

SCICOGN101, Introduction to Cognitive Science
Spring 2019



**SCICOGN101, Introduction to Cognitive Science
Spring 2019**

Classroom no: F-13

Class times: T1 Monday 8:45-10:45 and Thursday 13:45-15:45

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Office no. & location: E 1.02

Office hours: Monday and Thursday on appointment

I. Track information

- a. Prerequisites for this course: none
- b. This course serves as a prerequisite for: Advanced Cognitive Science (SCICOGN301) and Psycholinguistics (SCICOGN202)
- c. The course is part of the Cognitive Science track, which consists of SCICOGN101 (Introduction to Cognitive Science), SCICOGN202 (Psycholinguistics) and SCICOGN301 (Advanced Cognitive Science).
- d. Other courses which are relevant to this course: Pharmacology, Introduction to Psychology, Introduction to Life Science, Biochemistry, Molecular and Cellular Physiology, Human Physiology, Introduction to Computer Science and Programming, Introduction to Statistics.

For further information about the track, please see the track document available on the UCR intranet.

II. Course description

Cognitive science is a relatively new scientific field that deals with the study of higher-order human brain functions. This field combines techniques and concepts from many disciplines, especially from Neuroscience and Cognitive Psychology, but also from Medicine, Philosophy, Physics, Computer Science, Linguistics and Anthropology. During the last two decades, this integrated approach has gained a central position within the scientific realm due to dramatic new insights about human cognition and the development of new research technologies.

This course will familiarize you to concepts and skills required within the discipline of Cognitive Science. A selected number of key topics within the field will be discussed, including memory, action, perception and emotion. It will provide a good working knowledge of the basics of neuroscience, including neural communication and brain anatomy. You will also be introduced to the various (imaging) techniques as a tool to study brain function and complex behaviours. Moreover, we will discuss and practise the critical evaluation of scientific articles, such that you will become able to extract main objectives and pinpoint an article's strong and weak points as well as its relevance.

III. Study Load

This course earns students four credits (equivalent to 7.5 ECTS). The class meets twice a week for two hours. Preparation time is approximately 10 hours per week.

IV. Course materials

- a) Required books and literature: Gazzaniga et al. Principles of Cognitive Neuroscience, fourth international student edition. Review or original research articles on some topics.
- b) Recommended books and literature: these will be posted on Moodle or are available through Utrecht University's Omega electronic journal subscription.
- c) Other materials: website ZAPS:
<http://www.wwnorton.com/college/psych/zaps/students.htm> and website of the McGill University: <http://thebrain.mcgill.ca>

Students are responsible for acquiring all assigned reading individually.

V. Course organization and requirements

- a) Class meetings will encompass lectures, student presentations and discussion of group/individual work and in-class assignments.
- b) Although in-class participation is not graded directly, active participation is of course expected from you as it will improve your learning.
- c) It is essential that you prepare for class: read the assigned chapter(s) and perform the homework assignments. Deadlines for individual or group work are to be met. Missing deadlines means grade deduction.
- d) Absenteeism needs to be communicated in advance whenever possible.
- e) Missing an exam without proper reason and prior communication means scoring 0%. If you miss an exam with a proper and valid reason that has been communicated in advance, you will be offered the opportunity to do the exam in week 16, on Wednesday 15 May at 10 am. As this date is beyond the last day of class, you have to file an extension form well in advance (see article 6.5.4 in student handbook).
- f) Repeated lateness may affect your grade. Missing classes affects your grade as follows: missing four classes may lead to minor grade deduction, depending on your reasons for absence and whether or not I was informed on time. Missing five classes: 5 % grade deduction (of final grade). Missing six classes 10 % grade deduction. If you miss 7 or more classes, you fail the course.
- g) Use Moodle for submitting all your work.
- h) Special needs: students with documented learning disabilities or special needs should make their needs known to the instructor at the start of the course.
- i) Plagiarism is a serious academic offence which carries heavy sanctions. Acquaint yourself with the UCR Plagiarism Policy (see Student Handbook).
- j) Use of mobile devices is not allowed during class time unless otherwise indicated.
- k) You are expected to speak English at all times.

This course is subject to UCR academic rules and procedures. Both students and instructors are required to know and follow these rules and procedures.

