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department’s website referring to the minimum requirements of the course.

To obtain a passing grade, students must demonstrate a basic understanding of the core concepts of the evolution of the brain and mental functions, as well as the ability to interpret and apply this knowledge in a structured manner.

Evolutionary principles:

- Natural selection (variation, inheritance, differential reproductive success)
- Adaptation and fitness
- Sexual selection (intrasexual vs. intersexual selection)
- Inclusive fitness, kin selection
- Basic concept of evolutionary trade-offs

Origins of nervous systems:

- Excitability of cell membranes
- Synaptic transmission (chemical vs. electrical)
- Diffuse nerve net (e.g. cnidarians)
- Radial vs. bilateral symmetry
- Basic sensory–motor integration

Centralization and cephalization:

- Ganglia formation
- Cephalization (anterior concentration of neurons)
- Differences between diffuse and centralized nervous systems

Invertebrate vs. vertebrate organization:

- Ventral vs. dorsal nerve cord
- Segmentation of the nervous system
- Basic functional differences between invertebrate and vertebrate systems

Basic vertebrate brain plan:

- Spinal cord
- Brainstem (hindbrain)
- Midbrain
- Forebrain

Key evolutionary steps in forebrain development:

- Enlargement of the forebrain (encephalization)
- Differentiation of the telencephalon
- Pallium vs. subpallium distinction
- Emergence of layered cortex (basic concept of cortical lamination)
- Expansion of cortical surface (gyrification – basic idea only)

Comparative concepts:

- Homology vs. analogy
- Convergent evolution (basic idea)
- Allometry (brain size vs. body size scaling)

Brain development and plasticity:

- Genetic vs. environmental influences on development
- Neural plasticity (basic definition)
- Critical/sensitive periods (basic concept)

Learning and memory (evolutionary basics):

- Habituation
- Sensitization
- Classical conditioning
- Operant conditioning

Biological rhythms and sleep:

- Circadian rhythm
- Adaptive functions of sleep

Communication and social behaviour:

- Signal vs. cue
- Basic modalities (visual, auditory, chemical)
- Cooperation vs. competition

Reproduction and parental behaviour:

- Sexual selection strategies
- Parental investment
- Parent–offspring conflict

Human brain evolution (minimum level):

- Encephalization (relative brain size increase)
- Expansion of association cortex
- Evolutionary continuity vs. specialization

Failure to meet these minimum requirements results in a failing grade.

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

The evaluation will be based on the written exam as follows:
- the maximal score will be 50 points
- grade 5: 43-50 points
- grade 4: 37-42 points
- grade 3: 31-36 points
- grade 2: 25-30 points
- grade 1: 0-24 points

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students' independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Other resources:

Required	pdf.igen
Other/Comment	Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Neuroanatómia és neurofiziológia I.
Name of subject in English: Neuroanatomy and neurophysiology I.
Name of subject in German: Neuroanatomie und Neurophysiologie I.

Credit value of the course: 3
Semester: 1st semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB003_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, +36203454245
Course coordinator position: university professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014 (Semmelweis University)

Objectives of the course, and its place in the curriculum of the medical training program:

This course introduces the fundamental structural and cellular organization of the nervous system. Students learn the macroanatomy of the central and peripheral nervous systems, including the brain, spinal cord, cranial and spinal nerves, as well as the main anatomical divisions of the brain. The course also covers the microscopic structure of neural tissue, major neural cell types, gray and white matter organization, synaptic structure, and the basic physiological principles of neural

signaling, including membrane potentials, action potentials, synaptic transmission, and major neurotransmitter systems. The aim is to establish the anatomical and physiological foundations necessary for understanding neural function

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Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Knowledge:
- Structural organization of the nervous system, including the central and peripheral nervous systems.
- Macro- and microscopic anatomy of the brain and spinal cord, including major neural cell types and tissue organization.
- Basic neurophysiological mechanisms of neural activity, including membrane potentials, action potentials, and synaptic transmission.
- Major neurotransmitter and neuromodulatory systems and their functional roles

Skills:
- Identification of major neuroanatomical structures and systems using anatomical representations and schematic models.
- Interpretation of major neural pathways and functional circuits of the nervous system.
- Application of basic neurophysiological principles to explain neural communication and system-level functions.
- Integration of structural and functional knowledge to interpret neural mechanisms underlying behavior and cognition.

