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| Course title | Neuroimaging Techniques | | | | |
| Course code | PSY13## | | | | |
| Course type | Lecture | | | | |
| Level | Undergraduate | | | | |
| Year / Semester | Year 3 | | | | |
| Teacher's name | Maria Photiou | | | | |
| ECTS | 7.5 | Lectures / week | 1 | Laboratories / week | 0 |
| Course purpose and objectives | <p>The purpose of this course is to provide students with a comprehensive understanding of the various neuroimaging techniques used in the field of psychology. This course aims to equip students with the theoretical knowledge and practical skills necessary to critically evaluate, utilize, and contribute to research involving neuroimaging methods. By the end of the course, students should be able to apply neuroimaging techniques to investigate brain structure and function, analyze neuroimaging data, and interpret the implications of findings for psychological theories and applications.</p> | | | | |
| Learning outcomes | <p>The following learning outcomes are expected, where students will:</p> <ol style="list-style-type: none"> 1. Demonstrate a solid understanding of the fundamental principles underlying various neuroimaging techniques, including MRI, fMRI, PET, SPECT, and EEG/MEG. 2. Explain the differences between structural and functional imaging modalities and their respective applications. 3. Identify the strengths, limitations, and considerations associated with each neuroimaging technique. 4. Apply preprocessing techniques to clean and prepare neuroimaging data for analysis. 5. Utilize software tools (e.g., FSL, SPM) to perform statistical analyses and generate meaningful visual representations of neuroimaging results. 6. Analyze and interpret neuroimaging findings, including activation patterns, connectivity networks, and quantitative measures. 7. Assess the significance of neuroimaging results within the context of psychological theories and research questions. 8. Formulate connections between neuroimaging data and psychological concepts, demonstrating an understanding of how brain regions and networks relate to cognitive, emotional, and behavioral functions. 9. Recognize and discuss the ethical considerations associated with conducting neuroimaging research involving human participants. | | | | |

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| | <ol style="list-style-type: none"> 10. Apply ethical principles to the design, execution, and reporting of neuroimaging studies. 11. Develop research designs that incorporate neuroimaging techniques to address specific psychological research questions. 12. Design appropriate control conditions and experimental paradigms to enhance the rigor and validity of neuroimaging investigations. 13. Communicate neuroimaging findings clearly and effectively through written reports, oral presentations, and visual aids. 14. Tailor communication of neuroimaging results for different target audiences, including both experts and non-experts. 15. Discuss emerging trends and advancements in neuroimaging technology and their potential implications for psychological research and clinical applications. 16. Demonstrate an understanding of the interdisciplinary nature of neuroimaging and its collaboration with other scientific fields. 17. Apply problem-solving skills to address challenges encountered during the neuroimaging research process, such as data artifacts, analytical difficulties, and interpretation ambiguities. 18. Show initiative in exploring additional resources, literature, and methodologies related to neuroimaging techniques in psychology beyond the scope of the course. | | |
| Prerequisites | No | Required | No |
| Course content | <p>This course aims to equip students with the theoretical knowledge and practical skills necessary to critically evaluate, utilize, and contribute to research involving neuroimaging methods. By the end of the course, students should be able to apply neuroimaging techniques to investigate brain structure and function, analyze neuroimaging data, and interpret the implications of findings for psychological theories and applications.</p> <p>Week 1: Introduction to Neuroimaging Techniques</p> <p>Week 2: Neuroimaging Technology and Data Acquisition</p> <p>Week 3: Preprocessing and Data Analysis</p> <p>Week 4: Structural and Functional Neuroimaging</p> <p>Week 5: Advanced Analysis Techniques</p> <p>Week 6: Linking Neuroimaging and Psychology</p> <p>Week 7: Ethical Considerations and Responsible Research</p> <p>Week 8: Research Design and Methodology</p> <p>Week 9: Data Interpretation and Communication</p> | | |

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| | <p>Week 10: Emerging Trends and Future Directions</p> <p>Week 11: Practical Labs and Hands-on Experience</p> <p>Week 12: Final Projects and Presentations</p> |
| Teaching methodology | Lecture |
| Bibliography | The latest peer-reviewed journal articles, reviews, and reputable online resources will be distributed by the lecturer throughout the course. |
| Assessment | <ol style="list-style-type: none"> 1. Midterm & Final Exam (30% & 30%): Mid-term and final exams will be conducted covering the entire course. Both exams will include multiple-choice, short-answer, and essay questions. 2. Group assignment and presentation (20%): Assign group project where students integrate theoretical knowledge, practical skills, and critical analysis to address a complex neuroimaging question. 3. Individual assignments (10%): Hands-on assignments that involve preprocessing and analyzing neuroimaging data using software tools. Assignments will include tasks such as image registration, normalization, activation analysis, and connectivity analysis. 4. Presence & Participation (10%): Students should be present and actively participate in in-class discussions. |
| Language | Greek |