### Summary of Clinical (C) and neuroimaging (I) course modules

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<th>Topic and Weeks</th>
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<td><strong>Week 1</strong></td>
<td><strong>Clinical Course: Module C (6x4h) = 2 ECTS</strong></td>
<td><strong>Modern neuroimaging methods of investigation of the human brain in health and disease:</strong></td>
<td><strong>Module I (6x4h): 2 ECTS</strong></td>
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<tr>
<td><strong>Wednesday from 8-12h</strong></td>
<td><strong>(8-9h DNC patient colloquium; 9-12h course)</strong></td>
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<td><strong>(order newly defined on annual basis depending on teacher availability)</strong></td>
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<td><strong>Module C</strong></td>
<td><strong>N = Neuroanatomy; PF = Physiology and Function; BD = Brain Diseases; PA = Pathology; PL = Plasticity</strong></td>
<td><strong>Topic I: Introductory Science and Methods</strong></td>
<td><strong>Principles of Image Formation (PIF) Image restoration; Analogue-to-digital conversion; Image reconstruction; Image quality &amp; quality correction</strong></td>
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<tr>
<td><strong>Introduction to Neuroanatomy, Systems and Disease</strong></td>
<td><strong>Brief recapitulation on basic principles of neuroanatomy and physiology focusing on the brain and disease</strong></td>
<td><strong>Topic II: MR Physics and MR imaging Modalities</strong></td>
<td><strong>Matlab (ML) Basic use of Matlab</strong></td>
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<td><strong>Language – plasticity and development</strong></td>
<td><strong>Plasticity</strong></td>
<td><strong>Introductory Statistics (IS) Study design; Estimation &amp; Hypothesis testing; Continuous &amp; Categorical Data; Correlation &amp; Regression</strong></td>
<td><strong>Topic III: Structural brain imaging</strong></td>
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<td><strong>Motor Neuron Disease (MND) Progressive Supranuclear Palsy (PSP), and Fronto -Temporal Lobar Degeneration (FTLD)</strong></td>
<td><strong>Topic IV: Functional brain imaging</strong></td>
<td><strong>Morphometry &amp; Volumetry (MV) Concepts: Global vs local measures; Atlas based region-of-interest approaches; Volumetry; Voxel-based methods.</strong></td>
<td><strong>Diffusion-weighted Imaging (DWI) MR physics of water diffusion; Deterministic and probabilistic tractography</strong></td>
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<td><strong>Friday from 8-12h</strong></td>
<td><strong>Brain Connectivity</strong></td>
<td><strong>Advanced MR Methods (AMR) Relaxometry; Magnetisation transfer imaging; Advanced diffusion-MRI applications.</strong></td>
<td><strong>Structural Covariance (SC) Definition of seeds; structural covariance analysis of multi-modal data</strong></td>
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<td><strong>Wednesday from 8-12h</strong></td>
<td><strong>Diffusion-weighted Imaging (DWI) MR physics of water diffusion; Deterministic and probabilistic tractography</strong></td>
<td><strong>Structural Covariance (SC) Definition of seeds; structural covariance analysis of multi-modal data</strong></td>
<td><strong>Diffusion Covariance (DC) Analysis of diffusion data; Multi-modal data analysis and statistics</strong></td>
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<tr>
<td><strong>Module I</strong></td>
<td><strong>Integrative Human Brain Research Institute (IHBR)</strong></td>
<td><strong>Data mining &amp; Big Data Analysis</strong></td>
<td><strong>Challenges of the Human Brain Project (HBP)</strong></td>
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<td><strong>Wednesday from 8-12h</strong></td>
<td><strong>Introductory Science and Methods</strong></td>
<td><strong>Pattern Recognition methods (PR) Machine-learning principles, Support-vector machines; Classification</strong></td>
<td><strong>Data basing; Distributed networks; Data protection</strong></td>
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### Content summary

**Clinical Course: Module C (6x4h) = 2 ECTS**

**Modern neuroimaging methods of investigation of the human brain in health and disease:**

**Module I (6x4h): 2 ECTS**

- **(order newly defined on annual basis depending on teacher availability)**
- **Matlab (ML) Basic use of Matlab**
- **Introductory Statistics (IS) Study design; Estimation & Hypothesis testing; Continuous & Categorical Data; Correlation & Regression**
- **Morphometry & Volumetry (MV) Concepts: Global vs local measures; Atlas based region-of-interest approaches; Volumetry; Voxel-based methods.**
- **Diffusion-weighted Imaging (DWI) MR physics of water diffusion; Deterministic and probabilistic tractography**
- **Challenges of the Human Brain Project (HBP)**
- **Data basing; Distributed networks; Data protection**

**Brief recapitulation on basic principles of neuroanatomy and physiology focusing on the language system**

**Motor Neuron Disease (MND) Progressive Supranuclear Palsy (PSP), and Fronto -Temporal Lobar Degeneration (FTLD)**

**Brain Connectivity**

**Diffusion-weighted Imaging (DWI) MR physics of water diffusion; Deterministic and probabilistic tractography**

**Structural Covariance (SC) Definition of seeds; structural covariance analysis of multi-modal data**

**Data mining & Big Data Analysis**

**Pattern Recognition methods (PR) Machine-learning principles, Support-vector machines; Classification**

**Multi-variate statistics (MV) Gaussian mixture models; Intersubject variability**

**Challenges of the Human Brain Project (HBP)**

**Data basing; Distributed networks; Data protection**

**Summary of Clinical (C) and neuroimaging (I) course modules**

**Module C (6x4h) = 2 ECTS**

**Modern neuroimaging methods of investigation of the human brain in health and disease:**

**Module I (6x4h): 2 ECTS**

**Week 1**

**Clinical Course: Module C (6x4h) = 2 ECTS**

**Modern neuroimaging methods of investigation of the human brain in health and disease:**

**Module I (6x4h): 2 ECTS**

**Wednesday from 8-12h (8-9h DNC patient colloquium; 9-12h course)**

**Wednesday from 8-12h**