KGLD Semester Project Deliverable-II

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Data Set Link:

https://docs.google.com/spreadsheets/d/1z4w8Y6v5mwOeyAsztaLcoPqtQOqJJT7jtivVWUcdehQ/edit#gid=0

Domain Description

The selected domain of the project is Knowledge driven application for Teaching Faculty FAST School of computing Islamabad for Fall 2022. For this purpose, we'll be using the FAST NUCES "Courses Allocation, Fall-2022 Semester" data set, communicated to the students via email. The dataset contains all the information regarding all the courses offered in the semester, course code, and Teacher allocated to each course. The data will be discussed in detail later on. Our end Product will be a knowledge-driven application for our university that can answer the mentioned competency questions. Our goal is to create an ontology that could help in the analysis of any type of faculty allocation to any course.

Dataset Description:

The dataset contains the following attributes mentioned as follows:
Code: Course Code for each course.
Course: Course Name
CHS: Number of Credit Hours for each Course.
Section: Sections in which that particular course is being offered.
Course Instructor: Instructor assigned to the particular section and course.
Course Coordinator: Coordinator name assigned to any course.
Batch Allocation: The data set is further divided into sections according to the batch in which those courses are offered.

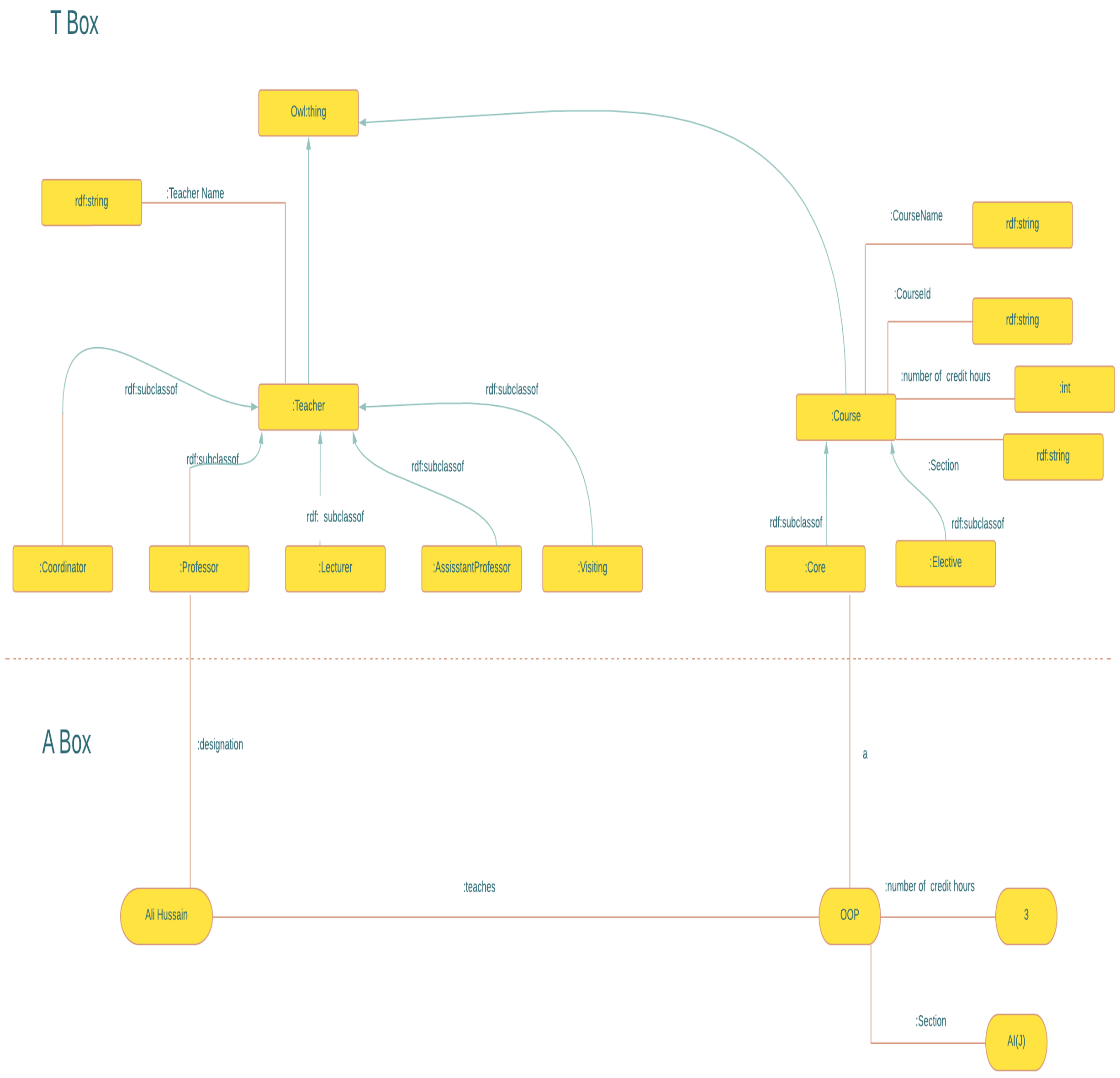
Competency Questions

Following are the competency questions that are we aiming to query from the final version of our application:

1. User should be able to query the names of all the teaching faculty.
2. User should be able to query the names of all the courses being offered in fall 2022.
3. User should be able to query the names of all the elective courses.
4. User should be able to query the names of all the core courses.
5. User should be able to query the credit hours of any courses.
6. User should be able to query the type of any courses.