Attitudes:
- Openness to interdisciplinary approaches linking neuroscience, psychology, and biology.
- Precision and responsibility in the use of scientific terminology and neuroanatomical nomenclature.
- Analytical and integrative thinking in understanding complex neural systems.
- Commitment to evidence-based scientific reasoning.

Autonomy and responsibility:
- Ability to independently review and organize neurobiological knowledge related to brain structure and function.
- Responsible participation in learning activities and discussions related to neuroscience topics.
- Application of acquired knowledge as a foundation for further methodological, experimental, and laboratory-based courses

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Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB003_2A

Prerequisites for course registration and completion: (NEPTUN ID):

None

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

Concurrent registration with the 2nd part of this multi-semester course (Neuroanatomy and Neurophysiology – II) is not allowed.

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

Dr. Farkas Kinga - 8 (SE Pszichiátriai Klinika)
Dr. Szabados-Szalárdy Orsolya - 8 (SE Magtud)
Dr. Adorján István 6 (SE Anatómiai Intézet)
Dr. Fabó Dániel 6 (SE ETK)

Dr. Lénárt Nikolett (KOKI)

1. Introduction and basic organization - Dr. Farkas Kinga
Introduction to neuroanatomy and neurophysiology, main parts and structures of the nervous system, basic nomenclature, overview of the cranium and vertebral canal, central vs peripheral nervous system (brain and spinal cord; somatic and autonomic divisions).

2. Macroanatomy of the CNS - Dr. Farkas Kinga
General macroanatomy of the central nervous system, encephalon, ventricular system, cerebrospinal fluid (liquor), meninges (dura), blood–brain barrier. Brain regions and cortical anatomy: Developmental divisions (prosencephalon, mesencephalon, etc.), telencephalon, lobes (lobi), gyri and sulci, structural organization of the cerebral cortex.

3. Microanatomy I. - Dr. Farkas Kinga
Gray and white matter, types of neural cells, layered organization of gray matter, white matter structure, myelination, introduction to action potential, structure of synapses.

4. Neurotransmission in the nervous system - Dr. Farkas Kinga
Electrical properties of neurons, membrane potential, action potential, synaptic transmission, long-term potentiation (LTP) and depression (LTD), glutamate and GABA, excitatory and inhibitory effects.

5. Peripheral nervous system - Dr. Szalárdy Orsolya
Organization of the peripheral nervous system, cranial nerves (I–XII), spinal cord and spinal nerves (cervical, thoracic, lumbar, sacral, coccygeal segments).

6. Brainstem and cerebellum - Dr. Szalárdy Orsolya
Structure and function of the cerebellum, medulla oblongata, pons, mesencephalon; nuclei, major parts, and functional organization.

7. Telencephalon: functional organization - Dr. Fabó Dániel
Brodmann areas, primary motor and sensory cortices, association cortices, macro- and microanatomy of cortical regions.

8. Brain tracts and networks - Dr. Fabó Dániel
White matter systems: association fibers, commissural fibers, projection fibers (thalamocortical, corticospinal, corticonuclear pathways), structural and functional connectivity.

9. Neuromodulation I. - Dr. Adorján István
Monoaminergic systems and their projections, dopamine systems, receptor types and functional effects in different brain regions.

10. Neuromodulation II - Dr. Adorján István
Serotonin, norepinephrine, cholinergic system (acetylcholine), neuropeptides, integrative role of neuromodulatory systems.

11. Glial cells and neuroimmune system - Dr. Szalárdy Orsolya
Astrocytes, oligodendrocytes, microglia, neuroinflammation, metabolic support, glymphatic system, myelination.

12. Neurovascular system of the brain - Dr. Szalárdy Orsolya
Cerebral circulation: internal carotid arteries, vertebrobasilar system, circle of Willis, dural venous sinuses, neurovascular coupling.

13. Glia–neuron–vascular interactions - Dr. Lénárt Nikolett
Functional interactions between neurons, glial cells, and the cerebral vasculature. Mechanisms of neurovascular coupling and their role in maintaining brain homeostasis.

