ONTOLOGY DESIGN (2021 Fall at **UT AUSTIN iSCHOOL**)

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INSTRUCTOR BIO

Sam Oh is *a* ***PROFESSOR*** *at* **SUNGKYUNKWAN UNIVERSITY** (SKKU, established in 1398) in Seoul, Korea and *an* ***AFFILIATE PROFESSOR*** *at* **UNIVERSITY** *of* **WASHINGTON** (UW) **iSCHOOL**. Prior to joining SKKU, he taught *at* the UW iSchool *for* 4 years. ***HIS EXPERTISE*** includes **DATA MODELING, METADATA** *and* **ONTOLOGY DESIGN, DATA ANALYTICS,** *and* **KNOWLEDGE MANAGEMENT**. He has consulted many companies and government sectors in Korea. He is a *PAST CHAIR and Special Ambassador of* **GLOBAL iSCHOOLS** and a ***CURRENT CHAIR*** *of* **DCMI GOVERNING BOARD**. He also chaired both TC46/SC9 (Identification & Description) for 6 years and ISO/IEC JTC1 SC34 (Document Description *and* Processing Languages) for 9 years. He ***TAUGHT CLASSES*** at the iSchools such as **SYRACUSE, PITTSBURGH, UT AUSTIN,** *and* **UNC** *at* **CHAPEL HILL**.

COURSE DESCRIPTION

The first part of this course covers essential knowledge needed *to* ***CREATE SOUND*** *and* ***INTEROPERABLE*** **METADATA SCHEMAS** *AND THEIR* **APPLICATION PROFILES (APs)**, which provide the bases for metadata interoperability. Designing metadata schemas and their APs will be done using XML Editors. Its focus will be on how to achieve syntactic interoperability among diverse metadata. The second part of the course will be focused on providing students with in-depth knowledge of how *to* ***DESIGN*** *AND* ***IMPLEMENT*** **SOUND ONTOLOGIES** *for* **SEMANTIC SYSTEMS**. Particular attention will be given *to* ***SMART USE*** *of* **ONTOLOGY LANGUAGES** *SUCH AS* **RDF/OWL (W3C STANDARD)** *and* **TOPIC MAPS (ISO STANDARD**). In a summary, this course will be focused on designing and implementing interoperable metadata and ontology schemas using XML and Ontology Editors. However, it will not deal with developing interfaces of those systems, so programming skills are not required for this class.

COURSE OBJECTIVES

The purpose of this course is to provide students with conceptual and technical knowledge needed in designing interoperable metadata and ontology schemas. The specific objectives of this course are as follows:

- *Students will acquire understanding of major* **STANDARD METADATA SCHEMES** *available* (**DC, MODS, VRA, MIX, textMD, PREMIS,** *and* **METS**)
- *Students will be able to use an XML Editor to design and implement complex metadata schemas and their APs.*
- *Students will learn how to package diverse metadata using METS.*
- *Students will learn* **ONTOLOGY LANGUAGES** *such as* **Topic Maps** *(ISO 13250) and* **RDF/OWL** *(W3C Recommendation)*
- *Students will be able to design sound ontologies using Topic Maps.*
- *Students will be able to design sound ontologies using RDF/OWL.*
- *Students will acquire competent understanding of the* **ONTOLOGY DESIGN METHODOLOGY**.

TEACHING METHODS

- *ALL THE CLASSES WILL BE RUN AS* **SYNCHRONOUS CLASSES**. *THESE LECTURES WILL BE RECORDED AND AVAILABLE IMMEDIATELY AFTER THE CLASS FOR REVIEW.*
- *THE* **CYBER OFFICE HOUR** *WILL BE HELD TO ASSIST PROJECTS. THIS SESSION IS ONLY FOR THOSE WHO HAVE QUESTIONS AND NEED HELP. ATTENDANCE TO THIS SESSION IS OPTIONAL.*

GRADING:

