GMS 6805: Introduction to Applied Ontology

Location: Online, TBA

Class Hours: Wednesdays 1:55-3:50 pm

Instructor: Mathias Brochhausen, PhD
Office: 3226, Clinical and Translational Science Building
Email: mbrochhausen@ufl.edu
Phone: 501-831-3119

Office Hours: By Appointment

Course Description: Applied ontology is a sub-discipline of knowledge representation that develops resources that make the meaning of terms processable by computers to improve interoperability of data and to support reasoning with digital knowledge bases. This course introduces students to the fundamentals of applied ontology and its role in biomedical informatics. Students will learn what ontologies are, how they differ from similar resources and how they are implemented in knowledge management environments.

Course Prerequisites: None, but PHI 6105: Seminar in Logic, or experience with symbolic logic, is an asset.

Course Objectives:

- Describe the need for semantic integration of biomedical data
- Identify the components of the Semantic Web technology and the goals of Semantic Web Technologies
- Describe how ontologies fit into the Semantic Web paradigm and the role of Applied Ontology within in
- Understand the computational principles behind ontology development and implementation
- Describe how ontological artifacts differ terminologies and other semantic resources
- Articulate standards and criteria for good ontologies and evaluate ontologies in light of these criteria
- Illustrate common pitfalls of ontology development
- Create a domain ontology in an ontology editor such as Protégé
- Construct queries that demonstrate an understanding of the logical principles of ontologies and the Semantic Web

Course Texts:

Required Tests:

Antoniou, G. (2012). *A Semantic Web Primer*. Cambridge, MA: The MIT Press.

Arp, R. et al. (2015) *Building Ontologies with Basic Formal Ontology*, Cambridge, MA: MIT Press.

Course Work and Evaluation:

Applied ontology requires the ability to think critically and provide clear oral and written proposals and evaluations. It also requires the ability to create machine readable ontological representation. Accordingly, assignments will be geared toward helping students develop and assess their writing skills and their coding skills, (producing owl files, writing queries).

Short assignments/quizzes – 25%
Project Proposal – 15%
Preliminary ontology owl file – 10%
Final Project – 50%

Course Project: The course project consists of two parts 1) a written component and 2) an ontology owl file.

Students may work independently or in groups. If you are working in a group, the group may have no more than 2 members, each member's contribution to the project should be clearly stated in the project proposal. Exceptions may be made but must be justified in writing and approved by the course instructor.

Students will present their work the last week of class.

The requirements for the research paper are listed below.

Scientific Paper
Project proposals – Project proposals must be approved by the course instructor. They should include, a title, an abstract, group members and their role if applicable, a section explaining the background and motivation for the project, objectives, and a methods section, and references. The references should be in Vancouver style.

Final project - Final papers should include, a title, an abstract, group members and their contributions if applicable (this belongs in a "credits" section), an introduction explaining the background and motivation for the project, a methods section, a results section, a discussion section, and references. The references should be in Vancouver style. The project should also result in an ontology owl file. The paper, the owl file, and the presentation will be evaluated to determine the final project score.

COURSE SCHEDULE (TENTATIVE):
The course schedule is subjected to change.

Week	Topic	Notes
Sep. 2	Introduction and course overview; Semantics, formal languages, and logic – and how are those relevant to medicine	
Sep. 9	Semantic representation and the Semantic Web **Reading:** Antoniou et al. pp.1-90	
Sep.16	Ontologies as part of the Semantic Web **Reading:** Antoniou et al. pp.91-130; Arp et al.pp.1-26	
Sep. 23	Logic for OWL ontologies: Description Logic **Additional reading:** Krötzsch M, Simancík F, Horrocks I: A Description Logic primer. arXiv:1201.4089v3, 2013.	
Sep. 30	Ontological design principles I: General considerations **Reading:** Arp et al.pp.43-84	
Oct. 7	Ontological design principles II: Using BFO as an Upper level **Reading:** Arp et al.pp.85-130	
Oct. 14	Ontological design principles III: BFO & the OBO Foundry **Reading:** Arp et al.pp.131-150 **Additional reading:** Smith B, Ashburner M, Rosse C, et al. "The OBO Foundry: Coordinated Evolution of Ontologies to Support Biomedical Data Integration", Nature Biotechnology, 25 (11), November 2007, 1251-1255. PMC2814061	
Oct. 21	Getting Started with Protégé Ontology Editor Getting started creating an ontology 1. Identifying a domain 2. Competency questions	**Project proposals due**
Oct. 28	Using ontologies in biomedical data management **Additional reading:** Brochhausen M, Bona J, Blobel B. The Role of Axiomatically-rich Ontologies in Transforming Medical Data to Knowledge. *Stud Health Technol Inform.* 2018; 249:38-49. PMID: 29866954 Brochhausen M, Zheng J, Birtwell D, Williams H, Masci AM, Ellis HJ, Stoeckert CJ Jr. OBIB – a novel ontology for biobanking. *J Biomed Semantics.* 2016 May 2;7:23. PMCID: PMC4855778.	
Nov. 7	Comparing ontologies to semantic resources in Biomedical Informatics	
Nov. 14	Hands-on ontology building session	**Preliminary owl files due**
Nov. 21	Writing a paper on a biomedical ontology project	
Nov. 28	**Thanksgiving Break**	
Dec. 2	SPARQL queries	
Dec. 9	Final Project Presentations	**Final project due**

Grading scale:

Letter Grade	Grade Points	Grade Percentage
A	4.0	95-100
A-	3.67	90-94
B+	3.33	87-89
B	3.0	83-86
B-	2.67	80-82
C+	2.33	77-79
C	2.0	73-76
C-	1.67	70-72
D+	1.33	67-69
D	1.0	63-66
D-	.67	60-62
E	0	< 59

For more detail on letter grades and related University of Florida policies, please see the Grades and Grading Policies at http://gradcatalog.ufl.edu/content.php?catoid=6&navoid=1219#grades.
UF POLICIES:

University policy on accommodating students with disabilities: Students requesting accommodation for disabilities must first register with the Dean of Students Office (http://www.dso.ufl.edu/drc/). The Dean of Students Office will provide documentation to the student who must then provide this documentation to the instructor when requesting accommodation. You must submit this documentation prior to submitting assignments or taking the quizzes or exams. Accommodations are not retroactive, therefore, students should contact the office as soon as possible in the term for which they are seeking accommodations.

University policy on academic misconduct: Academic honesty and integrity are fundamental values of the University community. Students should be sure that they understand the UF Student Honor Code at http://www.dso.ufl.edu/students.php. You are expected and required to comply with the University's academic honesty policy (University of Florida Rules 6C1-4.017 Student Affairs: Academic Honesty Guidelines, available at http://regulations.ufl.edu/chapter4/4017.pdf). Cheating, plagiarism, and other forms of academic dishonesty will not be tolerated. Note that misrepresentation of the truth for academic gain (e.g., misrepresenting your personal circumstances to get special consideration) constitutes cheating under the University of Florida Academic Honesty Guidelines

Netiquette – communication courtesy: All members of the class are expected to follow rules of common courtesy in all email messages, threaded discussions, and chats. The first instance of clearly rude and/or inappropriate behavior will result in a warning. The second instance will result in a deduction of five percentage points from your overall grade. The third instance will result in a drop of a letter grade (A to B, A- to B-, and so on).

Online Course Evaluations:
Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu.

GETTING HELP:
For issues with technical difficulties for E-learning in Canvas, please contact the UF Help Desk at:
learning-support@ufl.edu
(352) 392-HELP - select option 2
https://lss.at.ufl.edu/help.shtml

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.