7. User should be able to query the coordinator of any course.
8. User should be able to query the section-wise allocation of courses.
9. User should be able to query the section-wise allocation of coordinators.
10. User should be able to query the designation of all the teachers.
11. User should be able to query the courses being taught by any teacher.
12. User should be able to query the number of courses any teacher teaches.
13. User should be able to query the max number of courses any teacher teaches.
14. User should be able to query the min number of courses any teacher teaches.
15. User should be able to query the section-wise allocation of any teacher.
16. User should be able to query the number of courses any teacher teaches.

Conceptual Model:



External Data Set Link:

For faculty designation, we have used an external link http://isb.nu.edu.pk/Faculty/allfaculty.

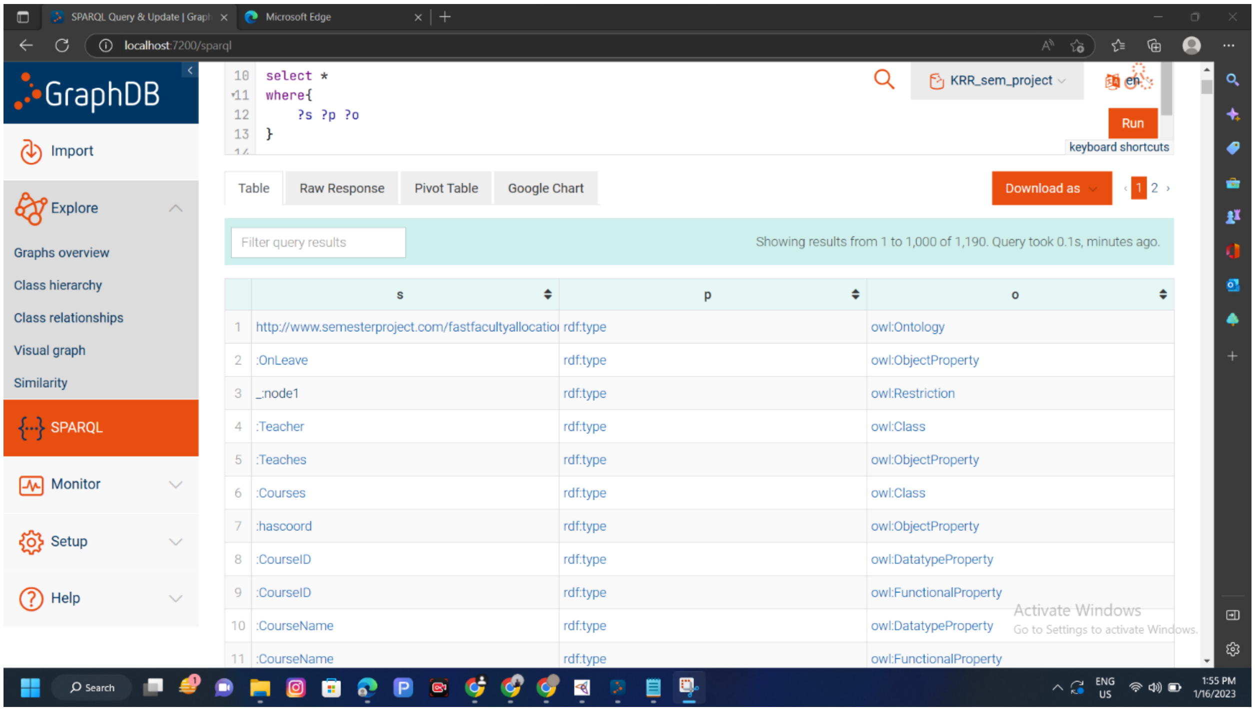
Modeling Decisions.

