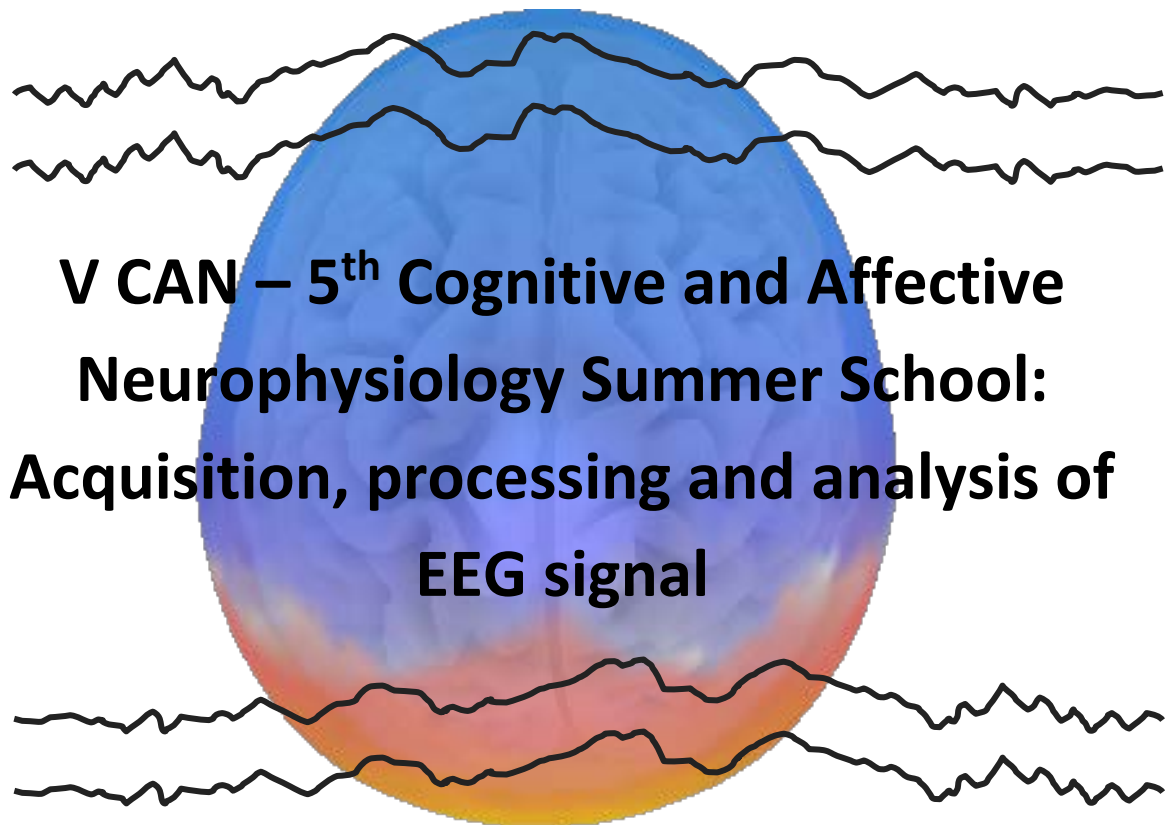


**Porto, 5-9 of September, 2016**



**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 Ciências da Educação 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/Aerportos/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.metroporto.pt/en/>.

**By Bus:**

Bus lines (Route planner: <http://www.itinerarium.net/wizard.aspx?ul=en-us>):

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:**

	Monday	Tuesday	Wednesday	Thursday	Friday
	5-Sep	6-Sep	7-Sep	8-Sep	9-Sep
09:00 09:30	Opening and Introduction to EEG	Lab safety and hygiene; Issues in EEG data collection	Signal processing (1)	Signal processing (2); ERP analysis (time domain)	Statistical analysis
09:30 10:00					
10:00 10:30					
10:30 11:00					
11:00 11:30					
11:30 12:00					
12:00 12:30					
12:30 13:00					
13:00 13:30	Lunch	Lunch	<i>[Free afternoon]</i>	Lunch	Lunch
13:30 14:00					
14:00 14:30	Introduction to ERP	Practicum: EEG data collection		Practicum: signal processing	Practicum: statistics
14:30 15:00					
15:00 15:30					
15:30 16:00					
16:00 16:30					
16:30 17:00					
17:00 17:30					
17:30 18:00					

