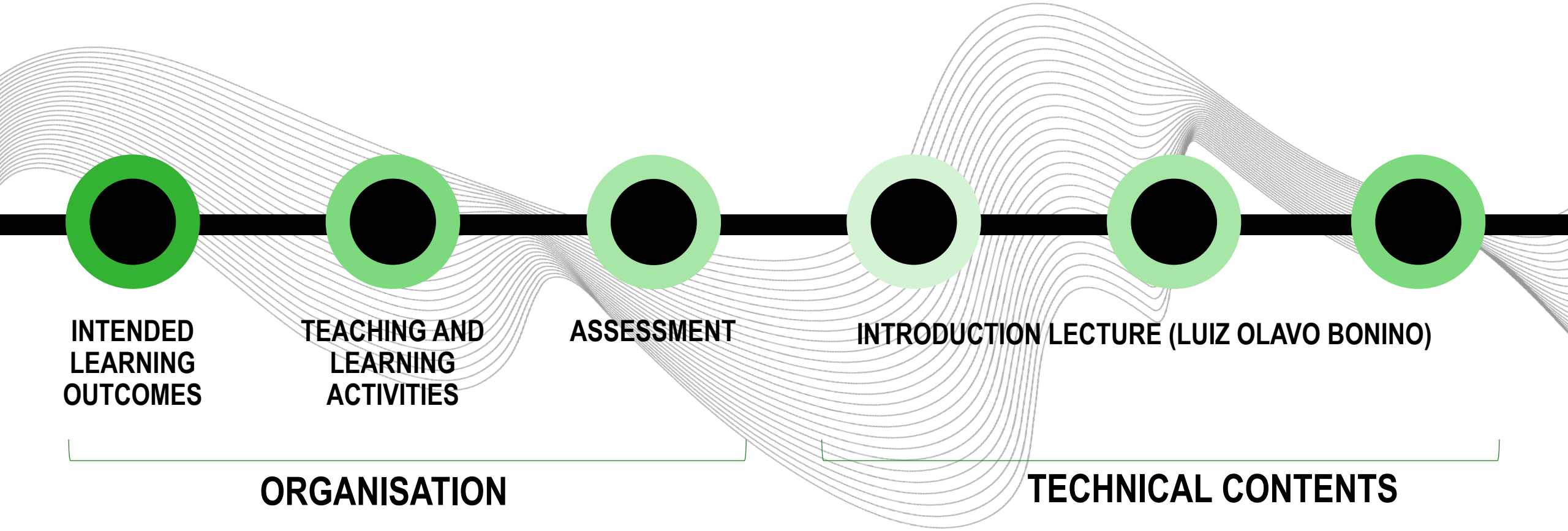
FACULTY OF ELECTRICAL ENGINEERING, MATHEMATICS AND COMPUTER SCIENCE

UNIVERSITY OF TWENTE.

# LINKED DATA AND SEMANTIC WEB

## LECTURE 0 – COURSE INFORMATION

# IN THIS PRESENTATION:



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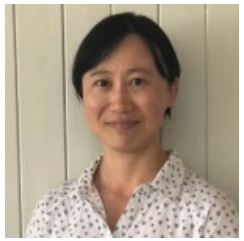
# TEACHING STAFF

Luís Ferreira Pires

SCS/EEMCS



Shenghui Wang

HMI/EEMCS

Luiz Olavo Bonino

SCS/EEMCS


João Moreira

SCS/EEMCS

Erwin Folmer

IEBIS/BMS – Kadaster

## External lecturer

- Wouter Beek (VU / Triply)