14. Consultation and integration (Farkas Kinga, Szalárdy Orsolya)
Summary, integration of neuroanatomical and neurophysiological concepts, clinical relevance, consultation and exam preparation.

Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB001_1A, AOMKPSZB001_2A, AOMVPSZB027_1A, AOMKPSZB004_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

The requirement for course signatrure is that students attend at least 50% of the lectures.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

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Number and type of individual assignments to be completed, submission deadlines:

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Requirements for the successful completion of the course:

Course signature and achievement of at least 50% on the written end-term examination (minimum 25/50 points).

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

Written examination includes the following topics:
1. Organization of the nervous system: central vs peripheral divisions
2. Anatomical terminology and basic structural orientation
3. Structure and protective elements of the CNS (cranium, vertebral canal, meninges)
4. Ventricular system and cerebrospinal fluid circulation
5. Blood–brain barrier: structure and function
6. Major developmental divisions of the brain (prosencephalon, mesencephalon, rhombencephalon)
7. Structure of the telencephalon: lobes, gyri, sulci
8. Functional organization of the cerebral cortex (Brodmann areas, primary and association areas)
9. Gray and white matter: structure and functional differences
10. Types and roles of neural cells (neurons and glial cells)
11. Structure and function of synapses
12. Membrane potential and action potential generation
13. Synaptic transmission: excitatory and inhibitory processes (glutamate, GABA)
14. Synaptic plasticity: long-term potentiation (LTP) and long-term depression (LTD)
15. Organization of the peripheral nervous system: somatic and autonomic systems
16. Cranial nerves (I–XII): classification and basic functions
17. Structure and organization of the spinal cord and spinal nerves
18. Brainstem and cerebellum: main structures, nuclei, and functions

19. Major white matter pathways: association, commissural, and projection fibers
20. Neuromodulatory systems: dopamine, serotonin, norepinephrine, acetylcholine and their functional roles

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Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

To obtain a passing grade, students must demonstrate a basic understanding of the core concepts of the neuroanatomy and neurophysiology, as well as the ability to interpret and apply this knowledge in a structured manner.

Basic Organization
- Divisions of the nervous system (CNS vs PNS)
- Somatic vs autonomic nervous system
- Basic anatomical terminology and orientation

Central Nervous System
- Structure of the brain and spinal cord
- Meninges, ventricular system, cerebrospinal fluid
- Blood–brain barrier

Brain Structure
- Major brain divisions (prosencephalon, mesencephalon, rhombencephalon)
- Telencephalon: lobes, gyri, sulci
- Brainstem and cerebellum: main parts and functions

Cortical Organization
- Primary motor and sensory cortices
- Association areas
- Basic understanding of Brodmann areas

Microanatomy
- Gray and white matter
- Neurons and glial cells (basic types and roles)
- Myelination
- Synapse structure

Neurophysiology
- Membrane potential and action potential (conceptual level)
- Synaptic transmission (excitatory vs inhibitory)
- Basic neurotransmitters (glutamate, GABA)
- Introduction to synaptic plasticity (LTP, LTD – conceptual)

Peripheral Nervous System
- Cranial nerves (general classification and main functions)
- Spinal cord organization and spinal nerves

Connectivity
- Basic types of white matter tracts (Association, Commissural, Projection fibers)

Neuromodulation

- Dopamine, serotonin, norepinephrine, acetylcholine (basic roles)

Support Systems

- Glial cell functions
- Neurovascular system and basic cerebral circulation

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

The evaluation will be based on the written exam as follows:
- the maximal score will be 50 points
- grade 5: 43-50 points
- grade 4: 37-42 points
- grade 3: 31-36 points
- grade 2: 25-30 points
- grade 1: 0-24 points

Artificial intelligence systems used in the teaching of the subject and the manner of their application

Artificial intelligence (AI) systems may be used solely to support learning and the acquisition of knowledge. Their use should complement, but not replace, students' independent work and critical thinking.
AI tools may assist students in organising information, personalising learning materials, and accessing or processing scientific literature more efficiently. However, the use of AI does not exempt students from their individual responsibilities related to studying, literature review, and preparation of assignments.
While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
The use of AI systems during examinations or formal assessments is strictly prohibited, unless the task explicitly requires the knowledge or application of AI tools.

