Aims of the Course:
- Introduction to EEG and ERP applied to the study of cognitive and affective processes.
- Acquisition of electrophysiological data of brain activity.
- Signal processing.
- Statistical analysis of the data.

All the modules will have a laboratorial hands-on component.

Scientific Coordination:
João Marques Teixeira, MD, PhD
Fernando Barbosa, PhD
Fernando Ferreira-Santos, PhD
Pedro R. Almeida, PhD

Language:
English

Basic knowledge of statistics desirable.

Venue:
Faculty of Psychology and Education Sciences, University of Porto.

Registration:
Until 31 of July 2016 (limited to 20 participants).

Registration form available at: http://www.fpce.up.pt/labpsi/summerschool/

Course Fee: €300 (includes all coffee breaks and 4 lunches)
Porto, 5-9 of September, 2016

V CAN – 5th Cognitive and Affective Neurophysiology Summer School: Acquisition, processing and analysis of EEG signal

Information booklet
General information:
The Cognitive and Affective Neurophysiology Summer School is organized by the Laboratory of Neuropsychophysiology of the University of Porto. For information about our lab, please visit our website, http://www.fpce.up.pt/labpsi/.

Location:
The summer school will take place at the Faculty of Psychology and Education Sciences of the University of Porto (in Portuguese: Faculdade de Psicologia e de Ciencias da Educaaco da Universidade do Porto – FPCE-UP)
Google Maps: http://goo.gl/maps/prtD8

How to get here?
By Air:
The closest airport is Porto Airport - Francisco Sá Carneiro: http://www.ana.pt/en-US/Aeroportos/porto/Porto/Pages/Homepage-Porto.aspx

By Metro (Tram):
The D Line (yellow) connects 'Pólo Universitário' and 'Gaia', crossing the central station 'Trindade', where it has connection with Lines A (blue), B (red) and C (green). Leaving at the 'Pólo Universitário' station you are at FPCE-UP. For more information, see http://www.metrodoporto.pt/en/.

By Bus:
Stop at: Igreja de Paranhos: 54 (AV.ALIADOS - PADRÃO MOREIRA)
Stop at: Rua Dr. Manuel Laranjeira: 38 (CAMPANHÃ - HOSP.S.JOÃO), 204 (HOSP.S.JOÃO - FOZ Mercado), 300 (CIRCULAR AV.ALIADOS - HOSP.S.JOÃO) e 301 (CIRCULAR SÁ DA BANDEIRA - HOSP.S.JOÃO)

By Car:
The best way to find FPCE-UP is to follow the signs to “Paranhos / Hospital de São João”.
Coming from the VCI: take the ‘Paranhos / Hospital’ exit off the freeway and stay to the right lane in the traffic lights at the 'Igreja de Paranhos' crossing. Turn right at the lights to the Rua do Dr. Manuel Pereira da Silva (street). A few yards further, turn on the first street to the left (where the Metro station of 'Polo Universitário' is located). You will find FPCE-UP to your left in that street.
Coming from Estrada da Circunvalação (EN12): go to 'Hospital de S. João' and, at the traffic lights, turn to the 'IPO - Instituto Português de Oncologia' (street: Rua António Bernardino Almeida). Go straight and turn left just before the street becomes a two-way street. Then keep going until you find FPCE-UP on your right side.

Duration:
The course will take place between 5 (Monday) and 9 (Saturday) of September of 2016. The course duration will be 36 hours in total.

Faculty:
Professors João Marques-Teixeira (MD, PhD), Fernando Barbosa (PhD), Fernando Ferreira-Santos (PhD), and Pedro R. Almeida (PhD) are the scientific coordinators of the course.
### Proposed Schedule:

<table>
<thead>
<tr>
<th>Time</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00</td>
<td>09:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>09:30</td>
<td></td>
<td>Opening and Introduction to EEG</td>
<td>Lab safety and hygiene; Issues in EEG data collection</td>
<td>Signal processing (1)</td>
<td>Statistical analysis</td>
</tr>
<tr>
<td>10:00</td>
<td>10:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11:00</td>
<td>11:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12:00</td>
<td>12:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13:00</td>
<td>13:30</td>
<td>Lunch</td>
<td>Lunch</td>
<td>Lunch</td>
<td>Lunch</td>
</tr>
<tr>
<td>13:30</td>
<td>14:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14:00</td>
<td>14:30</td>
<td>Introduction to ERP</td>
<td>Practicum: EEG data collection</td>
<td>[Free afternoon]</td>
<td>Practicum: signal processing</td>
</tr>
<tr>
<td>14:30</td>
<td>15:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15:00</td>
<td>15:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15:30</td>
<td>16:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16:00</td>
<td>16:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16:30</td>
<td>17:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17:00</td>
<td>17:30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17:30</td>
<td>18:00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Each session will have a coffee break. Coffee breaks and the lunches indicated are included in the course (you will be provided with lunch coupons).

A session for short participant presentations (5-10 mins.) may be scheduled, pending confirmation of the number of presentations.

On Friday we will organise a social dinner and outing for those who are interested. This event is not included in the course fees. Details will be provided during the week.
Detailed Programme:

1. Introduction to the EEG/ERP techniques in Cognitive and Affective Neuroscience
   1.1. Electroencephalography (EEG)
      1.1.1. History
      1.1.2. Main discoveries and applications, EEG rhythms
   1.2. Principles of electricity (and very light notes on mathematical analysis)
   1.3. Neurophysiological basis of the EEG signal
   1.4. Event-related potentials (ERP)
      1.4.1. History and technical definition
      1.4.2. ERP components: definition and overview
         1.4.2.1. Definition, classification, nomenclature, quantification
         1.4.2.2. Overview of the main components
   1.5. Technical basis of EEG/ERP
      1.5.1. Laboratory setting and recording equipment
      1.5.2. From the physical signal to the digital time-series
         1.5.2.1. Sensors, amplification, analog-to-digital conversion
         1.5.2.2. Sampling frequency, Nyquist-Shannon Theorem

2. Collecting EEG data
   2.1. Ethical guidelines and lab safety and hygiene
   2.2. Electrode positioning systems, montages, reference
   2.3. Software for recording and processing EEG/ERP data

3. Electrophysiological signal processing (using the freely available EEGLAB software)
   3.1. Introduction to time series analysis
   3.2. Digital filters
   3.3. Baseline correction
   3.4. Linear trend correction
   3.5. Event/response conditioning
   3.6. Removal/correction of artifacts
   3.7. Channel interpolation, downsampling
   3.8. Averaging and grand-averaging
   3.9. Quantification of ERPs in the time domain
   3.10. Advanced EEG/ERP analyses (short overview)

4. Statistical analysis of results
   4.1. Parametric statistical techniques (mean differences and analysis of variance)
      4.1.1. The sphericity problem
      4.1.2. The multiple comparisons problem
   4.2. Classical ERP component approach vs. mass-univariate approach/SPM
Bibliography -- Fundamental references:


Bibliography -- Introductory references:


Bibliography -- Advanced references (note that these will not be addressed in the present course):