1. Mapped all the classes and subclasses as present in the conceptual model.
2. Made teacher and course class disjoint
3. Made visiting subclass disjoint with all sibling classes
4. Object property Restriction on visiting for teaches have max cardinality 4
5. Object property Restriction on visiting for teaches have min cardinality 1
6. Mad coordinator class disjoint only with visiting class
7. Made the professor’s class disjoint with the lecturer and visiting
8. Object property Restriction professor on teaches have max cardinality 4
9. Object property Restriction professor on teaches have min cardinality 1
10. Made assistant professor class disjoint with the professor, lecturer, and visiting
11. Object property Restriction assistant professor on teaches have max cardinality 4
12. Object property Restriction assistant professor on teaches have min cardinality 1
13. Made lecturer class disjoint with the professor, assistant professor, and visiting
14. Object property Restriction Lecturer on teaches have max cardinality 4
15. Object property Restriction Lecturer on teaches have min cardinality 1
16. Made object property HasNumCRs and IsOfNumCRs transitive as well inverse
17. Made teacher a named class
18. Made the object property section a functional class
19. Made. the object property Teaches functional
20. Object property Teaches has domain teacher and range Course
21. Object restriction property on Courses, i-e course HasCoordinator Some Coordinator
22. Object restriction property on Teacher i-e teaches some course
23. Made the Course an enumerated class i-e covering of core or elective
24. Data property Course ID have domain Course and range rdfs: Literal
25. Data property Num Crs (No. of CRs) have domain Course and range xsd:int
26. Data property HasCoord have domain Course and range rdfs: Literal
27. Data property CourseName have domain Course and range rdfs: Literal
28. Data property SectionName have domain Course and range rdfs: Literal
29. Data property Restriction on NumCRs have max cardinality 4

30. Data property Restriction on NumCRs have min cardinality 3
31. Made Course a defined Class.

Queries

Q1: Query to display all the triples

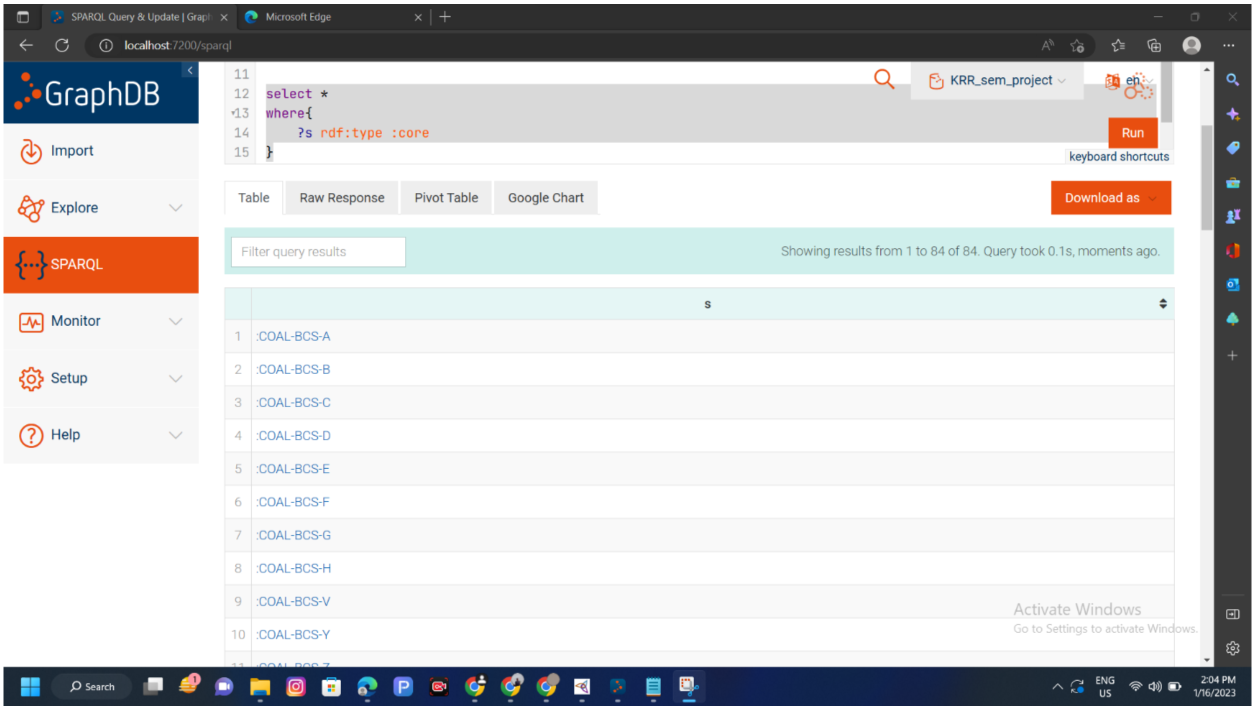


```
select *
where{
    ?s ?p ?o
}
```

Showing results from 1 to 1,000 of 1,190. Query took 0.1s, minutes ago.

	s	p	o
1	http://www.semesterproject.com/fastfacultyallocatio	rdf:type	owl:Ontology
2	:OnLeave	rdf:type	owl:ObjectProperty
3	_:node1	rdf:type	owl:Restriction
4	:Teacher	rdf:type	owl:Class
5	:Teaches	rdf:type	owl:ObjectProperty
6	:Courses	rdf:type	owl:Class
7	:hascoord	rdf:type	owl:ObjectProperty
8	:CourseID	rdf:type	owl:DatatypeProperty
9	:CourseID	rdf:type	owl:FunctionalProperty
10	:CourseName	rdf:type	owl:DatatypeProperty
11	:CourseName	rdf:type	owl:FunctionalProperty