Other resources:

Required	pdf.igen
Other/Comment	Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission:

Semmelweis University, Faculty of Medicine - pszichobiológia MSc
Name of the host institution (and any contributing institution):
Magatartástudományi Intézet, Pszichiátriai és Pszichoterápiás Klinika

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Name of subject in Hungarian: Pszichobiológiai kutatási módszerek
Name of subject in English: Research Methods in Psychobiology
Name of subject in German: Forschungsmethoden in der Psychobiologie

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Credit value of the course: 2
Semester: 1st semester
(in which the subject is taught according to the curriculum)

Weekly hours	Lecture	Practice	Seminar
0.0	0.0	0.0	0.0

Semester hours	Lecture	Practice	Seminar
28.0	28.0	0.0	0.0

Type of course:
obligatory

Academic year:
2026/27

Language of instruction (for optional and elective subjects):
Angol

Course code:
AOMKPSZB002_1A
(in the case of a new course, to be completed by the Dean’s Office, following approval)

Course coordinator name: Dr. Bódizs Róbert Zoltán (tudományos főmunkatárs)
Course coordinator location of work, telephone availability: Institute of Behavioural Sciences, Semmelweis University, +36203454245
Course coordinator position: university professor
Course coordinator Date and number of habilitation: 30. 06. 2014., 01/2014 (Semmelweis University)

Objectives of the course, and its place in the curriculum of the medical training program:

The course provides an introduction to the foundations, methods, and practical tools of research in psychobiology and related behavioral sciences. Students will learn the principles of scientific thinking, including hypothesis formation, research transparency, measurement theory, and the logic of experimental design. The course covers both qualitative and quantitative methodologies, psychometrics, and core behavioral and cognitive paradigms, linking experimental tasks to their

underlying neural systems. The course also introduces animal models, ethical considerations, and translational validity. Students will learn about open science practices, large-scale research databases and research planning strategies and requirements.

Format of the course (lectures, group work, practical lessons, etc.):

lecture

Competencies acquired through completion of course:

Knowledge:
- Characteristics, advantages, and limitations of research methods used in psychobiology
- Advanced knowledge of behavioral physiology
- In-depth knowledge of the effects of drugs and other active substances on behavior and psychological processes

- Basic neuropsychiatric knowledge and neuropsychological assessment methods

Skills:

- Interpret and investigate the physiological background of mental and cognitive processes (e.g. mood, emotion, memory, attention, decision-making) and apply research methods critically
- Analyse developmental characteristics of the nervous system and evaluate the role of animal models in psychobiological research
- Ability to design experiments/studies, analyze data, interpret findings, write scientific papers and reports, create data visualizations, and present research results
- Critical thinking in the evaluation of results, recognition of patterns and relationships, formulation of hypotheses, generation of new research questions, and development of creative solutions

Attitudes:
- critical: critically evaluate scientific claims and recognize their empirical foundations, strengths, and limitations
- rational: drawing conclusions based on logical reasoning and scientifically validated evidence
- committed to renewal and continuous improvement: receptiveness to new research directions, methods, and theoretical frameworks
- curious: interest in deeper underlying mechanisms of phenomena, formulation of questions, and pursuit of scientific explanations

Autonomy, and responsibility:
- Expresses opinions independently, with professional grounding and a clear sense of responsibility
- Based on their professional knowledge and awareness, is capable of independently analyzing and interpreting emerging professional questions
- Initiates and conducts responsible, rational, and evidence-based discussions with professionals from related disciplines
- Understands the importance of science communication (presenting research results in an

accessible manner) and, as a member of the scientific community, takes responsibility for addressing misconceptions, pseudoscientific theories, and misleading narratives in psychology and biology

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Course outcome (names and NEPTUN ID of related subjects):
AOMKPSZB012_1A, AOMKPSZB017_1A, AOMKPSZB008_2A, AOMKPSZB008_3A, AOMKPSZB019_1A, AOMKPSZB019_2A, AOMKPSZB020_1A

Prerequisites for course registration and completion: (NEPTUN ID):

none

In the case of multi-semester courses, position on the possibility of and conditions for concurrent registration:

The number of students required to start the course (minimum, maximum), method of selecting participants:

min. 5

Detailed course syllabus (if the course can be divided into modules, please indicate): (Theoretical and practical instruction must be broken down into hours (weeks), numbered separately; names of instructors and lecturers must be listed, indicating guest lecturers/instructors. It cannot be attached separately! For guest lecturers, attachment of CV is required in all cases!)

