Evolution of Neural Computation
Alessandro Treves, 040-3787623, SISSA room 241, ale@sissa.it, http://people.sissa.it/~ale/

Rolls and Treves, Neural Networks and Brain Function, Oxford UP, 1998 (R&T) can serve as a reference text. It can be downloaded/photocopied, and the relevant chapters be read in advance of each meeting. At each meeting, I will use and distribute slides and possibly additional written material.

Tuesday Nov 8: 15:00-16:30
1: What are we after in the course?

Thursday Nov 10, 15:00-16:45
2a: Chemical computation – neurotransmitters and neuromodulators
2b: Some slides on simple models of reinforcement learning. R&T Ch 5

Tuesday Nov 15, 15:00-16:45
3a: Elements of information theory. R&T App 2
3b: Geometrical computation – early vision in flies, in fish and in mammals
   JJ Atick, ecological theory of sensory processing, Network 3:213 (1992)

Thursday Nov 17, 9:00-10:45
4a: Creative geometry in the basal ganglia and in the cerebellum. R&T Ch 9
4b: virtual guest lecturer Elena Marchiori – Perceptrons and back-propagation. R&T Ch 5

---- phase transition into cortical systems

Tuesday Nov 22, 9:00-10:45
5a: Cortical ingredients for models of associative learning (incl. review of linear algebra). R&T Ch 1-3
5b: Simple associative nets – paleocortex and olfaction; amygdala and orbitofrontal cortex. R&T Ch 7

Thursday Nov 24, 9:00-10:45
6a: Memory from geometry to combinatorics – self-organization of cortical maps. R&T Ch 4
6b: Lamination and arealization in sensory cortex. R&T Ch 8

Friday Dec 2, 9:00-10:45
7a: Pure memory in the mammalian hippocampus – its internal differentiation. R&T Ch 6
7b: The discovery of grid cells. Nobel prize 2014

Tuesday Dec 6, 9:00-10:45
8a: Random number generators in the Dentate Gyrus, and neurogenesis
8b: guest lecturer Sophie Rosay – analyzing charts and their transitions

Wednesday Dec 7, 9:00-10:45
9a: Memory from statics to dynamics, from semantics to grammar
9b: Issues at the interface to higher cognition

Monday Dec 12, 9:00-10:45
10: Assessment, partially or entirely with multiple choice questions