Q2: Query to display all the courses that are core (it can be asked for elective as well)

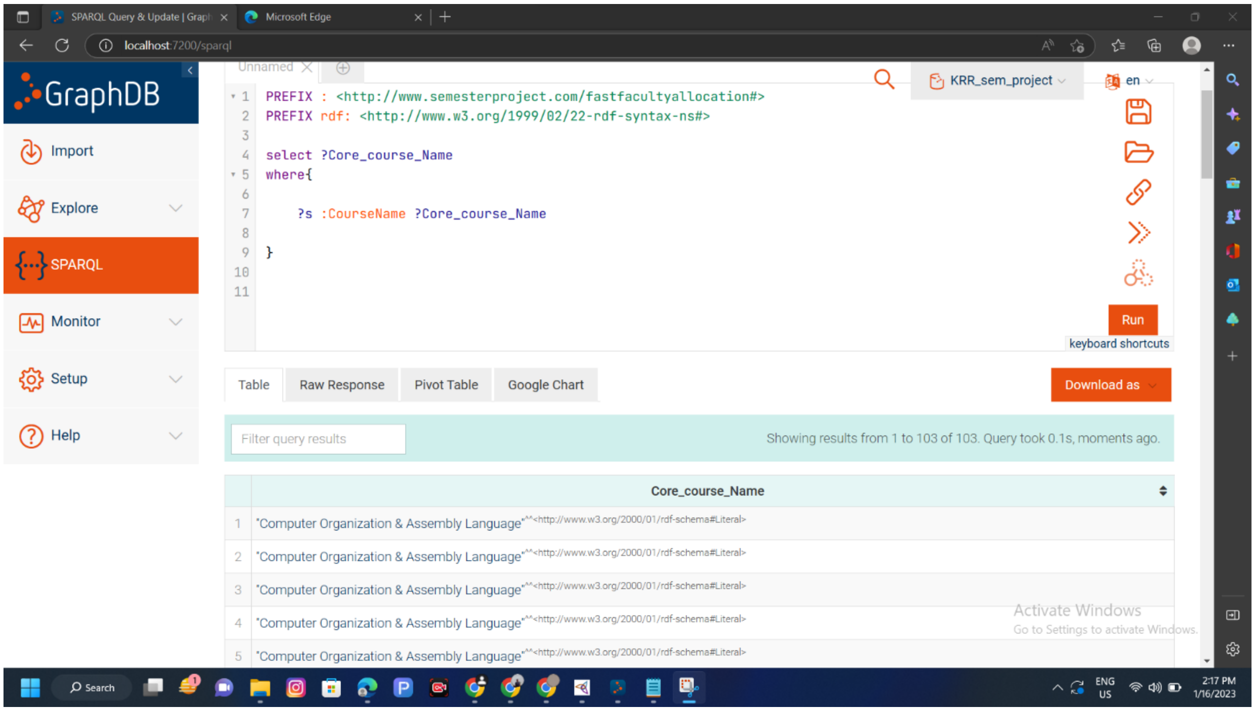


```
select *
where{
    ?s rdf:type :core
}
```

Showing results from 1 to 84 of 84. Query took 0.1s, moments ago.

	s
1	:COAL-BCS-A
2	:COAL-BCS-B
3	:COAL-BCS-C
4	:COAL-BCS-D
5	:COAL-BCS-E
6	:COAL-BCS-F
7	:COAL-BCS-G
8	:COAL-BCS-H
9	:COAL-BCS-V
10	:COAL-BCS-Y