Dr. Bódizs Róbert - 2 (SE Magtud)
Dr. Szabados-Szalárdy Orsolya - 8 (SE Magtud)
Dr. Farkas Kinga - 2 (SE Pszichiátriai Klinika)
G. Horváth Csenge - 10 (SE Magtud jelenleg pályázatos, felvételét kérjük teljes állású oktatóként)
Dr. Ujma Péter - 2 (SE Magtud)
Dr. Koncz Szabolcs - 4 (SE Gyógyszerhatástani Intézet)

1. Introductory lecture: Foundations of Scientific Thinking - Dr. Csenge G. Horváth
What is science? What does psychobiology study? Levels of explanation: Molecular → Cellular → Systems → Behavioral → Social. concept and aims of science; characteristics of scientific thinking (objectivity, evidence-based reasoning, replicability); induction vs. deduction; hypothesis; model, theory, law. Research transparency and reproducibility as scientific values

2. Scientific measurements - Dr. Csenge G. Horváth

Types of variables, measurement scales (nominal, ordinal, interval, and ratio scales); causality; concepts of validity and reliability; operationalization; sampling: population vs. sample, sampling procedures, sampling errors, sample size; generalizability; measurement error; signal-to-noise ratio

3. Qualitative research - Dr. Kinga Farkas

Focus groups, interviews, ethnography, case studies, action research; strengths and limitations

4. Research Designs in Quantitative Research - Dr. Csenge G. Horváth

Descriptive vs. correlational vs. experimental, Cross-sectional vs. longitudinal studies, Between / within / mixed designs, Randomization and control groups, Causality vs. association, Confounding & internal validity threats

5. Questionnaires and Psychometrics - Dr. Péter Ujma

Scale construction basics. Reliability (internal, test-retest, inter-rater), validity (construct, predictive, convergent). Intraclass correlation, within- and between-person measures. Latent and manifest variables, brief introduction to factor analysis, fitting models to data. Limitations, biases in self-reports: response styles, recall bias, acquiescence, method variance, face validity and social desirability. Measurement invariance, test bias.

6. Perception and psychophysics - Dr. Orsolya Szabados-Szalárdy

Midterm test 1.
Direct bridge between sensory systems and neural signals. Visual and auditory threshold tasks, just-noticeable difference, contrast sensitivity tests, temporal order judgment tasks, signal detection theory (conceptual).

7. Behavioral and Cognitive Experimental Paradigms - Dr. Orsolya Szabados-Szalárdy

Core paradigms and their neural relevance: Reaction time tasks, Stroop task, Go/No-Go, Wisconsin Card Sorting Test (conceptual), N-back task, Speed–accuracy trade-off, Task validity and ecological validity, Linking each paradigm to underlying neural systems.

8. Psychological and Affective Measurement - Dr. Orsolya Szabados-Szalárdy

Attention and executive function measures, Memory assessment: Digit Span, Corsi Block, Word list learning, Emotion and affect: Self-Assessment Manikin (SAM), Emotion recognition tasks, Social cognition: Theory of Mind tasks, Trust/cooperation paradigms

9. Human Electrophysiology - Dr. Orsolya Szabados-Szalárdy

Electrophysiology in human research: local field potentials (LFP), electroencephalography (EEG), electrocorticography (ECoG), and depth recordings. Autonomic nervous system measures: HRV, Skin conductance, Eye tracking, Laboratory vs. ecological assessments