- *Presenting* **METADATA SPECIFICATIONS** (5%)
- PROJECT 1: *Designing a* **DUBLIN CORE** *APPLICATION PROFILE* (10%)
- PROJECT 2: *Designing a* **MODS** *APPLICATION PROFILE* (10%)
- PROJECT 3: *Designing a* **VRA** APPLICATION PROFILE (10%)
- PROJECT 4: *Designing a* **METS** APPLICATION PROFILE (15%)
- PROJECT 5: *Designing a* **TOPIC MAPS** *ONTOLOGY* (25%)
- PROJECT 6: *Designing an* **RDF/OWL** *ONTOLOGY* (25%)

PROPOSED SCHEDULE I

LIVE CLASS TIME: *TUESDAY 6:30 PM – 9:30 PM CST*

MODULE/DATE	TOPICS TO LEARN	PROJECTS AND READING DUES
MODULE 1 8/31(Tuesday) 6:30-9:30 PM	**TOPICS** ○ COURSE OVERVIEW ○ LECTURE ON METADATA BASICS ○ LECTURE ON XML SCHEMA SYNTAX I	**READING** 1
MODULE 2 9/7 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ LECTURE ON XML SCHEMA SYNTAX 2 ○ DESIGNING XML SCHEMA (GENERAL) ○ LECTURE ON DUBLIN CORE (DC) ○ DESIGNING AND IMPLEMENTING *a* **DC** SCHEMA (SIMPLE METHOD)	**READING** 2
MODULE 3 9/14 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ DESIGNING AND IMPLEMENTING *a* **DC** SCHEMA (PROFESSIONAL METHOD) ○ DESIGNING AND IMPLEMENTING *a* **DC APPLICATION PROFILES**	**READING** 2
MODULE 4 9/21 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ METADATA OBJECT DESCRIPTION SCHEMAS (MODS) ○ STUDENT PRESENTATION: **MODS SPECS** AND **USE CASES** (GROUP 1) ○ DESIGNING AND IMPLEMENTING *a* **MODS SCHEMA**	**READING** 3
MODULE 5 9/28 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ DESIGNING AND IMPLEMENTING *a* **MODS-AP**	**READING** 3
OFFICE HOUR 10/4 (Mon) 6:30-8:00 PM	**CYBER OFFICE HOUR** ○ ANY STUDENT WHO *has a* QUESTION REGARDING *the* LECTURES *or* PROJECTS *is* WELCOME. ○ ATTENDANCE *to this* SESSION *is* OPTIONAL.	**RUN BY SUNNY HAN**
MODULE 6 10/5 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ VISUAL RESOURCE ASSOCIATION (VRA) ○ STUDENT PRESENTATION: **VRA SPECS** AND **USE CASES** (GROUP 2) ○ DESIGNING AND IMPLEMENTING *a* **VRA SCHEMA** ○ DESIGNING AND IMPLEMENTING *a* **VRA-AP**	**READING** 4 **PROJECT 1: DC-AP** *Due: 10/5(Tue) 11:59 PM*