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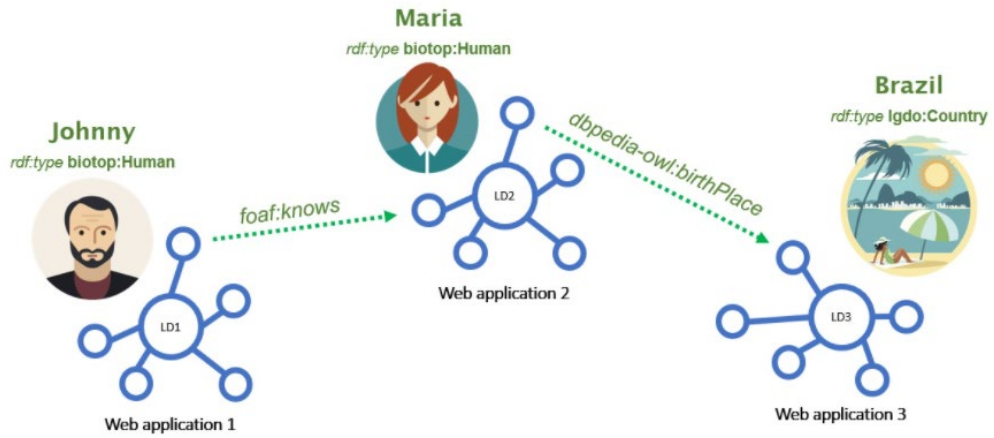
# THIS COURSE IS ABOUT…




- **The Semantic Web (SW):** extension of the *World Wide Web* to make Internet data machine-readable in a way that can be consumed and understood by machines
- **Linked Data (LD):** structured data interlinked with other data built upon the SW stack, enabling applications to share information in a way that can be automatically 'understood' by computers

# INTENDED LEARNING GOALS OF THE COURSE

| Level | Content | Assessment |
|---|---|---|
| Explain and apply | Principles of **Linked Data**, and the **Semantic Web** standards / technologies | Exam and project |
| Explain and address | Linked Data **challenges** for developing Semantic Web **applications** | Exam and project |
| Design | **Semantic models** following **ontology engineering** methodology for LD datasets | Project |
| Evaluate | Semantic Web application based on **different datasets** for **data analytics** | Project |

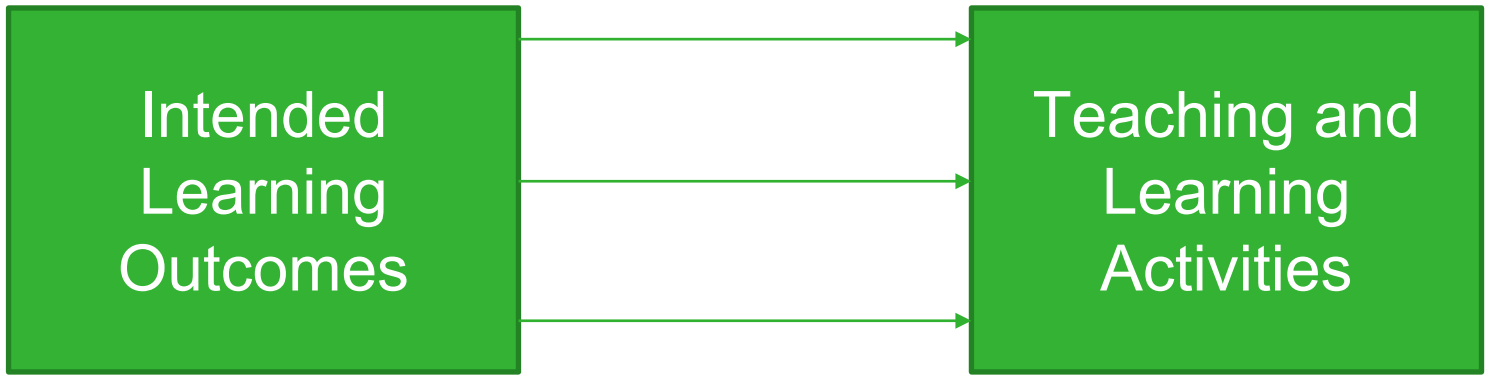
- Different from FAIR data stewardship and Ontology-Driven CM courses!