10. Psychoneuroendocrinology Research Methods - Dr. Róbert Bódizs

Hormone measurement and biomarkers (salivary and plasma assay), behavioural and endocrinological challenges (e.g. experimental stress induction, Dexamethasone Suppression Test), research designs (cross-sectional, longitudinal, experimental designs, daily/real world designs),

circadian timing effects, state vs. trait biomarkers, laboratory vs. ecological assessments, complex mathematical modelling

11. Animal Research I. - Dr. Szabolcs Koncz
In vivo vs. in vitro, animal models (transgenic, lesion, pharmacological), disease models (depression, anxiety, Alzheimer's)

12. Animal research II. - Dr. Szabolcs Koncz
Behavioral paradigms: Morris water maze, Elevated plus maze, Fear conditioning, Operant conditioning, Translational validity, 3R principles (Replace, Reduce, Refine), Ethical frameworks, Construct validity of animal models

13. Data, Databases, and Open Science - Dr. Csenge G. Horváth
Midterm test 2.
Open science movement, Pre-registration, Registered reports, Data sharing ethics, Public datasets: UK Biobank, Human Connectome Project, OpenNeuro, Gene Expression Omnibus, Licensing and data governance

14. Research planning - Dr. Csenge G. Horváth
Literature review strategy, Systematic search basics, Research questions and hypothesis formulation, Method selection, Feasibility, Ethical approval, Expected outcomes

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Other courses with overlapping topics (obligatory, optional, or elective courses) in interdisciplinary areas. To minimalize overlaps, topics should be coordinated. NEPTUN ID(s) of courses (to be provided):
AOMKPSZB001_1A, AOMKPSZB001_2A, AOMKPSZB005_1A, AOMKPSZB007_1A, AOMKPSZB007_2A, AOMKPSZB016_1A, AOMKPSZB018_1A

Requirements for attendance, options for making up missed sessions, and method of absence justification:

The requirement for course signatrure is that students attend at least 75% of the lectures.

Assessment methods during semester (number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks):
(number, topics, and dates of midterms and reports, method of inclusion in the course grade, opportunities for make-up and improvement of marks)

The course signature requires regular attendence the achievement of a minimum overall performance of 50% in two midterm in-class tests organized during the semester to be eligible for

the final exam. The combined score of both tests will be calculated, and at least 50% is required to obtain the course signature.

Each midterm test will include 20 questions (either simple-choice or True/False), with each question counting 1 point. The total score of both tests is 40 points, and at least 20 points are required to receive the course signature. Students will receive 10 minutes to complete the test.

The midterm in-class tests will be held in the 6th and 13th weeks. A make-up session will be offered in the following week for students who were unable to attend the originally scheduled test dates in the 7th and 14th weeks.

Number and type of individual assignments to be completed, submission deadlines:

None

Requirements for the successful completion of the course:

Course signature and successful end-term examination.
Achievement of at least 50% on the combined midterm tests (minimum 20/40 points) required for course signature.
Achievement of at least 50% on the written end-term examination (minimum 25/50 points).

Type of assessment:
terminal examination

Exam requirements (list of topics, topics of the test exam, and the optional project topics accepted as an exam)

Written examination includes the following topics:

Foundations of Scientific Thinking
Scientific measurements
Qualitative research
Research Designs in Quantitative Research
Questionnaires and Psychometrics
Perception and psychophysics
Behavioral and Cognitive Experimental Paradigms
Psychological and Affective Measurement
Human Electrophysiology
Psychoneuroendocrinology Research Methods
Animal Research I
Animal Research II
Data, Databases, and Open Science
Research planning

Clear, specific minimum requirements for assessment. (The list of mandatory concepts, parameters, diagrams, calculations, and practical skills required to obtain a passing grade, as well as the criteria for the completion and evaluation of project assignments accepted as an exam.) A link published on the department's website referring to the minimum requirements of the course.

