Term Information

Effective Term	Spring 2023
Previous Value	*Spring 2019*

Course Change Information

What change is being proposed? (If more than one, what changes are being proposed?)

List the course as a Number, Nature and Mind GE Theme.

What is the rationale for the proposed change(s)?

This course meets the theme goals and ELOs.

What are the programmatic implications of the proposed change(s)?

(e.g. program requirements to be added or removed, changes to be made in available resources, effect on other programs that use the course)?

We anticipate no programmatic implications in light of this change.

Is approval of the requrest contingent upon the approval of other course or curricular program request? No

Is this a request to withdraw the course? No

General Information

Course Bulletin Listing/Subject Area	Philosophy
Fiscal Unit/Academic Org	Philosophy - D0575
College/Academic Group	Arts and Sciences
Level/Career	Graduate, Undergraduate
Course Number/Catalog	5840
Course Title	Advanced Philosophy of Cognitive Science
Transcript Abbreviation	Adv Phil Cog Sci
Course Description	In-depth examination of the influence of results in cognitive science upon the way in which philosophers approach fundamental issues about the nature of the mind.
Semester Credit Hours/Units	Fixed: 3

Offering Information

Length Of Course	14 Week, 12 Week, 8 Week, 7 Week, 6 Week, 4 Week
Flexibly Scheduled Course	Never
Does any section of this course have a distance education component?	No
Grading Basis	Letter Grade
Repeatable	No
Course Components	Lecture
Grade Roster Component	Lecture
Credit Available by Exam	No
Admission Condition Course	No
Off Campus	Never
Campus of Offering	Columbus, Lima, Mansfield, Marion, Newark, Wooster
Previous Value	*Columbus*

Prerequisites and Exclusions

Prerequisites/Corequisites	Prereq: 3 cr hrs in Philos at or above 2000-level; or Grad standing; or permission of instructor.
Previous Value	*Prereq: 6 cr hrs in Philos at or above 2000-level; or Grad standing; or permission of instructor.*
Exclusions	
Electronically Enforced	Yes

Cross-Listings

Cross-Listings

Subject/CIP Code

Subject/CIP Code	38.0101
Subsidy Level	Doctoral Course
Intended Rank	Junior, Senior, Masters, Doctoral
Previous Value	*Senior, Masters, Doctoral*

Requirement/Elective Designation

Number, Nature, Mind
The course is an elective (for this or other units) or is a service course for other units

Previous Value

The course is an elective (for this or other units) or is a service course for other units

Course Details

Course goals or learning objectives/outcomes

- Students will acquire the knowledge and skills required to explain, interpret, analyze and assess fundamental issues and arguments in the cognitive sciences.

Content Topic List

- Philosophically significant findings in cognitive science
- Levels of explanation
- Theory of representation
- The nature of desire
- The nature of action

Sought Concurrence

No

Attachments

- PHILOS_5840_syllabus.doc: Syllabus

  (Syllabus. Owner: Shuster,Amy Lynne)

- Philos 5840 - Philosophy of Cognitive Science -- ELO Questionnare 4.11.docx: GE Theme NNM submission form

  (Other Supporting Documentation. Owner: Shuster,Amy Lynne)

Comments

Workflow Information

Status	User(s)	Date/Time	Step
Submitted	Shuster,Amy Lynne	06/16/2022 02:46 PM	Submitted for Approval
Approved	Downing,Lisa J	06/16/2022 03:57 PM	Unit Approval
Approved	Vankeerbergen,Bernadette Chantal	08/26/2022 10:26 AM	College Approval
Pending Approval	Cody,Emily Kathryn Jenkins,Mary Ellen Bigler Hanlin,Deborah Kay Hilty,Michael Vankeerbergen,Bernadette Chantal Steele,Rachel Lea	08/26/2022 10:26 AM	ASCCAO Approval

Philosophy 5840: Advanced Philosophy of Cognitive Science

GE Theme: Number, Nature, and Mind

Instructor: Prof. Richard Samuels
Email: samuels.58@osu.edu
Tel.: 614-292-1701
Office Address: Room 314H University Hall

Place & Time: TR 3:55 – 5:15 @ 353 University Hall

Format of instruction: 3 contact hours per week, seminar format with in-class participation and questions.

Office Hours: Thursday 2:00-3:30 via Zoom. If this time doesn't work for you, please feel free to arrange to meet with me at other times—just ask!