Q3: Query to display names of all the courses

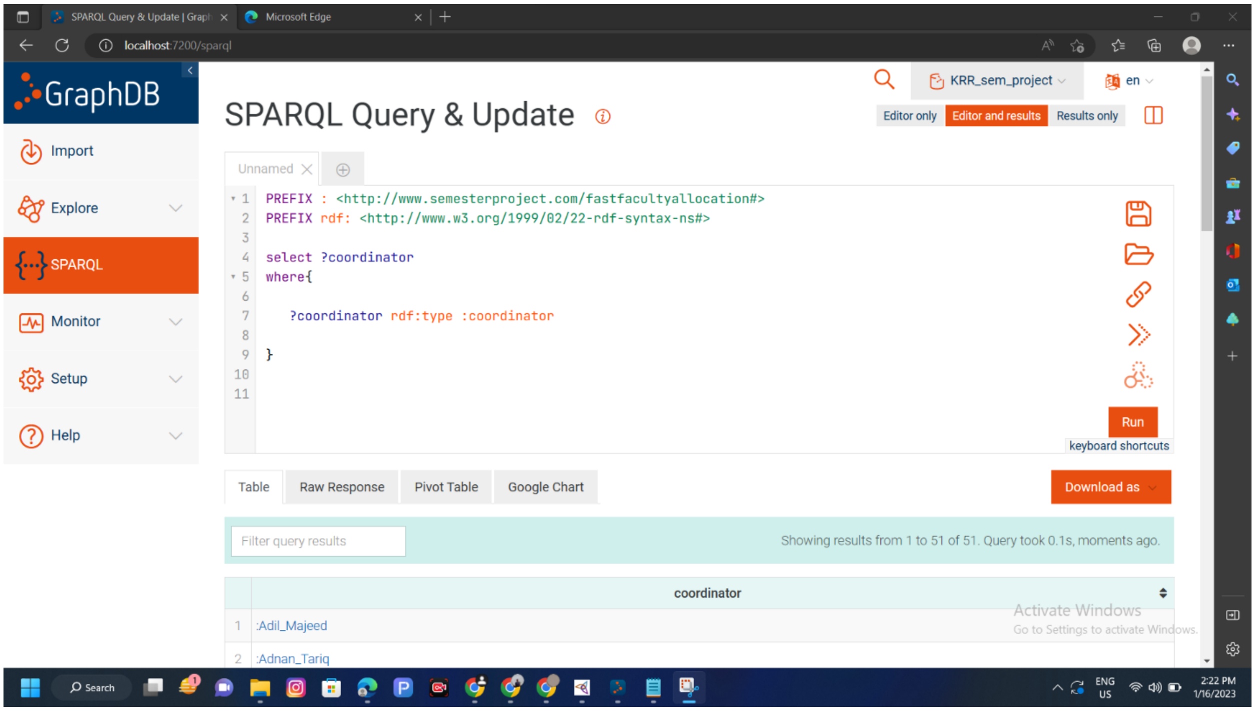


```
PREFIX : <http://www.semesterproject.com/fastfacultyallocation#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

select ?Core_course_Name
where{

    ?s :CourseName ?Core_course_Name


}
```

Showing results from 1 to 103 of 103. Query took 0.1s, moments ago.

	Core_course_Name
1	"Computer Organization & Assembly Language"^^<http://www.w3.org/2000/01/rdf-schema#Literal>
2	"Computer Organization & Assembly Language"^^<http://www.w3.org/2000/01/rdf-schema#Literal>
3	"Computer Organization & Assembly Language"^^<http://www.w3.org/2000/01/rdf-schema#Literal>
4	"Computer Organization & Assembly Language"^^<http://www.w3.org/2000/01/rdf-schema#Literal>
5	"Computer Organization & Assembly Language"^^<http://www.w3.org/2000/01/rdf-schema#Literal>

Q4: Query to display names off all the teachers that are coordinators

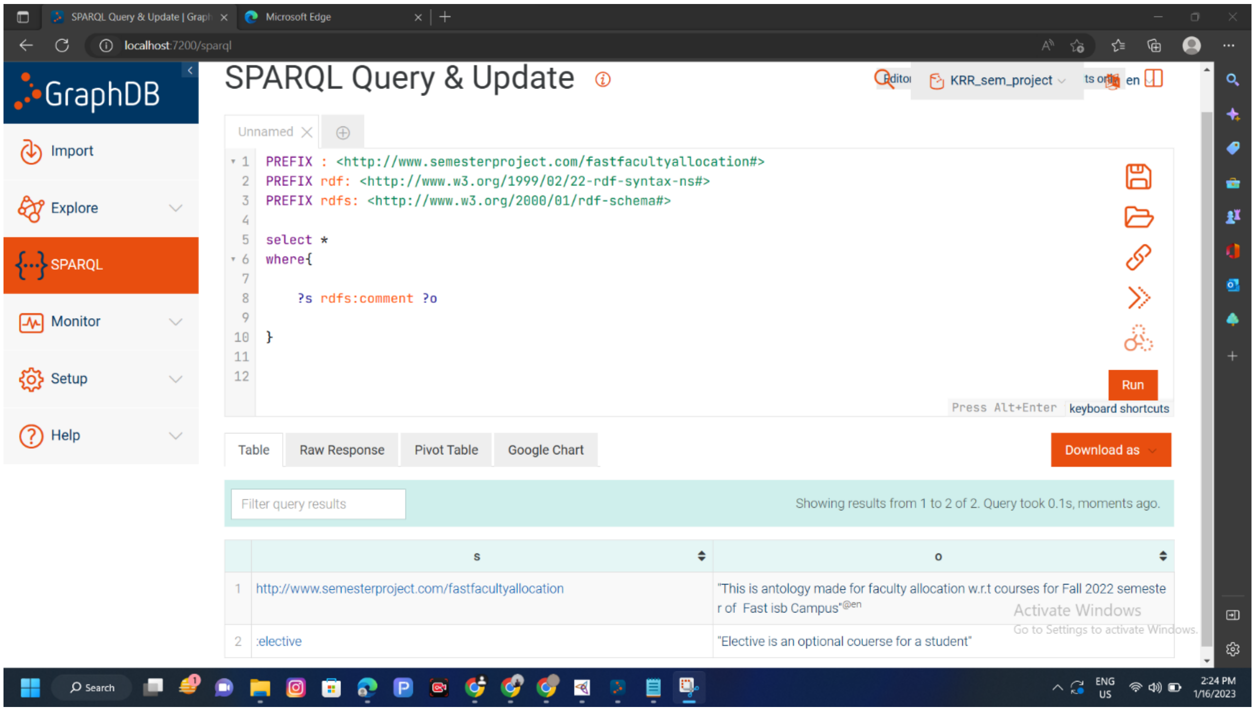


```
PREFIX : <http://www.semesterproject.com/fastfacultyallocation#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

select ?coordinator
where{

   ?coordinator rdf:type :coordinator

}
```

Showing results from 1 to 51 of 51. Query took 0.1s, moments ago.

	coordinator
1	:Adil_Majeed
2	:Adnan_Tariq

Q5: Query to display all the available comments in the ontology

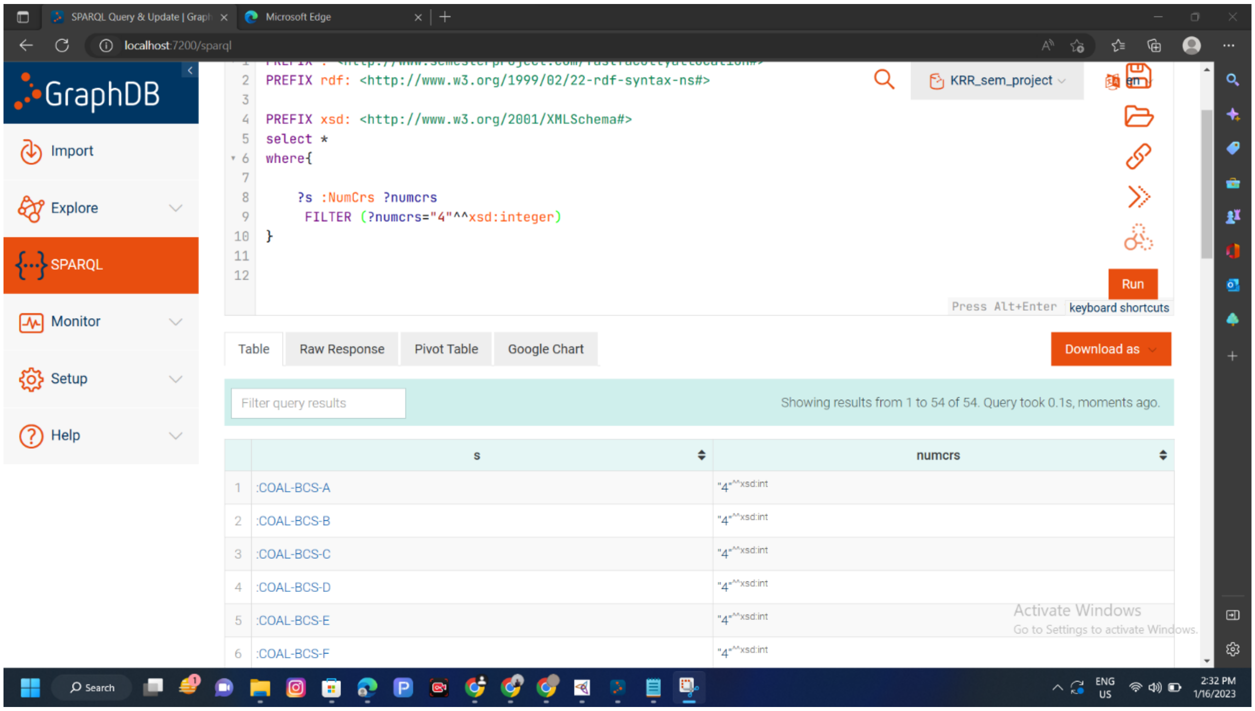


```
PREFIX : <http://www.semesterproject.com/fastfacultyallocation#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>

select *
where{

    ?s rdfs:comment ?o

}
```

Showing results from 1 to 2 of 2. Query took 0.1s, moments ago.

	s	o
1	http://www.semesterproject.com/fastfacultyallocation	"This is antology made for faculty allocation w.r.t courses for Fall 2022 semester of Fast isb Campus"@en
2	:elective	"Elective is an optional couerse for a student"