Basics of scientific thinking:
- Induction vs. deduction
- Hypothesis (testable vs. non-testable)
- Theory vs. model vs. law
- Replicability and reproducibility
- Falsifiability

Measurement and variables:
- Independent vs. dependent variables
- Confounding variables
- Nominal, ordinal, interval, ratio scales
- Operationalization
- Reliability (basic definition)
- Validity (basic definition)
- Measurement error
- Signal-to-noise ratio

Sampling:
- Population vs. sample
- Random sampling (basic concept)
- Sampling bias
- Sample size (basic importance)
- Generalizability

Research design:
- Descriptive vs. correlational vs. experimental design
- Causation vs. correlation
- Cross-sectional vs. longitudinal design
- Between-subject vs. within-subject design
- Control group
- Randomization
- Internal validity (basic concept)

Qualitative research:
- Interview
- Focus group
- Case study
- Basic strengths and limitations of qualitative methods

Psychometrics:
- Internal consistency
- Test–retest reliability
- Construct validity
- Convergent validity (basic idea)
- Latent vs. manifest variables (basic distinction)
- Response bias (e.g. social desirability)

Psychophysics and perception:
- Threshold (absolute threshold)
- Just-noticeable difference
- Signal detection (signal vs. noise, hits vs. false alarms – basic concept)

Experimental paradigms:
- Reaction time
- Stroop effect
- Go/No-Go task
- Working memory task (e.g. N-back – basic idea)
- Speed–accuracy trade-off

Cognitive and affective measurement:
- Attention (basic concept)
- Working memory (basic concept)
- Emotion rating (e.g. self-report scales)
- Theory of Mind (basic concept)

Electrophysiology and physiological measures:
- EEG (basic principle: electrical brain activity)
- Event-related potentials (basic idea)
- Heart rate variability (HRV – basic concept)
- Skin conductance (arousal indicator)

Psychoneuroendocrinology:
- Hormone measurement (saliva vs. blood – basic distinction)
- State vs. trait measures
- Circadian effects (basic concept)

Animal research:
- In vivo vs. in vitro
- Animal model (basic definition)
- Translational validity
- 3R principles (Replace, Reduce, Refine)

Open science and data:
- Pre-registration
- Data sharing
- Research transparency
- Public dataset (basic concept)

Research planning:
- Research question vs. hypothesis
- Basic structure of a study (question → method → data → interpretation)
- Literature search (basic concept)
- Ethical approval (basic concept)

Method and type of grading (Share of theoretical and practical examinations in the overall evaluation. Inclusion of the results in the end-of-term assessment. Possibilities of and conditions for offered grades.): (Share of theoretical and practical examinations in the overall evaluation, Inclusion of the results in the end-of-term assessment, Possibilities of and conditions for offered grades)

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While AI tools may support the search for relevant scientific sources, the interpretation, critical evaluation, and synthesis of the information remain the responsibility of the student.
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Printed resources:

Type	Recommended
Author	Flannelly, L.t., Flannelly, K.J., & Jankowski, K.R.B.
Title	Fundamentals of Measurement in Health Care Research
Publisher	Journal of Health Care Chaplaincy 20(2)
Year of publication	2014
Other/Comment	75-82. - https://doi.org/10.1080/08854726.2014.906262

Type	Recommended
Author	Murphy, P.N.
Title	What is psychobiology?
Publisher	In P.N. Murphy (Ed.), The Routledge International Handbook of Psychobiology (pp. 1-4). Routledge
Year of publication	2018
Other/Comment	https://doi.org/10.4324/9781315642765-1

Type	Recommended
Author	Oualitative research: Lim, W.M.
Title	What is Qualitative Research? An Overview and Guidelines.
Publisher	Australasian Marketing Journal 33(2)
Year of publication	2025
Other/Comment	199-229. p.

Type	Recommended
Author	Flannelly, L.t., Flannelly, K.J., & Jankowski, K.R.B.
Title	Fundamentals of Measurement in Health Care Research
Publisher	Journal of Health Care Chaplaincy 20(2)
Year of publication	2014
Other/Comment	75-82. - https://doi.org/10.1080/08854726.2014.906262

Type	Recommended
Author	Hamilton AB, Finley EP.
Title	Qualitative methods in implementation research: An introduction.
Publisher	Psychiatry Res. 2019 Oct;280:112516. doi: 10.1016/j.psychres.2019.112516
Year of publication	2019

Type	Recommended
Author	Oualitative research: Lim, W.M.
Title	What is Qualitative Research? An Overview and Guidelines.
Publisher	Australasian Marketing Journal 33(2)
Year of publication	2025
Other/Comment	199-229. p.