- Online Office hours: https://osu.zoom.us/j/168945559?pwd=cG9NQzRZZjAvSEt1bW9lZG5tbFkrdz09
  - Passcode: OFFICE

Course Description: Over the past few decades, cognitive science has exerted a profound influence on longstanding philosophical debates regarding the nature of the human mind. In this course we focus on some of these debates. Specifically, we consider the following questions: Is the human mind a computer of some sort? Is psychology reducible to biology? How is it possible for our thoughts to represent the world? What are concepts, and how do we acquire them? How do human beings acquire the capacity to think about numbers?

Although no background in cognitive science is assumed, we will read papers by prominent psychologists and neuroscientists, as well as philosophers. Through group discussion of assigned reading we will work as a class to understand and assess the major theories and arguments relevant to addressing the above questions.

Prerequisites: 3 cr hrs in Philos at or above 2000-level; or Grad standing; or permission of instructor.

Readings: All readings will be available online via the Carmen course homepage. It is, of course, mandatory to read the assigned readings.

Grading Scheme: We will use the Standard OSU Grading Scheme
93–100: A
90–92.9: A-
87–89.9: B+
83–86.9: B
80–82.9: B-
77–79.9: C+
73–76.9: C
70 –72.9: C-
67 –69.9:
D+ 60 –66.9:
D Below 60: E

Assignments: Your overall course grade will be assigned based on the following components (percentage of overall grade in parenthesis):

1. *Critical Note:* ONE brief critical note on a reading, approximately 500 words (10%)
2. *Short Paper:* ONE short paper, approximately 1000 words in length. (20%.)
3. *Long Paper:* You will be required to write ONE essay, approximately 2500 words in length. (30%.)
4. *Group Presentations:* Later in the semester we will organize into groups. Each group will be responsible for running part of a class: a) selecting a topic, b) deciding on reading, and c) leading the class discussion. I will meet with groups to provide advice and feedback. (20%)
5. *Attendance & Participation*: You are expected to attend and to participate in classes. (10%)
6. *Reading Responses:* You will be assigned an online reading response question each week. Your response should be uploaded to Carmen by the specified deadline – typically a Monday at 5pm. (10%)

- Further information regarding each of the above assignment – topics, due date, guidelines etc. – will be

distributed at the relevant times later in the semester.

- Please note: Extensions will only be given under the most extraordinary of circumstances.

Disabilities: The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

Academic misconduct: It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term "academic misconduct" includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct **http://studentlife.osu.edu/csc/**.

Class Conduct: Consistent, respectful, and informed participation is expected from every student in the course. This includes:

- Respectful discussion that avoids personal history
- No email or internet usage during class
- Cell phones turned off when class begins.

GE Theme Goals and Objectives: The Curriculum Committee of the College of Arts & Sciences requests that syllabi of all GE courses list the goals and learning objectives for the relevant category of the GEC.

The goals of the Number, Nature, and Mind GE Theme are:

1. Successful students will analyze the nature of mathematics and/or mathematical reasoning at a more advanced and in-depth level than in the Foundations component.
2. Successful students will integrate approaches to number, nature, and mind by making connections to their own experience of mathematical thinking and its application in the world, and by making connections to work they have done in previous classes and/or anticipate doing in the future.
3. Successful students will experience and examine mathematics as an abstract formal system accessible to mental manipulation and/or mathematics as a tool for describing and understanding the natural world.

Expected Learning Outcomes: Successful students are able to...

1.1 Engage in critical and logical thinking about the nature and/or application of mathematical reasoning.
1.2 Engage in an advanced, in-depth, scholarly exploration of the philosophical and/or cognitive foundations of mathematics and/or the application of mathematics in understanding the natural world.
2.1 Identify, describe, and synthesize approaches to or experiences of the role of mathematics and mathematical reasoning in different academic and non-academic contexts.
2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.
3.1 Analyze and describe how mathematics functions as an idealized system that enables logical proof and/or as a tool for describing and understanding the natural world.

Many of the topics we cover in Philosophy 5840 are concerned with mathematics as a tool for describing and understanding cognition, with the philosophical foundations that underwrite such applications of mathematics, and with

questions regarding the cognitive foundations of our ability to think and reason mathematically. You will encounter these issues throughout the seminars, readings, and assignments.
More specifically, you will be introduced to computational accounts of the human mind and engage in advanced, in depth, exploration of the philosophical assumptions that underwrite the application of computational methods to the study of cognition. In addition, you will identify, describe, and synthesize approaches to understanding those cognitive processes responsible for the acquisition of mathematical abilities in childhood, and analyze and describe the philosophical assumptions that underwrite such explanations.