PROPOSED SCHEDULE 2

LIVE CLASS TIME: *TUESDAY 6:30 PM – 9:30 PM CST*

MODULE 7 10/12 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ **TextMD**, **MIX** *and* **PREMIS** ○ STUDENT PRESENTATION: **TEXTMD/MIX SPECS** *AND* **USE CASES** (GROUP 3) ○ STUDENT PRESENTATION: **PREMIS SPECS** *AND* **USE CASES** (GROUP 4)	**READING** 5,6,7
OFFICE HOUR 10/18 (Mon) 6:30-8:00 PM	**CYBER OFFICE HOUR** ○ ANY STUDENT WHO *has a* QUESTION REGARDING *the* LECTURES *or* PROJECTS *is* WELCOME. ○ ATTENDANCE *to this* SESSION *is* OPTIONAL.	**RUN BY SUNNY HAN**
MODULE 8 10/19 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ METADATA ENCODING *and* TRANSMISSION SCHEMAS (**METS**) 1 ○ STUDENT PRESENTATION: **METS SPECS** *AND* **USE CASES** (GROUP 5) ○ **METS** USAGE GUIDELINES AND AP EXAMPLES ○ DESIGNING *AND* IMPLEMENTING *a* **METS AP**	**READING** 8 **PROJECT 2: MODS-AP** *Due: 10/19(Tue) 11:59 PM*
MODULE 9 10/26 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ METADATA ENCODING *and* TRANSMISSION SCHEMAS (**METS**) 2 ○ DESIGNING *AND* IMPLEMENTING *a* **METS AP**	**READING** 8
OFFICE HOUR 11/1 (Mon) 6:30-8:00 PM	**CYBER OFFICE HOUR** ○ ANY STUDENT WHO *has a* QUESTION REGARDING *the* LECTURES *or* PROJECTS *is* WELCOME. ○ ATTENDANCE *to this* SESSION *is* OPTIONAL.	**RUN BY SUNNY HAN**
MODULE 10 11/2 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ TOPIC MAPS (ISO Standard Ontology Language) ○ INTRODUCING BASIC CONCEPTS OF TOPIC MAPS ○ MODELING THE FIRST **TOPIC MAPS** ONTOLOGY TOGETHER	**READING** 9 **PROJECT 3: VRA-AP** *Due: 11/9(Tue) 11:59 PM*
MODULE 11 11/9 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ **TM** ONTOLOGY MODELING METHODOLOGY 1 ○ MODELING *and* IMPLEMENTING TOPIC MAPS ONTOLOGIES	
OFFICE HOUR 11/1 (Mon) 6:30-8:00 PM	**CYBER OFFICE HOUR** ○ ANY STUDENT WHO *has a* QUESTION REGARDING *the* LECTURES *or* PROJECTS *is* WELCOME. ○ ATTENDANCE *to this* SESSION *is* OPTIONAL.	**RUN BY SUNNY HAN**
MODULE 12 11/16 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ Understanding **TM** ONTOLOGY MODELING METHODOLOGY 2 ○ FURTHER MODELING *and* IMPLEMENTING TOPIC MAPS ONTOLOGIES	**PROJECT 4: METS-AP** *Due: 11/23(Tue) 11:59 PM*
OFFICE HOUR 11/15 (Mon) 6:30-8:00 PM	**CYBER OFFICE HOUR** ○ ANY STUDENT WHO *has a* QUESTION REGARDING *the* LECTURES *or* PROJECTS *is* WELCOME. ○ ATTENDANCE *to this* SESSION *is* OPTIONAL.	**RUN BY SUNNY HAN**

PROPOSED SCHEDULE 3

LIVE CLASS TIME: *TUESDAY 6:30 PM – 9:30 PM CST*

MODULE 13 11/23 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ W3C **RDF/OWL** ONTOLOGY LANGUAGE ○ INTRODUCING BASIC CONCEPTS *OF* **RDF/OWL** ONTOLOGY LANGUAGE	**READING** 10
MODULE 14 11/30 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ **RDF/OWL** ONTOLOGY MODELING METHODOLOGY ○ MODELING *and* IMPLEMENTING RDF/OWL ONTOLOGIES	**PROJECT 5: TM Ontology** *Due: 11/30(Tue) 11:59 PM*
MODULE 15 12/7 (Tuesday) 6:30-9:30 PM	**TOPICS** ○ FURTHER MODELING *and* IMPLEMENTING RDF/OWL ONTOLOGIES	
OFFICE HOUR 12/13 (Mon) 6:30-8:00 PM	**CYBER OFFICE HOUR** ○ ANY STUDENT WHO *has a* QUESTION REGARDING *the* LECTURES *or* PROJECTS *is* WELCOME. ○ ATTENDANCE *to this* SESSION *is* OPTIONAL.	**RUN BY SUNNY HAN**
12/14 (Tuesday)		**PROJECT 5: RDF/OWL Ontology** *Due: 12/14(Tue) 11:59 PM*

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Class recordings are reserved only for the use of the students enrolled in this class and only for educational purposes. Recordings should not be shared outside the class in any form. Violation of this restriction could lead to Student Misconduct proceedings.