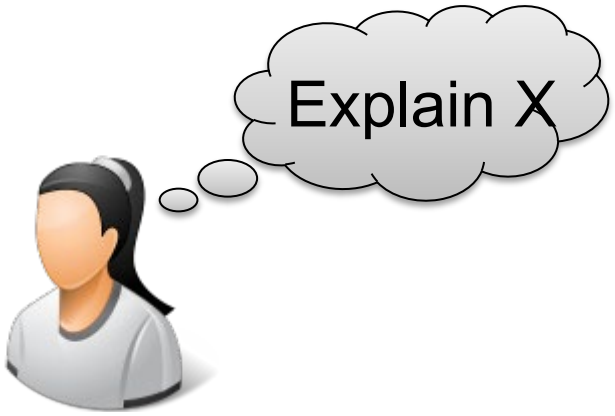
Project Based Learning: this course is technical

→ you will implement a SW app, so no hand-waving about technology!

- Previous knowledge: REST, XML/JSON (schema), relational database (SQL)
- Complementary materials: see Canvas

# CONSTRUCTIVE ALIGNMENT




*"We don't need no thought control"*



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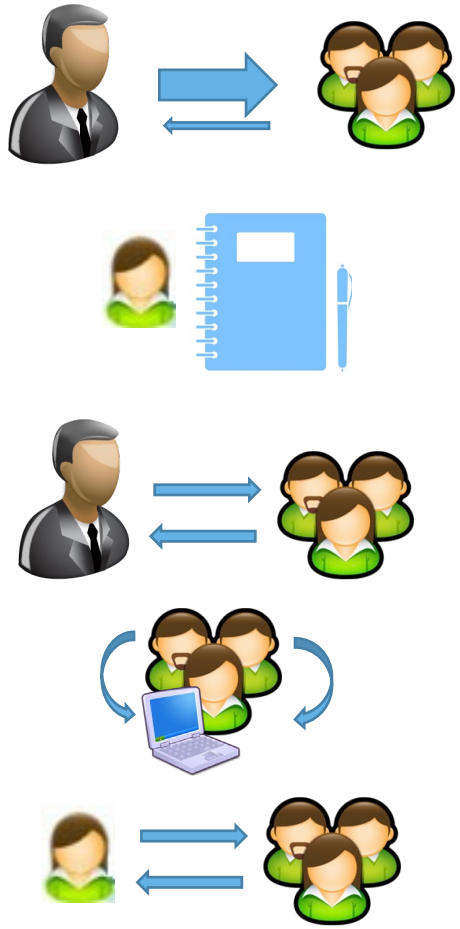
# COURSE ACTIVITIES