Topics & Readings

- Notes: a) The list of topics and readings is tentative. Expect some changes! b) All readings are available from the Carmen website. c) Readings are required, unless indicated otherwise.

Behaviorism & The Emergence of Cognitive Science

Session 1: Introduction & Course Mechanics

Session 2: The Behaviorist Prehistory of Cognitive Science
- B.F. Skinner, "Selections from Science and Human Behaviour"
- B.F. Skinner, "About Behaviorism"
- Optional: G. Graham "Behaviorism", SEP

Session 3: Against Behaviorism
- N. Chomsky, "Review of Verbal Behaviour" (especially, sections 1-4, and 11)
- D. Dennett, "Skinner Skinned" in Brainstorms

Cognition and Computation

Sessions 4 & 5: Representationalism & The Representational Theory of Mind
- Fodor, J. 1987. "The Persistence of the Attitudes" from *Psychosemantics*
- Egan, F. 2012 "Representationalism"
- Optional: Pylyshyn, Z. 1986 "The Explanatory Role of Representations"

- Circulate 1st Assignment

Session 6: Classical Computationalism
- J. Haugeland, "Semantic Engines" in Haugeland (ed.), Mind Design
- Marr, D. 1982. Vision. Chapters 1 and 6.
- Optional: Samuels, R 2018. "Classical Computational Models"

Session 7: Connectionism & Deep Learning
- Clark "Connectionism" from *Mindware*
- Buckner, Deep learning: A philosophical introduction
- Optional: Marcus, "Multi-Layer Perceptrons"

Session 8: The Relative Merits of Different Computational Accounts of Cognition
- J. Fodor and Z. Pylyshyn, "Connectionism and Cognitive Architecture"
- R. Matthews, "Can Connectionists Explain Systematicity?"
- G. Marcus, "Relations Between Variables"

Session 9: Triviality Arguments Against Computationalism
- Putnam, H. (1988) Representation and Reality (Cambridge, MA: MIT Press), chaps. 5, 6, Appendix.
- Searle, J. (1992) The Rediscovery of the Mind (MIT Press), chap. 9.
- Optional: Sprevak, M (2017) "Triviality arguments about computational implementation" in Sprevak & Colombo (Eds.) The Routledge Handbook of The Computational Mind, pp. 175-191

Session 10: Some Responses to Triviality Arguments

- Chalmers, D.J. (1995) 'On Implementing a Computation', Minds and Machines, 4, pp. 391–402.
- Optional: Sprevak, M. (2012) 'Three Challenges to Chalmers on Computational Implementation', Journal of Cognitive Science, 13, pp. 107–143.

Psychology and Reduction: How does psychology relate to neuroscience?

Session 11: The Classical Case for Autonomy
- Fodor, J. 1974. "Special sciences". Synthese 28: 97-115.
- Optional: Oppenheim & Putnam, 1956, "The Unity of Science as a Working Hypothesis."

Session 12: Against Autonomy
- Kim, J. 1992. "Multiple realization and the metaphysics of reduction." Philosophy and Phenomenological Research 52: 1-26.
- Optional: Shapiro, L. 2000. "Multiple Realizations." Journal of Philosophy 97: 635-654.

Circulate 2nd Assignment

Sessions 13 & 14: Mechanisms & Autonomy
- Piccinini & Craver, "Integrating psychology and neuroscience: functional analyses as mechanism sketches"
- Weiskopf, "Models and mechanisms in psychological explanation"

AUTUMN BREAK - No Class

The Origin of Concepts: Where do our ideas come from?

Sessions 15 & 16: Theories of Concepts - A Primer
- Margolis & Laurence "Concepts", *The Blackwell Guide to Philosophy of Mind*

Session 17: 'Mad dog' Nativism
- Fodor, J.A. 1981. The present status of the innateness controversy. In J.A. Fodor, *Representations*. MIT Press.
- Margolis & Laurence, Radical Concept Nativism (with Stephen Laurence), *Cognition*, 86, 2002.

Session 18: Empiricism about concepts
- Hume, D. *An Enquiry Concerning Human Understanding*, sections 2-3.
- Prinz , J. The Return of Concept Empiricism
- Machery, E. Concept Empiricism: A Methodological Critique, *Cognition*, 104: 19–46.

Session 19: Moderate Nativism
- Spelke, Elizabeth and Katherine D. Kinzler (2007) "Core Knowledge," in *Developmental Science*, 10 (1): 89-96

Number Concepts: How do humans acquire number concepts?

Session 20: Background and Nativism about Number Concepts
- Feigenson, Dehaene & Spelke (2004) Core systems of number
- Leslie, A. M., Gallistel, C. R., & Gelman, R. (2007). Where integers come from.
- Optional: Leslie, A. M., Gelman, R., & Gallistel, C. R. (2008). The Generative Basis of Natural Number Concepts.

Circulate 3rd Assignment

Veterans Day – No Class

Session 21: Objections to the Nativism about Number Concepts
- O'Shaughnessy, Gibson, & Piantadosi (2021) The Cultural Origins of Symbolic Number
- Mix, K. S., & Sandhofer, C. M. (2007). Do we need a number sense? *Integrating the Mind*, 293–326

Session 22: Number concepts are learned: The Bootstrapping Hypothesis
- Carey - Where Our Number Concepts Come From

- Carey, S. (2004). Bootstrapping and the origins of concepts. *Daedalus*, 59–68.
- Optional: Beck - Can bootstrapping explain concept learning?

Session 23: Bootstrapping (Cont.)

- Rey, G. (2014). Innate and learned: Carey, mad dog nativism, and the poverty of stimuli and analogies (yet again).
- Carey - Why Theories of Concepts Should Not Ignore the Problem of Acquisition
- Optional: Spelke - Core Knowledge, Language, and Number

THANKSGIVING - NO CLASS

Session 24: **Group Presentations**

Session 25: **Group Presentations**

Session 26: **Group Presentations**

New Theme Course Submission Form

Philosophy 5840: Advanced Philosophy of Cognitive Science

Submitted for approval for the new theme Number, Nature, and Mind

Background Statement

As described in detail on the syllabus, Philosophy 5840 focuses on several central philosophical issues regarding the nature of mind and cognition, including:

- Is the mind is a computational system of some sort?
- Is cognition reducible to neurobiology?
- What are concepts, and how we acquire them?
- How do human beings acquire concepts for the natural numbers, 1, 2, 3…?

The first issue (and to a lesser extent the second) is concerned with the application of mathematics – computability theory, in particular – to the study of human minds. The third issue is centrally concerned with the application of various logical and set theoretic notions to the study of concepts. The final issue concern the cognitive foundations of the human capacity for numerical thought. This makes Philosophy 5840 an ideal course for the *Number, Nature, and Mind* GE Theme.

The 3-credit hour course is comprised of two weekly seminars (80 minutes each) in which we will discuss a selection of readings from influential psychologists, linguists, neuroscientists, and philosophers. Mastery of the material will be assessed partially on the basis of three writing assignments – a critical note (500 words), a short paper (1000 words) and a longer term paper (2500 words). In addition, students will be assessed on the basis of class participation, their involvement in a group presentation, and weekly reading response questions. These various assignments and activities will play a central role in achieving the ELOs and assessing that achievement.

Overview

Each category of the General Education (GE) has specific learning goals and Expected Learning outcomes that connect to the big picture goals of the program. Expected Learning Outcomes (ELOs) describe the knowledge or skills students should have by the end of the course. Courses in the GE Themes must meet the ELOs common for **all** GE Themes and those specific to the Theme, in addition to any ELOs the instructor has developed specific to that course.

The prompts below provide the goals of the GE Themes and seek information about which activities (discussions, readings, lectures, assignments) provide opportunities for students to achieve the ELO's associated with that goal. The answer should be concise and use language accessible to colleagues outside of the submitting department or discipline. The specifics of the activities matter—listing "readings" without a reference to the topic of those readings will not allow the reviewers to understand how the ELO will be met. However, the panel evaluating the fit of the course to the Theme will review this form in conjunction with the syllabus, so if readings, lecture/discussion topics, or other specifics are provided on the syllabus, it is not necessary to reiterate them within this form.

Goals and ELOs shared by *all* Themes

Goal 1: Successful students will analyze an important topic or idea at a more advanced and in-depth level than the foundations. In this context, "advanced" refers to courses that are e.g., synthetic, rely on research or cutting-edge findings, or deeply engage with the subject matter, among other possibilities.

Goal 2: Successful students will integrate approaches to the theme by making connections to out-of-classroom experiences with academic knowledge or across disciplines and/or to work they have done in previous classes and that they anticipate doing in future.

For each of the ELOs below, please identify and explain course assignments, readings, or other activities within this course that provide opportunity for students to attain the ELO. If the specific information is listed on the syllabus, it is appropriate to point to that document. The ELOs are expected to vary in their "coverage" in terms of number of activities or emphasis within the course. Examples from successful courses are shared on the next page.

ELO 1.1 Engage in critical and logical thinking.	Students will engage in advanced critical and logical thinking regarding various aspects of cognition and cognitive science though a variety of means: • Each of the the main writing assignments – the critical note, the short essay, and the term paper –require critical engagement with influential philosophical theories and arguments, and require that student develop sustained logical analyses of these theories and arguments. • Seminar discussions are centrally concerned with critically assessing a range of influential theories and arguments via the application of sustianed logical thinking. • Reading response questions will require students to provide critical evaluations of the readings.
ELO 2.1 Identify, describe, and synthesize approaches or experiences.	All the topics discussed in Philosophy 5840 are inherently interdisciplinary in that they require systematic reflection on – and the integration of – ideas and methods from multiple distinct disciplines, including the history of philosophy, cognitive psychology, computer science, neuroscience, and mathematics. The development of cognitive science involves an interplay between theoretical developments in philosophy, linguistics, psychology, computer science, and mathematics, as well as experimental research on both human and nonhuman organisms. Throughout the course students are challenged to identify and describe these approaches, characterize the interplay between them, and to assess how, if at all, the synthesis of these strands of thought have led to plausible accounts of mind and cognition. Students will experience these challenges in seminar discussions, in their course reading, when addressing reading response questions,

	and when doing their written assignments. In addition, the end of term group presentations will require that students colaborate in order to develop and deliver a class presentation that focuses on a philosophically significant issue in the cognitive and behavioral sciences.
ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.	At a concrete level, the development and progression of students in Philosophy 5840 is traced most clearly through both the increasing sophistication of the assignments that they complete and the increasing autonomy that they have in determining the content of the assignments. For example, the topic of the first written assignment is set by me, and consists of a 500 word critical discussion of a well-known argument for behaviorism. In constrast, for the final paper assignment, students are required to identify a topic of their own (in consultation with me) which draws on material that we studied during the semester, and is 2500 words in length. At a more abstract level, student reflection and self-assessment occurs through in-class discussion, and reading response questions. For example, throughout the course students will routinely be asked questions of the form 'What do you think is most important?' and 'Which theory do you find most plausible and why?' Among other things, such questions are designed to prompt student reflection and to inititate conversations that involve critical self-evaluation of their initial views.

Goals and ELOs of the GE Theme: Number, Nature, and Mind

GOAL 1: 1. Successful students will analyze the nature of mathematics and/or mathematical reasoning at a more advanced and in-depth level than in the Foundations component.
GOAL 2: Successful students will integrate approaches to number, nature, and mind by making connections to their own experience of mathematical thinking and its application in the world, and by making connections to work they have done in previous classes and/or anticipate doing in the future.
GOAL 3: Successful students will experience and examine mathematics as an abstract formal system accessible to mental manipulation and/or mathematics as a tool for describing and understanding the natural world or human cognition.

Enter your ELOs in the Table below, editing and removing rows as needed. There should be at least one ELO for each goal, and they should be numbered to correspond to the goal (e.g., ELO1.1 is the first ELO for Goal 1, ELO 2.2 would be the second ELO for the second goal).

For each ELOs, please identify and explain course assignments, readings, or other activities within this course that provide opportunity for students to attain the ELO. If the specific information is listed on the syllabus, it is appropriate to point to that document. The number of activities or emphasis within the course are expected to vary among ELOs. Examples from successful courses are shared below.