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READINGS

1. **METADATA BASICS *and* XML SCHEMA**
   - Intro *to* XML Schema: *https://www.w3schools.com/xml/schema_intro.asp*
   - Understanding Metadata: *https://groups.niso.org/apps/group_public/download.php/17446/Understanding%20Metadata.pdf*
2. **DC (DUBLIN CORE)**
   - Dublin Core Terms: *http://www.dublincore.org/specifications/dublin-core/dcmi-terms/*
   - Dublin Core Terms: *http://www.dublincore.org/specifications/dublin-core/dcmi-namespace/*
3. **MODS (METADATA OBJECTS *AND* DESCRIPTION SCHEMAS)**
   - MODS Guide *and* Maintenance: *https://www.loc.gov/standards/mods/userguide/generalapp.html*
4. **VRA (VISUAL RESOURCE ASSOCIATION) Core**
   - VRA Core Guide *and* Maintenance: *https://www.loc.gov/standards/vracore/schemas.html*
   - VRA Cataloging Examples: http://core.vraweb.org/vracore_examples.html (Pay attention to the XML records.)
5. **PREMIS (PRESERVATION METADATA: IMPLEMENTATION STRATEGIES)**
   - PREMIS Guide *and* Maintenance: *http://www.loc.gov/standards/premis/v3/premis-3-0-final.pdf*
6. **TextMD (TECHNICAL METADATA *for* TEXT)**
   - TextMD Guide *and* Maintenance: *https://www.loc.gov/standards/textMD/*
7. **MIX (TECHNICAL METADATA *for* DIGITAL STILL IMAGES)**
   - MIX Guide *and* Maintenance: *https://www.loc.gov/standards/mix/*
8. **METS (METADATA ENCODING *and* TRANSMISSION SCHEMAS)**
   - METS Primer: *http://www.loc.gov/standards/mets/METSPrimer.pdf*
9. **TM (TOPIC MAPS ONTOLOGY LANGUAGE)**
   - TAO *of* Topic Maps*: https://ontopia.net/topicmaps/materials/tao.html*
   - Living *with* Topic Maps *and* RDF*: https://ontopia.net/topicmaps/materials/tmrdf.html#N121*
10. **RDF/OWL (RESOURCE DESCRIPTION FRAMEWORK *and* WEB ONTOLOGY LANGUAGES)**
    - RDF Primer: *https://www.w3.org/TR/rdf-primer/*
    - Data Modeling, RDF, *and* OWL: *An* Introduction *to* Ontologies*: https://tdan.com/data-modeling-rdf-owl-part-one-an-introduction-to-ontologies*
11. **Schema.org**
    - Home: https://schema.org/
    - Full hierarchy: https://schema.org/docs/full.html
12. **FOAF**
    - Home: http://xmlns.com/foaf/spec/
    - Tool to create *your* FOAF *file*: http://www.ldodds.com/foaf/foaf-a-matic.html
13. **Validation and Converting**
    - RDF Validator: https://www.w3.org/RDF/Validator/
    - XML Validator: https://www.w3schools.com/xml/xml_validator.asp
    - RDF Converter: including RDF/XML) http://www.easyrdf.org/converter

Additional Readings (optional)

- *COVID-19 pandemic reveals the peril of ignoring metadata standards | https://www.nature.com/articles/s41597-020-0524-5*
- *Implications of Knowledge Organization Systems for Health Information Exchange and Communication during the COVID-19 Pandemic. | https://content.sciendo.com/view/journals/dim/ahead-of-print/issue.xml*

Recommendation:

- *Ontology Summit (each year there is a theme, with multiple sessions/webinars, all free.). https://ontologforum.org/index.php/OntologySummit*