Type	Recommended
Author	Coolican, H.
Title	Research Methods and Statistics in Psychology (8th ed.)

Publisher	Routledge
Year of publication	2024
Other/Comment	https://doi.org/10.4324/9781003215967 (pp. 1-34) and (pp. 35-68) and (pp.69-101)

Type	Recommended
Author	Hamilton AB, Finley EP.
Title	Qualitative methods in implementation research: An introduction.
Publisher	Psychiatry Res. 2019 Oct;280:112516. doi: 10.1016/j.psychres.2019.112516
Year of publication	2019

Type	Recommended
Author	Coolican, H.
Title	Research Methods and Statistics in Psychology (8th ed.)
Publisher	Routledge
Year of publication	2024
Other/Comment	https://doi.org/10.4324/9781003215967 (pp. 1-34) and (pp. 35-68) and (pp.69-101)

Type	Recommended
Author	Shubhra Mangal.
Title	Research Methodology in Behavioural Science
Publisher	PHI
Year of publication	2013
Other/Comment	pp. 1-34. and pp.93-126

Type	Recommended
Author	Shubhra Mangal.
Title	Research Methodology in Behavioural Science
Publisher	PHI
Year of publication	2013
Other/Comment	pp. 1-34. and pp.93-126

Type	Recommended
Author	Loehlin J. & Beaujean A.
Title	Latent Variable Models
Publisher	Routledge, New York & London
Year of publication	2017

Type	Recommended
Author	Loehlin J. & Beaujean A.
Title	Latent Variable Models
Publisher	Routledge, New York & London
Year of publication	2017

Type	Recommended

Author	Ursin H.
Title	The psychology in psychoneuroendocrinology
Publisher	Psychoneuroendocrinology Aug. 23. (6.): 555-70. doi: 10.1016/s0306-4530(98)00036-5.
Year of publication	1998

Type	Recommended
Author	Ursin H.
Title	The psychology in psychoneuroendocrinology
Publisher	Psychoneuroendocrinology Aug. 23. (6.): 555-70. doi: 10.1016/s0306-4530(98)00036-5.
Year of publication	1998

Type	Recommended
Author	González-Diaz, S.N., Arias-Cruz, A., Elizondo-Villarreal, B. et al.
Title	Psychoneuroimmunoendocrinology: clinical implications.
Publisher	World Allergy Organ j. 10, 19 (2017)
Year of publication	2017
Other/Comment	https://doi.org/10.1186/s40413-017-0151-6

Type	Recommended
Author	González-Diaz, S.N., Arias-Cruz, A., Elizondo-Villarreal, B. et al.
Title	Psychoneuroimmunoendocrinology: clinical implications.
Publisher	World Allergy Organ j. 10, 19 (2017)
Year of publication	2017
Other/Comment	https://doi.org/10.1186/s40413-017-0151-6

Type	Recommended
Author	Neil R. Carlson and Melissa A. Birkett
Title	Physiology of Behavior (13th edition)
Publisher	Pearson Education Limited, eBook
Year of publication	2022
Other/Comment	ISBN 13: 9781292430256

Type	Recommended
Author	Neil R. Carlson and Melissa A. Birkett
Title	Physiology of Behavior (13th edition)
Publisher	Pearson Education Limited, eBook
Year of publication	2022
Other/Comment	ISBN 13: 9781292430256

Type	Recommended
Author	Matt Carter and Jennifer Shieh
Title	Guide to Research Techniques in Neuroscience (2nd edition)
Publisher	Academic Press

Year of publication	2015
Other/Comment	ISBN: 9780128005118

Type	Recommended
Author	Matt Carter and Jennifer Shieh
Title	Guide to Research Techniques in Neuroscience (2nd edition)
Publisher	Academic Press
Year of publication	2015
Other/Comment	ISBN: 9780128005118

Other resources:

Required	pdf.igen
Other/Comment	Course material

Required	pdf.igen
Other/Comment	Course material

Signature of habilitated instructor (course coordinator) announcing the course:

Signature of the director of the host institution:

Date of submission: