BIOPSYCHOLOGY

MASTER STUDY PROGRAMME, SECOND BOLOGNA CYCLE
COURSE DESCRIPTIONS

COMPULSORY COURSES FOR THE 1ST YEAR OF STUDY

Course name: **CLINICAL PSYCHOLOGY**
Number of ECTS credits: **6**

Content:
- Definition of clinical psychology.
- Historical development of clinical psychology.
- Theoretical models in clinical psychology (psychoanalytic, cognitive-behavioral, humanistic-existential, systemic, integrative).
- Clinical psychodiagnostics.
- Phases of diagnostical process.
- Anamnesis.
- Psychological tests in clinical psychology.
- Projective techniques and self-descriptive techniques.
- Psychological report.
- Diagnostical classifications and psychopathology.
- Clinical assessment of cognitive abilities.
- Clinical assessment of personality, interpersonal relationships and emotions.
- Research in clinical psychology.
- Clinical-psychological counselling and psychotherapy.
- Specifics of working with children and adolescents.
- Specifics of working with people with special needs.
- Ethics in clinical psychology.

Course name: **RESEARCH DESIGN AND STATISTICAL DATA ANALYSIS**
Number of ECTS credits: **6**

Content:
- Types of studies in psychology
- Effect size and sample size determination
- Multiple linear regression
- Analysis of variance
- Principal component analysis and canonical correlation analysis
- Cluster analysis
- Statistical analysis using a computer program
- Data visualization and presentation of results from data analysis
- Case studies from psychological research using statistical advanced methods

Course name: **INTERACTION AND USER EXPERIENCE**
Number of ECTS credits: **6**

Content:
The content of the course will be based on various topics related to interactive systems in user experience.

Possible topics include:
- Interaction design
- Understanding users
- User interfaces

- Data analysis, interpretation and presentation
- Prototyping, design and construction
- User experience
- Field Studies
- User based evaluation of the system or product.
- User centered design

Course name: **BIOPSYCHOLOGY**
Number of ECTS credits: **6**

Content:
- Introduction to biopsychology
- Anatomy of the nervous system
- Introduction to neuroscience: a review of the basic neuronal processes, a review of the basic biophysical processes, a review of the basic biochemical processes
- Biopsychology of feelings and stress
- Biopsychology of motivation: Hunger and eating, Hormones and sexuality, Sleep, dreaming and other biological rhythms
- Sensory system: Sight, Hearing, Physical senses, Chemical senses
- Motor system: control of movement
- Biopsychology of psychopathological disorders: schizophrenia and affective disorders, anxiety, autism, ADHD
- Biopsychology of neurodegenerative diseases Biopsychology of addiction

Course name: **LEARNING AND MEMORY**
Number of ECTS credits: **6**

Content:
- Overview on learning psychology
- Behavioural learning theories
- Social learning theories
- Cognitive learning theories
- Metacognition
- Basic components of memory
- Long-term memory, storage and retrieval
- Temporary storage of information in working memory
- Memory based on levels of processing
- Forgetting and memory faults
- Developmental aspects of memory
- Social memory
- Attention
- Sleeping and memory
- Neuroanatomy and physiology of memory and learning
- Molecular mechanisms

Course name: **PSYCHOTERAPEUTIC APPROACHES AND PSYCHOTERAPY**
Number of ECTS credits: **6**

Content:
- In-depth overview of the theoretical framework and basic concepts of different psychotherapeutic approaches.
- Overview of the historical background of different psychotherapeutic approaches and psychotherapy.
- Definition and learning of various psychotherapeutic methods and technics.
- Learning characteristics of therapeutic relationship, communication and the context of therapeutic treatment.
- Overview of ethical questions in the field of psychological counselling and psychotherapy.

Course name: **BEHAVIOURAL GENETICS**
Number of ECTS credits: **6**

Content:
- Introduction to Behavioural Genetics: historical background, core concepts, and applications in psychology.
- Genes and Environment: gene–environment interactions and correlations, epigenetic mechanisms.
- From Genes to Behaviour: genome–phenotype pathways, gene expression, neurobiological and endocrine mediators.
- Quantitative Genetics: heritability, variance, twin, family and adoption studies.
- Biological Foundations of Personality: genetic models, temperament, stability and plasticity.
- Personality in Animals and Humans: a comparative approach and individual differences.
- Biological Bases of Social Behaviour: attachment, aggression, parental behaviour, and prosociality.
- Genetics of Mental Health: vulnerability, stress, anxiety, mood disorders, ADHD, and addictions.
- Biology of Stress: neuroendocrine responses, regulation, and individual differences.
- Self-Control, Impulsivity, and Risk Behaviours.
- Animal-Assisted Psychological Interventions (AAI): genetic and neuroendocrine mechanisms and applications.
- Applications of Behavioural Genetics in Psychological Practice: assessment, counselling, and individualised interventions.
- Ethical Issues in the Use of Genetic Information in Psychology.

Seminars and tutorials include the analysis of practical case studies, group discussions, team workshops, reflection, and practical problem-solving activities.

Course name: **ADVANCED MODELING IN PSYCHOLOGY**
Number of ECTS credits: **6**

Content:
- Introduction to Modeling
- Graph Theory, Network Flows and Algorithms
- Stochastic Processes
- Monte Carlo Methods
- Markov Chains and Related Models
- Linear Programming
- Integer Programming
- Evolutionary Trees

Course name: **HEALTH PSYCHOLOGY**
Number of ECTS credits: **6**

Content:
- Definition of health, illness and health psychology
- Definition and understanding of risk and protective factors for health and public-health strategies connected with them
- Understanding of the process of becoming ill and how we perceive, interpret and respond to symptoms of illness.
- Understanding of impact of illness on the individual and their families, including the concept of quality of life.

COMPULSORY COURSES FOR THE 2ND YEAR OF STUDY

Course name: **RESEARCH METHODS IN NEUROSCIENCE**
Number of ECTS credits: **6**

Content:

Theoretical basis, principles, indications, methods of application, interpretations of results of research methods in neuroscience:
- electrophysiological and related methods
- (EEG, EMG, EP, P300, DBS, TCMS),
- examination of autonomic nervous system
- cerebrospinal fluid examinations
- morphologic brain imaging (CT, MRI)
- functional brain imaging (fMRI)
- functional methods SPECT, PET

Course name: **ADVANCED STATISTICAL METHODS IN PSYCHOLOGY**
Number of ECTS credits: **6**

Content:
- Regression models and their use in psychology
- Logistic regression
- Basics of event history analysis
- Hierarchical linear models
- Analyses with missing data
- Case studies from psychological research using advanced statistical methods

Course name: **MASTER'S THESIS**
Number of ECTS credits: **21**

Content:
A comprehensive treatment of the contents of the selected subject area of the programme and/or an interdisciplinary connection to other subject areas of the same programme, or even an interdisciplinary treatment of a subject theme.

Students choose a topic according to their interests and in accordance with the supervisor as well as the subject areas that a particular student wants to deal with in detail. The thesis can be research oriented or professional, i.e. oriented into professional practice.

The thesis' length should comply with the Instructions for writing a Master thesis.

In research oriented theses students develop investigative methods: suitability issues, developing their work plan, setting goals and formulating hypotheses, searching for documentary and bibliographic resources, defining the structure of research, etc. and demonstrate their knowledge of and the ability to select and apply the most appropriate psychological theories.

A practice-oriented, i.e. professional thesis must follow the rules and practices in use in the relevant areas of professional practice.

ELECTIVE COURSES

Course name: **ETHOLOGY**
Number of ECTS credits: **6**

Content:
- Principal terms and definitions
- Sensorial ability and transmission in nervous system
- Physiology of behaviour (hormones and pheromones, stress)
- Biology of behaviour
- Genetic of behaviour through process of evolution, domestication and ontogenesis
- Anomalous behaviour
- Animal Welfare
- Ethogram of some species (horse, pig, hen, dog, cat and rabbit)
- Research methods in animal behaviour

Course name: **SELECTED TOPICS IN NEUROSCIENCE**
Number of ECTS credits: **6**

Content:
Theoretical basis and principles of neuroscience and practical clinical proceedings of one of the following neuropsychological topics:
- Aphasic syndromes
- Developmental dyslexia
- Apraxia
- Neglect
- The frontal syndromes
- Amnestic disorders and dementia

Course name: **MOLECULAR METHOD OF PROCESSING BIOLOGICAL SAMPLES**
Number of ECTS credits: **6**

Content:

Theoretical content:
- Choice of representative sample at quantitative research
- Criteria of choice of appropriate method (quantitative research)
- Biological samples, preanalytical variables (correct abstraction, processing, transport and storing)
- Methods of processing of biological samples: microscopic techniques, photometric techniques, immunochemical techniques, radioimmune techniques, flow cytometry, molecular methods (nucleic acid isolation and amplification with polymerase chain reaction (PCR), using forward and reverse primers, verification of effectiveness of amplification, use of high troughput methods-microarrays (RNA; DNA, protein) as well as different methods of product evaluation.
- Interpretation of data and results gained with molecular methods

Content of laboratorial exercises:
- Techniques of microscopy with light microscope.
- Determining analytes with enzmyes immunoassays (ELISA) with photometric methods.
- Use of immunochemical methods.
- Nucleic acid isolation and amplification with polymerase chain reaction (PCR), using forward and reverse primers, verification of effectiveness of amplification and product evaluation.