Q6: Query to display all the courses that have credit hours 4

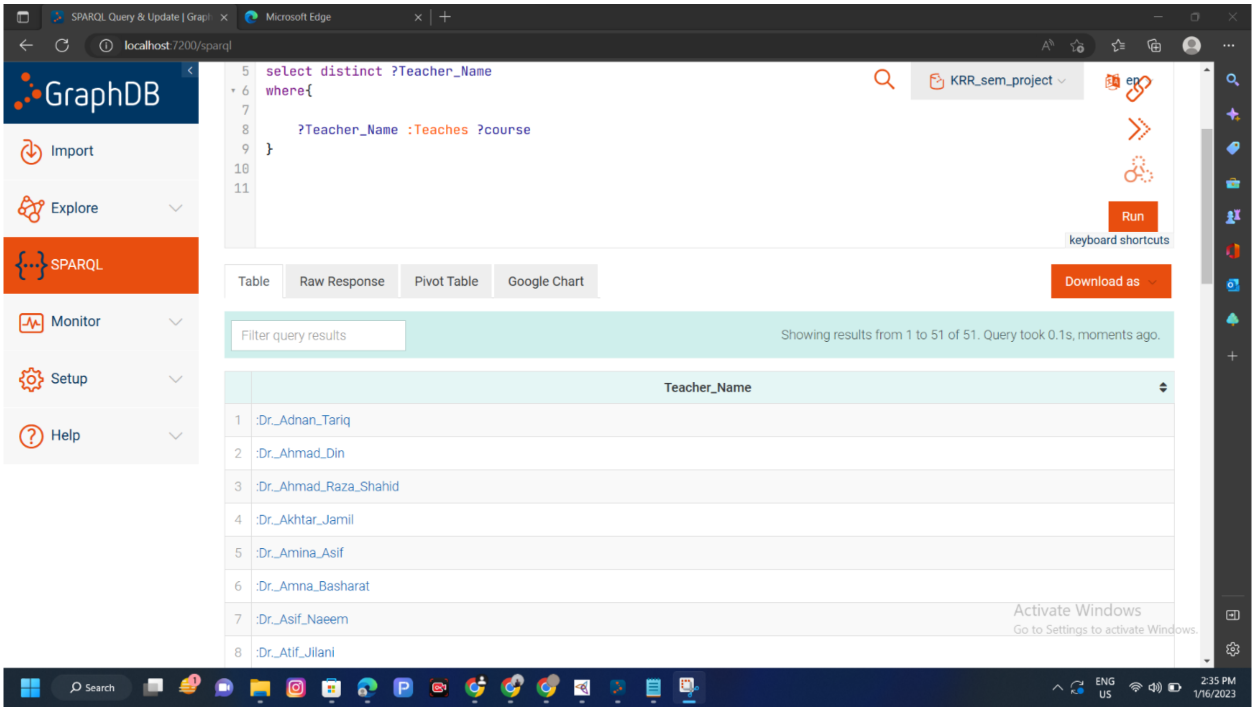


```
PREFIX : <http://www.semesterproject.com/fastfacultyallocation#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
select *
where{

    ?s :NumCrs ?numcrs
     FILTER (?numcrs="4"^^xsd:integer)
}
```

Showing results from 1 to 54 of 54. Query took 0.1s, moments ago.

	s	numcrs
1	:COAL-BCS-A	"4"^^xsd:int
2	:COAL-BCS-B	"4"^^xsd:int
3	:COAL-BCS-C	"4"^^xsd:int
4	:COAL-BCS-D	"4"^^xsd:int
5	:COAL-BCS-E	"4"^^xsd:int
6	:COAL-BCS-F	"4"^^xsd:int

Q7: Query to display all the teachers that teaches some courses

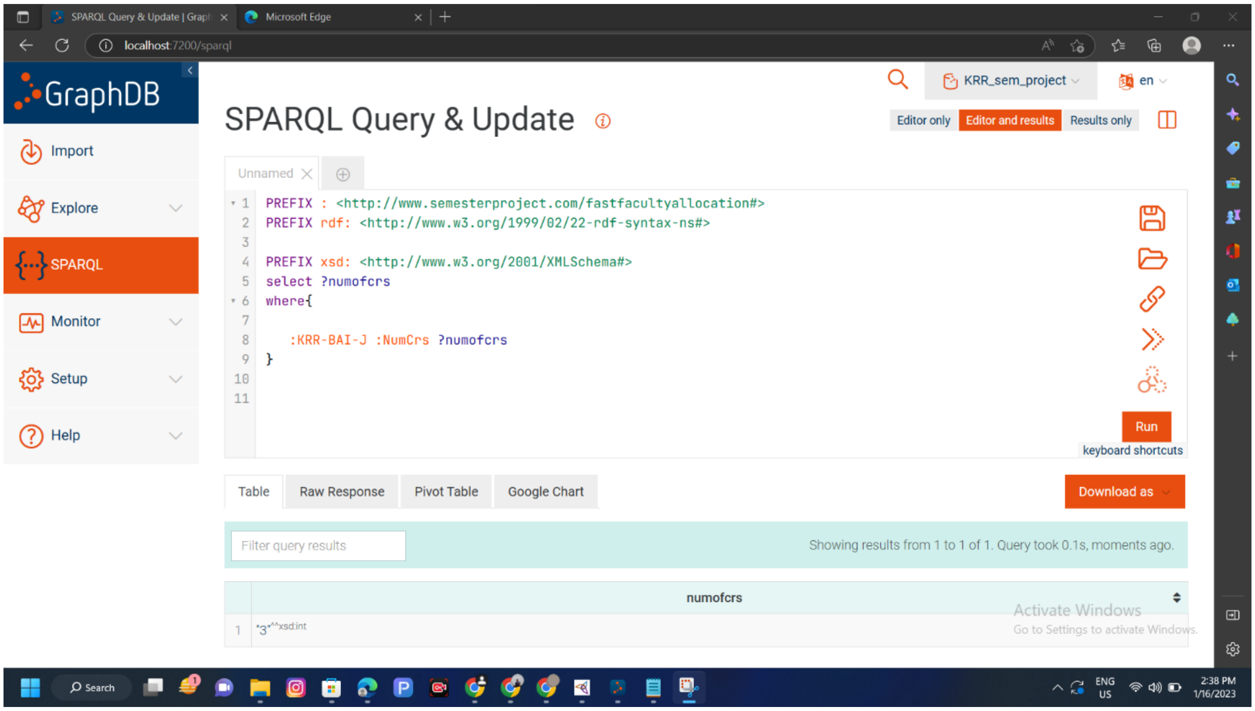


```
select distinct ?Teacher_Name
where{

    ?Teacher_Name :Teaches ?course
}
```