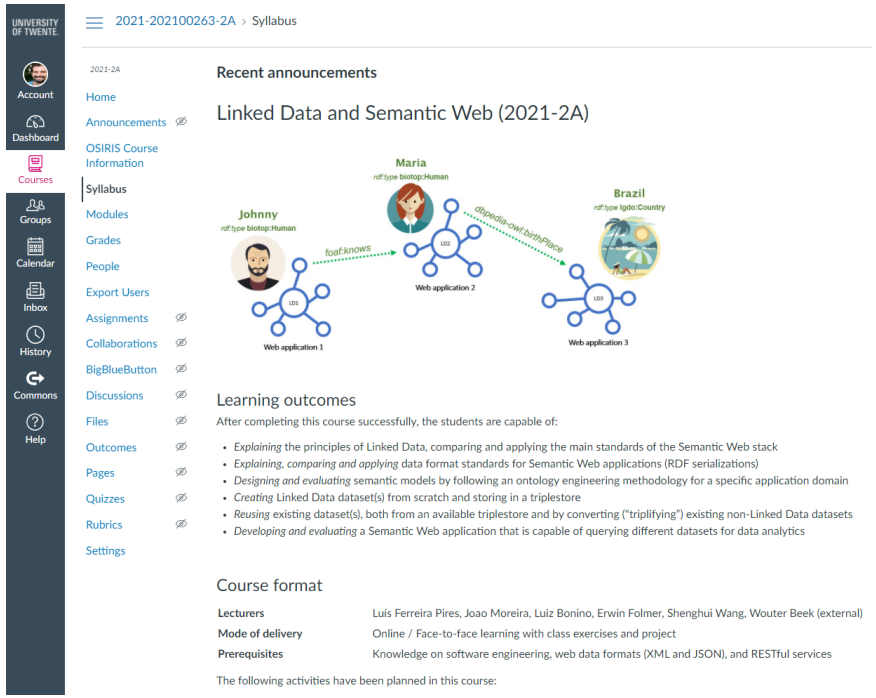
- **Lectures**
  Overview of the subject(s) of the week.
  8 sessions
- **Self-learning**
  Described on Canvas, week by week
- **Lab (practical) sessions**
  Apply knowledge on assignments and receive feedback, not graded but required for the exam
- **Project sessions**
  Work with your pairs
- **Project presentation and final exam**



*"If you don't eat yer meat, you can't have any pudding.*
*How can you have any pudding if you don't eat yer meat?"*

# COURSE TIMETABLE AND CANVAS

https://canvas.utwente.nl/courses/9784




| Week | Topics | Lecture | Lab session | Lecturer |
|---|---|---|---|---|
| Week 1 | Introduction | 09/02 13:45 - 15:30 | 11/02 13:45 - 17:30 | Luiz Olavo Bonino |
| Week 2 | Ontology engineering | 16/02 10:45 - 12:30 | 18/02 13:45 - 17:30 | Joao Moreira / Luís Ferreira Pires |
| Week 3 | W3C RDF, vocabularies, triplification | 01/03 10:45 - 12:30 | 04/03 13:45 - 17:30 | Joao Moreira |
| Week 4 | Logics and W3C OWL | 08/03 10:45 - 12:30 | 11/03 13:45 - 17:30 | Luís Ferreira Pires |
| Week 5 | Triple stores and W3C SPARQL | 15/03 10:45 - 12:30 | 18/03 13:45 - 17:30 | Erwin Folmer / Wouter Beek |
| Week 6 | Ontology matching | 22/03 10:45 - 12:30* | 25/03 13:45 - 17:30 | Shenghui Wang |
| Week 7 | RDF validation with SHACL | 29/03 10:45 - 12:30* | 01/04 13:45 - 17:30 | Luiz Olavo Bonino |
| Week 8 | Applications | 05/04 10:45 - 12:30* | 08/04 13:45 - 17:30 | Shenghui Wang |
| Week 9 | Project presentations | 13/04 13:45 - 17:30 | - | |
| Week 10 | Exam | 20/04 13:45 - 16:30 | - | |

Week 1: https://canvas.utwente.nl/courses/9784/pages/week-1?module_item_id=300769



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# PROJECT

- Students work in pairs: groups of 2 students
- Look for partners with the same motivation and sign up on Canvas
- Submit deliverables through Canvas (assignments)
- Feedback on all milestones, M4 will be graded

All milestone deliverables: report and "live"

**M0:** Case analysis and refinement

**M1:** Tripliflication of non-LD dataset

➢ with existing vocabularies, published on web

**M2:** Ontology engineering

➢ Ontology developed published on web

**M3:** Integrated analysis

➢ Linking (& matching), querying and analyzing datasets (M1, M2) with online dashboard

**M4:** Project presentation and final report

https://canvas.utwente.nl/courses/9784/pages/project-assignment-description?module_item_id=300812

# ASSESSMENT


- Results from exercises (lab sessions) grant access to the exam
- Each project group uploads evidences to Canvas

Final grade

$F = ( P + E ) / 2$

where

*P* = Project grade

*E* = Exam grade

➢Check ***Assessment*** section (Canvas home)



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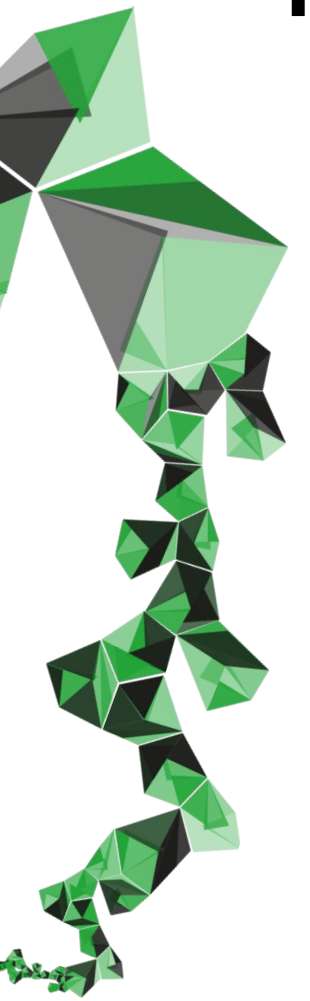
# MATERIALS AND TOOLS



https://canvas.utwente.nl/courses/9784/pages/materials-and-tools

**Books:** B1. Introduction to ontology engineering. 2020. C. Maria Keet.

[For reference] B2. A Semantic Web Primer Grigoris Antoniou and Frank van Harmelen. 2008. 2nd ed.

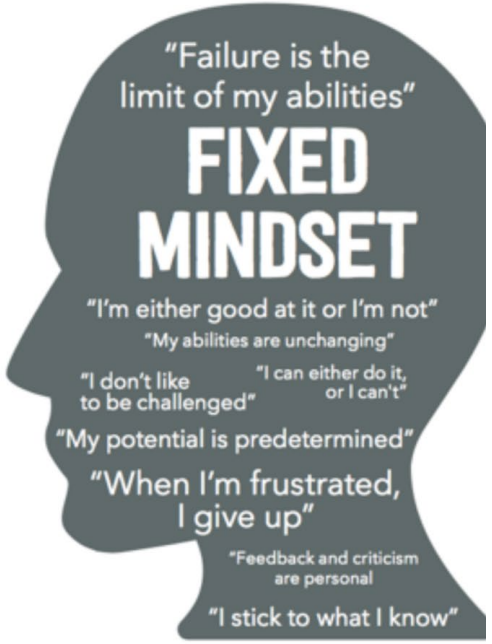
[For reference] B3. Semantic Web Services. 2011. Dieter Fensel Federico, Michele Facca, Elena Simperlloan Toma.

**Papers, videos, W3C specifications:** Will be informed in the week description.

**Software tools**

1. Protégé: ontology editor and a knowledge management system
2. Visual Paradigm: CASE Tool supporting UML
3. Apache Jena Fuseki: triplestore (“SPARQL server”)
4. OpenRefine: data cleanup and transformation (data wrangling)
5. RDF Libraries for programming:
    - Java - Apache Jena
    - Python – RDFLib

# REQUIRED ATTITUDE


- Take responsibility of your own learning process!
- There is more you need to know than what is told during the lectures in order to do the exercises and the exam
  - RESTful architecture
  - Data XML/JSON + schemas
  - Data querying databases (e.g., SQL)

Not everything can be explained in the lectures: be prepared to search, read and think a lot! >> We're open for QA



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# REQUIRED ATTITUDE

## Originality

- You are allowed and even encouraged to communicate with other groups to ask for tips
- But literally copying work from other groups will be punished as fraud

## Feedback

- Prepare the sessions properly so that you can get feedback from your peer students and the teachers
- Use the Discussion Board on Canvas to get feedback and answers to frequently asked questions from peer students and the teachers!