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:**

- Luck, S. J. (2014). *An introduction to the event-related potential technique* (2<sup>nd</sup> ed.). Cambridge, MA: MIT Press.  
[See website for free materials: <http://mitpress.mit.edu/books/introduction-event-related-potential-technique-1>]
- Luck, S. J., & Kappenman, E. S. (2012). *The Oxford Handbook of Event-related potentials*. New York: Oxford University Press.
- Niedermeyer, E., & Lopes da Silva, F. H. (2005). *Electroencephalography: Basic principles, clinical applications, and related fields* (5<sup>th</sup> ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

**Bibliography -- Introductory references:**

- Andreassi, J. L. (2000). *Psychophysiology: Human behavior & physiological response* (4<sup>th</sup> ed.). Mahwah, NJ: Lawrence Erlbaum.
- Carretie, L. (2009). *Psicofisiologia*. Madrid: Piramide. [in Spanish]
- Fabiani, M., Gratton, G., & Federmeier, K. D. (2007). Event-related brain potentials: Methods, theory, and applications. In J. T. Cacioppo, L. G. Tassinary, & G. G. Berntson (Eds.), *Handbook of Psychophysiology* (3<sup>rd</sup> ed., pp. 85-119). New York: Cambridge University Press.
- Jackson, A. F., & Bolger, D. J. (2014). The neurophysiological bases of EEG and EEG measurement: A review for the rest of us. *Psychophysiology*. doi:10.1111/psyp.12283
- Keil, A., Debener, S., Gratton, G., Junghöfer, M., Kappenman, E. S., Luck, S. J., Luu, P., Miller, G. A., & Yee, C. M. (2014). Committee report: Publication guidelines and recommendations for studies using electroencephalography and magnetoencephalography. *Psychophysiology*, *51*, 1-21. doi:10.1111/psyp.12147 [Free access]
- Picton, T. W., Bentin, S., Berg, P., Donchin, E., Hillyard, S. A., Johnson, R. et al. (2000). Guidelines for using human event-related potentials to study cognition: Recording standards and publication criteria. *Psychophysiology*, *37*, 127-152. doi: 10.1111/1469-8986.3720127 [Available from SPR: <http://www.sprweb.org/articles/Picton00.pdf>]
- Putnam, L. E., Johnson, Jr., R., & Roth, W. T. (1992). Guidelines for reducing the risk of disease transmission in the psychophysiology laboratory. *Psychophysiology*, *29*, 127-141. doi: 10.1111/j.1469-8986.1992.tb01676.x [Available from SPR: <http://www.sprweb.org/articles/Putnam92.pdf>]

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

- Cacioppo, J. T., Tassinary, L. G., & Berntson, G. G. (Eds.) (2007), *Handbook of Psychophysiology* (3<sup>rd</sup> ed.). New York: Cambridge University Press.
- Handy, T. C. (Ed.) (2004). *Event-related potentials: A methods handbook*. Cambridge, MA: MIT Press.
- Michel, C. M., Murray, M. M., Lantz, G., Gonzalez, S., Spinelli, L., & Grave de Peralta, R. (2004). EEG source imaging. *Clinical Neurophysiology*, *115*, 2195-2222. doi:10.1016/j.clinph.2004.06.001
- Nunez, P. L., & Srinivasan, R. (2006). *Electric fields of the brain: The neurophysics of EEG* (2<sup>nd</sup> ed.). New York: Oxford University Press.
- Sanei, S., & Chambers, J. A. (2007). *EEG signal processing*. Chichester: John Wiley & Sons.