Course name: **MOLECULAR BASIS OF CENTRAL NERVOUS SYSTEM DISORDERS**
Number of ECTS credits: **6**

Content:
Explanation of the molecular basis of the most frequent and some rare central nervous system disorders and injuries like:
- encephalitis,
- meningitis,
- epilepsy,
- Parkinson's disease,
- Alzheimer's disease,
- Huntington's disease,
- Tourette's disease,
- cerebrovascular attack,
- multiple sclecrosis,
- Creutzfeldt-Jakob disease,
- migraine.

Various underlying causes of these neuropathologies like: infections, trauma, degeneration, structural defects, tumors, autoimmune disorders, stroke.

Specific attention will be given to:
- Genes and proteins: The importance of a well kept balance.
- Gene technology: impact on neuropathology.
- Biomarkers: Protein content diagnostics of the cerebrospinal fluid as a central tool in the diagnosis of various diseases.
- Scientific research: current research methods.

Course name: **MOLECULAR BASIS OF NEURODEGENERATION**
Number of ECTS credits: **6**

Content:
Focus on parallels between ageing and different neurodegenerative disorders, i.e., the progressive loss of structure or function of neurons.

Examples of Neurodegenerative disorders to be dealt with at the molecular level:
- Parkinson’s, Alzheimer’s, and Huntington’s disease,
- ageing,
- amyotrophic lateral disease.

Similarities that relate these diseases to one another on a sub-cellular levels of:
- genetics,
- intracellular mechanisms:
- protein degradation pathways, atypical protein assemblies, mitochondrial dysfunction, axonal transport,
- programmed cell death.

Current therapies and therapeutic advances that could ameliorate (many) neurodegenerative diseases simultaneously.

Course name: **NEUROBIOLOGY OF PHYSICAL/SPORTS ACTIVITY 2**
Number of ECTS credits: **6**

Content:
We will focus on the grips of sports activities on our mental health. We will show various approaches and goals of planning exercise for different age groups, both genders, patients with the most common diseases, and especially psychological disorders. We will get to know the latest literature on the topic of primary and secondary treatment of the disease through the grips of physical activity to our health.

You will get acquainted with modern trends in public health actions that combine physical-cognitive exercise with nutrition for even greater and more comprehensive effects on the health and efficacy of an individual.

Course name: **NEUROSCIENCE AND ART**
Number of ECTS credits: **6**

Content:
The 'influence' of neuroscience on art is manysided:
- With acumulating knowledge of brain function the expression in art has changed (vision – projection, hearing – (a)tonic music),
- Descriptions of different neuropsychologic disorders can be found in art (eg. Novels of T. Mann),
- Artistic expression can change due to neurologic or psychiatric disorders (eg. Ravel's Bolero, van Gogh's yellow period).

Key question: What is the neuroscience of creativity?

Course name: **PSYCHOPHARMACOLOGY OF MENTAL DISORDERS**
Number of ECTS credits: **6**

Content:
Overview of mental disorder classification:
- Clinical disorders and major mental disorders, learning disorders, substance use disorders: depression, anxiety disorders, bipolar disorder, ADHD, autism spectrum disorders, anorexia nervosa, bulimia nervosa, and schizophrenia.
- Neurobiological basis of mental disorders, relevant for pharmacological treatment.
- Psychopharmacology of depression: Noradrenergic and serotonergic pathways in normal brain and in depression, desirable features of an antidepressant, drugs used in the treatment of depression, classification of antidepressants (TCA, MOI, SSRI, ...)
- Psychopharmacology of anxiety disorders: monoaminergic (antidepressants, buspirone, antipsychotics) or amino acid (benzodiazepines, anticonvulsants) neurotransmitter systems
- Antipsychotics, hypnotics, dementia, Parkinsonism
- Basic pharmacokinetics, pharmacodynamics of psychopharmaca: absorption, distribution, metabolism, elimination and toxicology of psaychotropics (ADMET).
- Drugs overview for neurodegenerative disorder (Alzheimer, ALS, Parkinson)
- Drug and substance abuse, drugs for abuse treatment
- Overview of basic mechanism of action of psychotropic drugs with addiction potential

Course name: **NEUROPSYCHOLOGY**
Number of ECTS credits: **6**

Content:

BASIC THEORETICAL CONCEPTS (I. part)
- Introduction to neuropsychology
- Neuropsychological method
- Neuropsychological examination
- Sources of neuropsychological damage
- The role of neuropsychological treatment in differential diagnosis

NEUROPSYCHOLOGICAL ASSESSMENT (II. part)
- Orientation and basic attention
- Attention
- Visuospatial and constructional capabilities
- Memory
- Verbal capabilities
- Executive capabilities

NEUROPSYCHOLOGY OF SPECIFIC NEUROLOGICAL AND PSYCHIATRIC DISESASES (III. part)

- Dementia, extrapyramidal diseases, demyelinating impairment, brain tumours, brain stroke, traumatic brain injury, HIV and AIDS, depression and mood disorders, schizophrenia and other psychotic disorders, ADHD.

NEUROPSYCHOLOGICAL REHABILITATION AND OTHER THERAPEUTIC OPTIONS (IV. part)
- Cognitive rehabilitation in neurological and psychiatric disorders
- Treatment of neuropsychiatric disorders in dementia
- Cognitive behavioural therapy in the treatment of patients with neurological disorders

Course name: **NUTRITION AND THE BRAIN**
Number of ECTS credits: **6**

Content:
1. Food and the evolution of human brain; structure of the nervous system; communication in the body related to metabolism; role of the central nervous system within metabolism.
2. Sensing of food by vision, smell and taste through, olfactory, chemo- and mechanoreceptors; flavour as the sensory impression of food, as determined by the combined senses.
3. Hormonal control of metabolism by the hypothalamus-autonomic central nervous system-liver-stomach-intestine axis; hormones and peptides like insulin, leptin, ghrelin, cholecystokinin, nesfatin, brain-derived neurotrophic factor, nerve growth factor.
4. The brain modulates insulin sensitivity in multiple tissues; metabolic interplay between digestive tract bacteria and their host's central nervous system; the blood-brain-barrier as a regulator of the digestive tract-brain axis.
5. Circadian rhythms; food intake as peripheral zeitgeber; nutrition as intervention, nutrition for shift work jobs; the Importance of sleep in metabolism.
6. hypothalamus-pituitary-adrenal gland axis; the influence of nutrition on stress, blood cholesterol, low and high blood pressure control, and vice versa.
7. Brain rewards systems and the activation by food.
8. Obesity and metabolic syndrome and the role of the central nervous system.
9. The interrelation of white adipose tissue, leptin and the central nervous system; the interrelation of muscle, exercise and the central nervous system.
10. Depression, mood, behaviour related to nutrition.
11. Nutrition during critical brain development in pregnancy and early years of life.
12. Neurogenesis in general and nutritional effects.
13. Neurodegeneration; dementia: common pathways of inflammation, insulin resistance and glucose levels; the limbic system affected by nutrition, with the hippocampus and amygdala, and its functions like emotion, behaviour, motivation, long term memory.
14. Nutrients and impact on brain function in the elderly.
15. Nutrition after traumatic brain injury

Course name: **RESTORATIVE ENVIRONMENTS FOR HEALTHY OCCUPAINTS**
Number of ECTS credits: **6**

Content:
Indoor Environmental Quality
- Materials, Sound, Light, Air quality
- Accessibility and usability

Human health in the built environment
- Occupant health & perceptions
- Human factors/ergonomics

Restorative/regenerative sustainability
- Environmental, economic, social impacts of buildings
- Restorative environmental and ergonomic design

Course name: **STATISTICAL MODELING IN SOCIAL AND BEHAVIORAL SCIENCES**
Number of ECTS credits: **6**

Content:
Introduction and basic concepts: Review of basic probability and statistical concepts

Statistical Inference: Hypothesis Test Terminology, standard statistical tests, ANOVA, power analysis

Statistical modeling: Simple Linear Regression, Multiple Linear Regression, Stepwise regression models, Non-linear regression models, Regression tree

Feature extraction: feature selection, feature generation, feature transformation, dimensionality reduction, PCA, LDA

Clustering: Sequential and Hierarchical Clustering, Clustering based on Function Optimization: K-means clustering

Factor Analysis

Course name: **COMPUTATIONAL SOCIAL SCIENCE**
Number of ECTS credits: **6**

Content:
The course will cover topics that might include (but are not restricted to) any of the following according to the needs and development of the subjects covered:
- Computation and Social Science
- What to model?
- Sociological and Psychological Models
- Obtaining data
- User studies
- Web scraping
- Cloud services
- Predictive Computational Modeling
- Data mining
- Using Machine Learning tools
- Social Networks Analysis
- Simulations