VI. Assessment

- a) Midterm exam: 20%
- b) Endterm exam: 25%
- c) Class presentation: 15%
- d) Critical analysis of a scientific paper: 20%
- e) Homework and in-class assignments combined: 20%

a and b. Exams. These will consist of open questions. Scoring will take into account correctness/completeness of requested facts and conclusions/clarity of answers. Detailed SLO's will be posted on Moodle. An in-class review session will be organized. Although all review sessions are on a voluntary basis, you are very much encouraged to join.

c. Class Presentation. For your class presentation (done in groups, three to four people per group), you can choose from a list of preselected articles. Make sure you study the original publication carefully. Your group will present this article in class. Every member of the group has to present. The most commonly used division of tasks is explained below, however feel free to deviate. Member one provides the class with some background information on the topic (10 min); most of this can be found in the textbook, but you are encouraged to use additional sources. Be aware that the background information is part of the material to be studied for the exams and will only be discussed by you, not by the instructor. Hence, as a presenter, you have to make sure your explanation is clear to your peer students and as a listener, you need to become familiar with the upcoming presentation in advance and ask questions if the explanation is not completely clear to you. Member two and three will explain the article. You will need to discuss what the goal of the research was, briefly how it was done, what was found and what the authors' conclusions are. Select the most relevant / interesting issues from the article, rather than discussing every aspect. If your group consists of four people, member four could, for instance, lead a class discussion, or broaden the scope of the paper. Connect your discussion to what you learned in this course so far. Try to find ways to interact with the class, for instance by means of a discussions, questions and quizzes. Please put your presentation on Moodle at least 24 hours before class! Lateness will affect your grade. The presentation will be graded using a template that is placed on Moodle. Grading criteria are: organization, subject knowledge, graphics, connection to audience and elocution.

Presentation topics:

1. **Anatomy:** From Phineas Gage and Monsieur Leborgne to H.M.: Revisiting Disconnection Syndromes by Thiebaut de Schotten M, Dell'Acqua F, Ratiu P, Leslie A, Howells H, Cabanis E, Iba-Zizen MT, Plaisant O, Simmons A, Dronkers NF, Corkin S, Catani M. In Cereb Cortex. 2015 25(12) pp 4812-27.
2. **Lateralization:** The hypothesis of neuronal interconnectivity as a function of brain size-a general organization principle of the human connectome by Hänggi J et al. Front Hum Neurosci. 2014, 8.
3. **Vision, synesthesia:** Neural Basis of Individual Differences in Synesthetic Experiences by Scholte and Rouw, J of Neuroscience 2010, Volume: 30, Issue: 18, pp: 6205-6213.
4. **Face recognition:** TMS demonstrates that both right and left superior temporal sulci are important for facial expression recognition. By Sliwinska MW, Pitcher D. Neuroimage. 2018 18. pp: 1053-8119(18)30723-7
5. **Memory:** Creating a False Memory in the Hippocampus by Ramirez et al Science 26 July 2013: Vol. 341 no. 6144 pp. 387-391.
6. **Emotion:** Virtual race transformation reverses racial in-group bias. Hasler BS¹, Spanlang B², Slater M. PLoS One. 2017 Apr 24;12(4)
7. **Development:** The specificity of the neural response to speech at birth. May L¹, Gervain J², Carreiras M^{3,4}, Werker JF Dev Sci. 2018 May;21(3).

d. Critical analysis of scientific paper. A guide on how to critically evaluate a scientific paper is posted on Moodle. Moreover, we will practice this skill in class (week 6). Choose one article from the list of articles that is posted on Moodle (see document: "Guide to critical analysis of a scientific paper"). First, write an abstract summarizing the key points of the article: its research question(s), methods used, main findings and conclusions. Then, critically evaluate the article: are the questions relevant, are the methods used appropriate, is the experiment well designed and are the conclusions valid? Also provide suggestions for improvement of the article and for further research. Use between 700 and 900 words. Criteria for grading: structure/readability 30%, ability to summarize key elements 20%, ability to comment upon specific weak and strong points of article 30%, ability to express your own opinion/ideas (by providing suggestions) 20%. Hand in your final work via Moodle.

e. Assignments. During the course you perform various assignments, both outside class (homework), and in class. All homework is graded and approximately 50% of the in-class assignments is graded. In-class assignments will either be on the assigned reading or on the presentation that is given by your peers. In order to perform well on the in-class assignments it is important to prepare well for class.

