

Master in CsH: LCO

2014-2016

PHILOSOPHY AND FOUNDATIONS OF SYMBOLIC SYSTEMS (3
credits)

2014-2015

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Offices: C4 and C5 (Santamaria Centre)

Syllabus (subject to possible amendment)

1. General symbolic systems.
2. Formal languages, semantic structures, and formal systems. The notion of consequence. What is a logic?
3. Deduction, Induction, and Abduction.
4. Formal Grammars. The Chomsky Hierarchy.
5. Internal Foundations of Mathematics: Number Theory, Set Theory, Category Theory.
6. Logic in the classical foundations of mathematics: Logicism, Intuitionism, Formalism.
7. Information and Computation: Information Theories and Systems.
8. Computability: Church-Turing Thesis.
9. Introduction to Coding Theory and Cryptography: Basic notions.

Requirements

Students are required to attend all lectures and seminars and they must submit two short essays (mid-December, and mid-January) and to prepare one seminar presentation (maximum 20 minutes). Topics for writing essays will be the same for all students. Seminar presentations will consist in answering and discussing questions which will appear during the course of PFSS, and in solving and discussing previously distributed exercises.

Bibliography

Basic bibliography

Benacerraf, P. and Putnam, H. (eds) (1983) *Philosophy of Mathematics: Selected Readings* 2nd ed. Cambridge: Cambridge University Press

Boden, M. (ed.) (1990), *The Philosophy of Artificial Intelligence*. Oxford: Oxford University Press.

Dretske, F., (1981), *Knowledge and the Flow of Information*. Cambridge, Mass.: M.I.T. Press.

Floridi, L. (1999), *Philosophy and Computing*. London: Routledge.

Floridi, L. (2010), *Information. A very Short Introduction*. Oxford: Oxford University Press.

Gleick, J. (2011) *The Information: A History, A Theory, A Flood*. Fourth Estate Publishing.

Kahn, D. (1996), *The Codebreakers: The Comprehensive History of Secret Communication from Ancient Times to the Internet*. Revised and Updated. Scribner: New York.

Partee, B. H., ter Meulen, A. & Wall, R. E. (1990) *Mathematical Methods in Linguistics*. Dordrecht: Kluwer.

Piper, F. and Murphy, S. (2002), *Cryptography. A Very Short Introduction*. Oxford: Oxford University Press.

Shapiro, S. (2000) *Thinking about Mathematics: The Philosophy of Mathematics* Oxford: Oxford University Press.

Shapiro, S. (ed) (2005) *The Oxford Handbook of Philosophy of Mathematics and Logic*. Oxford: Oxford University Press.

Simon, H. (1969), *Sciences of the Artificial*. Cambridge, Mass.: M.I.T. Press.

Wang, H., (1974), *From Mathematics to Philosophy*. London: Routledge.

Wolfram, S. (1989), *Philosophical Logic. An Introduction*. London: Routledge.

Advanced bibliography

Boyer, C. B. (1968), *A History of Mathematics*. New York: Wiley.

Floridi, L. (ed.) (2004), *The Blackwell guide to the Philosophy of Computing and Information*. Oxford: Blackwell.

Goble, L. (ed.) (2001), *The Blackwell guide to Philosophical Logic*. Oxford: Blackwell.

Goldie, C. M., and R. G. E. Pinch (1991), *Communication Theory*. Cambridge: Cambridge University Press.

Hoopes, J. (ed.), (1991) *Peirce on Signs. Writings on Semiotic by Charles Sanders Peirce*. The University of North Carolina Press.

Jacquette, D. (ed.) (2002), *Philosophy of Mathematics. An Anthology*. Oxford: Blackwell.

Kleene, S. C. (1952), *Introduction to Metamathematics*. Amsterdam: North-Holland.

Newell, A. & Simon, H. A. (1972), *Human Problem Solving*. Englewood Cliffs, NJ.: Prentice-Hall.

Mac Lane, S. (1986), *Mathematics, Form and Function*. New York: Springer Verlag.

Morris, C. W. (1955), *Signs, Language, and Behavior*. New York: George Braziller, Inc.

Moser, S.M. and Chen, P-N. (2012), *A Student's Guide to Coding and Information Theory*. Cambridge: Cambridge University Press.

Roman, S. (1997), *Introduction to Coding and Information Theory*. New York: Springer.

Shapiro, S. (1991) *Foundations without Foundationalism: A case for Second-order Logic*. Oxford: Clarendon Press

Van Heijenoort, J.(ed.) (1977), *From Frege to Gödel. A Source Book in Mathematical Logic (1879-1931)*. Cambridge, Mass.: Harvard University Press

Interesting links

world.logic.at/

<http://plato.stanford.edu/>

www.turing.org.uk/turing/

Evaluation and grading system:

Active participation by students will be required, both in the lectures and in the seminars. Specific readings for each topic will be assigned. Students will be expected to read them and then to contribute actively in the classroom. Students will also be required to prepare seminar presentations and to write two short essays during the course of PFSS.

Final examination: Take-home final.

30% short essays + 30% seminar presentation, exercises, and participation + 40% take-home final.