ELO 1.1 Engage in critical and logical thinking about the nature and/or application of mathematical reasoning.	As described in the syllabus and background statement, students will engage in critical and logical thinking about the application of the theory of computation to modelling cognition. Though such engagement will occur throughout the semester, it is perhaps most pronounced in the module of Cognition and Computation (Session 4-10), where students will focus on: • Fundamental notions in computability theory, including the notion of an effective procedure, a formal system and a Turing machine (Sessions 5&6) • Major differences between various sorts of computational models of cognition– e.g. so-called classical, early connectionist and deep-learning models. (Sessions 6-8) • Fundamental philosophical/theoretical issues regarding how the mathematics of computation applies to physical systems, such as the human brain (Session 9 & 10.) Such topics will be the focus of the readings and reading response questions for sessions 4-10, will be central to our in-class discussions, and will form the focus of one of the essay assignments – the 1000 word essay.
ELO 1.2 Engage in an advanced, in-depth, scholarly exploration of the philosophical and/or cognitive foundations of mathematics and/or the application of mathematics in understanding the natural world or human cognition.	Though such engagement is pervassive throughout the course, this ELO is perhaps most clearly addressed by two course modules: • Cognition & Computation: As indicated in the discussion of ELO 1.1, this module involves an advanced, in-depth, scholarly exploration of the philosophical foundations of the theory of computation and its application to the study of human cognition. (See above for more details.) • Number Concepts: The module on number concepts (Sessions 20-23) is centrally concerned with the cognitive foundations of mathematics. More specifically, it focuses on the question of how human beings acquire those concepts required for basic arithmetic –especially concepts for the natural numbers 1, 2, 3,… Both modules will be accompanied by reading assignments, reading response questions, and in-class

	discussions that require advanced, in-depth, scholarly exploration of the relevant issues.
ELO 2.1 Identify, describe, and synthesize approaches to or experiences of the role of mathematics and mathematical reasoning in different academic and non-academic contexts.	Throughout the course students are challenged to identify, describe and sythesize different views about the application of mathematics to the study of cognition. For example: • We identify and describe the application of Turing-style computation to the study of cognition (Sessions 5 & 6) • We identify and describe role of mathematics in the characterization of cognitive functions, and algorithmic level characterizations of cognitive processes (Sessions 6 & 7) • We identify and describe some central mathemtical ideas employed in conectionists and deep-learning models of cognition (Sessions 7&8) • We identify and describe hybrid models of cognition that synthesize both classical and non-classical conceptions of computation. (Sessions 8) • We idetify and describe and sythesize different views about how computational theory applies to the study of physical systems. (Sessions 9&10) • We identify and describe the role of various logical and mathematical notions in the construction of theories of concepts and how they are synthesised in order to provide acocunts of various cognitive capacities (Sessions 15-18). In addition, the final course module on number concepts, will involve the identification, description and synthesis of views regarding core aspects of arguably our earliest experience of mathematics – the acquisition of simple arithmetic abilities in childhood.
ELO 2.2 Demonstrate a developing sense of self as a learner through reflection, self-assessment, and creative work, building on prior experiences to respond to new and challenging contexts.	At a concrete level, the development and progression of students in Philosophy 5840 is traced most clearly through both the increasing sophistication of the assignments that they complete and the increasing autonomy that they have in determining the content of the assignments. For example, the topic of the first written assignment is set by me, and consists of a 500 word critical discussion of a well-known argument for behaviorism. In later constrast, for the final paper assignment, students are required to identify a topic of their own (in consultation with me) which draws on material that we studied during the semester, and is 2500 words in length.

	At a more abstract level, student reflection and self-assessment occurs through in-class discussion, and reading response questions. For example, throughout the course students are, with respect to particular topics, asked questions of the form 'What do you think is most important?' and 'Which theory do you find most plausible and why?' Among other things, such questions are designed to prompt student reflection and to inititate conversations that involve critical self-evaluation of their initial views.
ELO 3.1 Analyze and describe how mathematics functions as an idealized system that enables logical proof and/or as a tool for describing and understanding the natural world or human cognition.	This course will analyze and describe various branches of mathematics both an idealized systems and as tools for describing and understanding human cognition. With regard to mathematics as an idealized system that enables proof we will analyze and describe the following: • Fundamental notions in computability theory – e.g. effective procedure, finite state automata, Turing machine, Universal Turing machine, as well as the Church-Turing thesis, and Turing's account of computability. (Sessions 6, 9 & 10) • Central ideas in formal logic – e.g. the distinction between model theory and proof theory, the distinction between syntax and semantics, and the notion of formal validity (Sessions 4, 5, 15 and 16) • The Dedekind-Peano axioms for arithmetic (Session 20) With regard to mathematics as a tool for describing and understanding cognition, this will figure prominently throughout the course, including: • Different approaches to modelling cognition computationally (Sessions 4-8) • Different accounts of the structure of concepts (Sessions 15-19) • Different accounts of the nature and origin of number concepts (Sessions 20-23) Students experience the above sorts of ideas throughout the seminars, readings, reading-response questions, and essay assignments. They learn how mathematics functions as a tool for analyzing the natural world from lectures and readings and most viscerally from the experience of solving multi-part problems on homework assignments, which take them from initial assumptions to sometimes surprising conclusions.