The homework assignments (called A1, A2, etc.) are listed and explained in the document **Assignments** on Moodle. They may consist of questions about the assigned reading or a small experiment that you need to conduct via a website called ZAPS. You may use whatever (academic) material you want to provide your answers. It is also possible (and advisable) to work on the assignments together with other students but, naturally, each student is responsible for handing in his/her work. Your answers to the homework assignments should be posted on **Moodle** to me on the **night before the next class before 8 pm**; no paper copy is required. Most homework assignments will be discussed in class and will thus enable you to participate in class discussions in a fruitful manner. Failing to hand in an assignment will result in an F score for that particular assignment (= 0%). You are allowed to resubmit a maximum of two assignments in order to improve yourself. Deadline for resubmission of assignments is Sunday April 14 by midnight.

f. Muddy points. Whenever you struggle with the material, feel free to ask me and your fellow students on the Forum discussion on Moodle any questions on the topic. I will regularly visit this forum to see which subjects need more attention in class. In the course schedule, starting on the next page, you can see there are two 'Muddy points' moments where you are invited to share your muddy points with each other. However, this forum is open and can be used throughout the entire course.

VII. Course schedule (subject to minor changes)

Wk	Class	Topic	Preparation/ Assignments
1	Class 1a Monday 28/01	Course instructions History of cognitive neuroscience	Read Ch 1 page 3-14 (instruments..)
	Class 1b Thursday 31/01	History of cognitive neuroscience The mind-body problem	A1 Quiz before Wednesday 8 p.m. (See assignments file on Moodle) Read Ch 2: page 23-32 (synaptic transmission..)
2	Class 2a Monday 04/02	Electrical neurotransmission	Read Ch 2: page 23-37, see YouTube Crash Course on The Nervous System part 1-3 Muddy points: forum on Moodle
	Class 2b Thursday 07/02	Synaptic transmission Anatomy	Read: from the simple to the complex, molecular level of organization (beginner, intermediate and advanced) and from the simple to the complex, neurological level of organization (beginner intermediate and advanced) from website: http://thebrain.mcgill.ca Read Ch 2: pp 37-45
3	Class 3a Monday 11/02	Basic Neuroanatomy Presentation 1: anatomy	Read Ch 2: pp 37-60 A2: Quiz 2 Prepare for presentation
	Class 3b Thursday 14/02	Anatomy and Techniques 1:	Read Ch 3: pp 71- 105
4	Class 4a Monday 18/02	Techniques 2	Read Ch 3: pp 105-117 A3: Stroop test
	Class 4b Thursday 21/02	Techniques 3	
5	Class 5a Monday 25/02	Hemispheric specialisation Presentation 2 lateralization	Read Ch 4: pp 121- 136 (hemispheric..) Prepare for presentation

	Class 5b Thursday 28/02	Perception 1: Introduction to the senses The somatosensory system Plasticity	Read Ch 5: pp 163-167, somatosensation pp 179 (somato..)- pp184 (vision) and pp 213- (perceptual) end
6	Class 6a Monday 04/03	In class assignment: critical analysis of a scientific paper	Read article (plasticity) posted on Moodle Read guide: Guide to critical analysis of a scientific paper (Moodle) A4: Article summary
	Class 6b Thursday 07/03	Perception 2: Vision	Read Ch 5 pp 184 Vision to 201 (deficits...):
7	Class 7a Monday 11/03	Perception 3: Vision: deficits Multimodal processing Presentation 3: synaesthesia	Read Ch 5 201-end Prepare for presentation
	Class 7b Thursday 14/03	Perception 4: Audition	Read “the hearing brain” (on Moodle) read Ch 5 audition pp 167-172 Deadline critical analysis
8	Class 8a Monday 18/03	Revision time	Prepare for exam, in-class Q and A session (voluntary)
	Class 8b Thursday 21/03	Exam	
25 March – 29 March SPRING BREAK			
9	Class 9a Monday 01/04	Object recognition 1	Read Ch 6: pp 219- 241 (category...) Muddy points: forum on Moodle
	Class 9b Thursday 04/04	Object recognition 2 Presentation 4: face and object recognition	Read Ch 6 246- 269 Prepare for presentation
10	Class 10a Monday 08/04	Action 1	Read Ch 8: 327- 356 (movement..) Not: central pattern generators and central representation of movement plans
	Class 10b Thursday 11/04	Action 2	Read Ch 8 356- 366.

11	Class 11a Monday 15/04	Memory types Working Memory	Read: how memory works, short term memory, neurological level of organization (beginner, intermediate and advanced) from website: http://thebrain.mcgill.ca Read Ch 9 pp379-389 (long term..) A5: ZAPS Memory
	Class 11b Thursday 18/04	Long term memory 1 Long term memory types	Read Ch 9: pp 389-397 (evidence from..) Read: How memory works, long term memory, neurological level of organization (beginner, intermediate and advanced) from website: http://thebrain.mcgill.ca
12	Class 12a Monday 22/04	EASTER MONDAY	No class
	Class 12b Thursday 25/04	Long term memory 2 Presentation 5 : memory	Read Ch 9 397- 410 (encoding,...) Prepare for presentation
13	Class 13a Monday 29/04	Emotion 1	Read Ch 10 pp 425 - 446: the influence...(NOT theories of emotion generation) A6: ZAPS Emotion Deadline resubmission critical analysis
	Class 13b Thursday 02/05	Emotion 2 Presentation 6: learned fear	Read Ch 10 pp 449 (emotion and social stimuli) 455 (get a grip) and 459(other areas..) end Prepare for presentation
14	Class 14a Monday 06/05	Development 1	Read from Moodle: development pp 669 - end Read Ch 2: pp 60-67

	Class 14b Thursday 09/05	Development 2 Presentation 7: development	Prepare for presentation
15	Class 15a Monday 13/05	Revision time	Prepare for exam, in class Q and A session (voluntary) Resubmit Assignments (max of 2)
	Class 15b Thursday 16/05	Final Exam	

VIII. Student learning outcomes

More detailed objectives (to be used when studying for exam) will be put on Moodle!

Instructor will (GIO's)	Student is able to do (SLO'S)	
Explain what cognitive science entails and how it evolved	Describe how the field has evolved and why it is a combination of various disciplines	Period 1 Week 1
Provide feedback on student presentations	Present scientific data, in a well-informed, clear and interactive manner	Week 3-14
Discuss and practice with students the reading and analysis of scientific articles, including their strengths, weaknesses and implications	Critically analyze scientific literature within the discipline	Week 2-14
Introduce basic concepts concerning the electrical and chemical processes involved in neurotransmission	Understand the basics that underlie neuronal communication	Period 2 (Week 2/3)
Introduce the most relevant methods used in Cognitive science, giving various examples of their application in research	Understand the basics of these methods,	Period 3 (week 3-4)

Provide articles dealing with these techniques and discuss with the students their limitations and possibilities	Describe the possibilities as well as the limitations of the various techniques, with emphasis on functional MRI	
Explain to and discuss with students key issues of perception on a behavioural, cellular and systems basis, with emphasis on visual perception, including object and face recognition Explain and discuss with students some of perceptual deficits encountered in the clinic	Describe the main concepts of visual perception Describe symptoms of these deficits, underlying neuronal substrates and possible way to diagnose these deficits	Period 4 (week 5-6)
Explain and discuss and differentiate between simple and complex motor behaviours Explain and discuss the role of various cortical and subcortical areas in motor processing.	Describe how specific behavioural goals are accomplished, include the role of the primary motor cortex and premotor areas Describe the modulatory role of the basal ganglia and cerebellum	Period 5 Week 7-8
Explain to and discuss with students the processes underlying learning and memory on a behavioural, cellular and system basis Explain and discuss with students the characteristics of declarative memory, nondeclarative memory and working memory	Describe what happens during memory storage and retrieval. Describe these characteristics, the neuronal structures involved in these different types of memory and their functioning. Describe studies in which each of these memory types is examined	Period 6 Week 9-10
Define emotions Explain and discuss some of the psychological models for emotion	Describe what emotions are Explain the basic characteristics of these models	Period 7 Week 11-12

<p>Explain and discuss the neural basis of emotions</p> <p>Explain and discuss the emotional influences on various cognitive functions</p>	<p>Describe the role of a number of brain structures in emotion</p> <p>Explain the influences of emotion on learning/memory and decision making</p>	
<p>Explain and discuss changes in brain structure and function during development that lead to changing cognitive abilities</p> <p>Explain that different brain regions mature at different age and how this affects cognitive behaviour</p> <p>The role of nurture vs. nature in the development of brain and behaviour</p> <p>Describe some behavioural methods to study cognition in infants</p>	<p>Describe three changing structures in the brain, describe the consequences for behaviour</p> <p>Point out two areas that mature late and two areas that mature early and how this affects behaviour</p> <p>Describe the influences of nature and nurture, give one example of each</p> <p>Describe at least 2 of these methods</p>	<p>Period 8 Week 13-14</p>

IX. Appendices

All course materials (except for the book) will be put on Moodle or handed out during class