Showing results from 1 to 51 of 51. Query took 0.1s, moments ago.

	Teacher_Name
1	:Dr._Adnan_Tariq
2	:Dr._Ahmad_Din
3	:Dr._Ahmad_Raza_Shahid
4	:Dr._Akhtar_Jamil
5	:Dr._Amina_Asif
6	:Dr._Amna_Basharat
7	:Dr._Asif_Naeem
8	:Dr._Atif_Jilani

Q8: Query to get the number of credit hours for a particular course

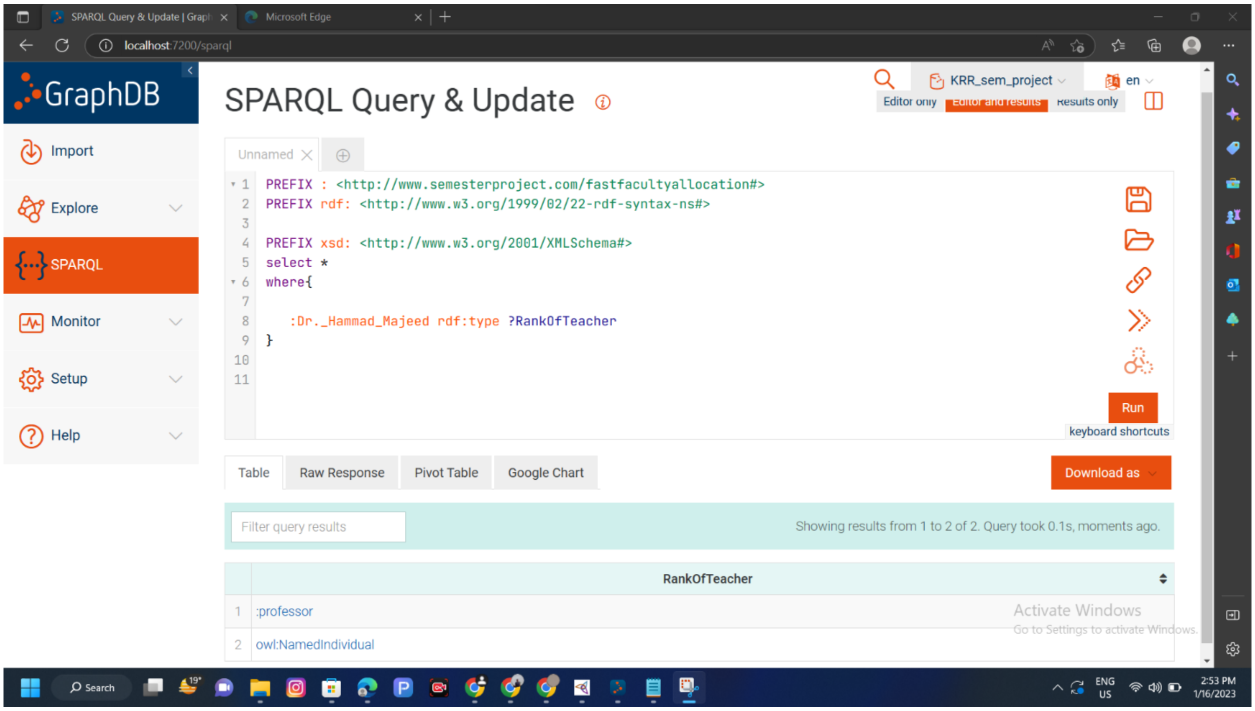


```
PREFIX : <http://www.semesterproject.com/fastfacultyallocation#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
select ?numofcrs
where{

    :KRR-BAI-J :NumCrs ?numofcrs
}
```

Showing results from 1 to 1 of 1. Query took 0.1s, moments ago.

	numofcrs
1	"3"^^xsd:int

Q9: Query to display rank of any teacher

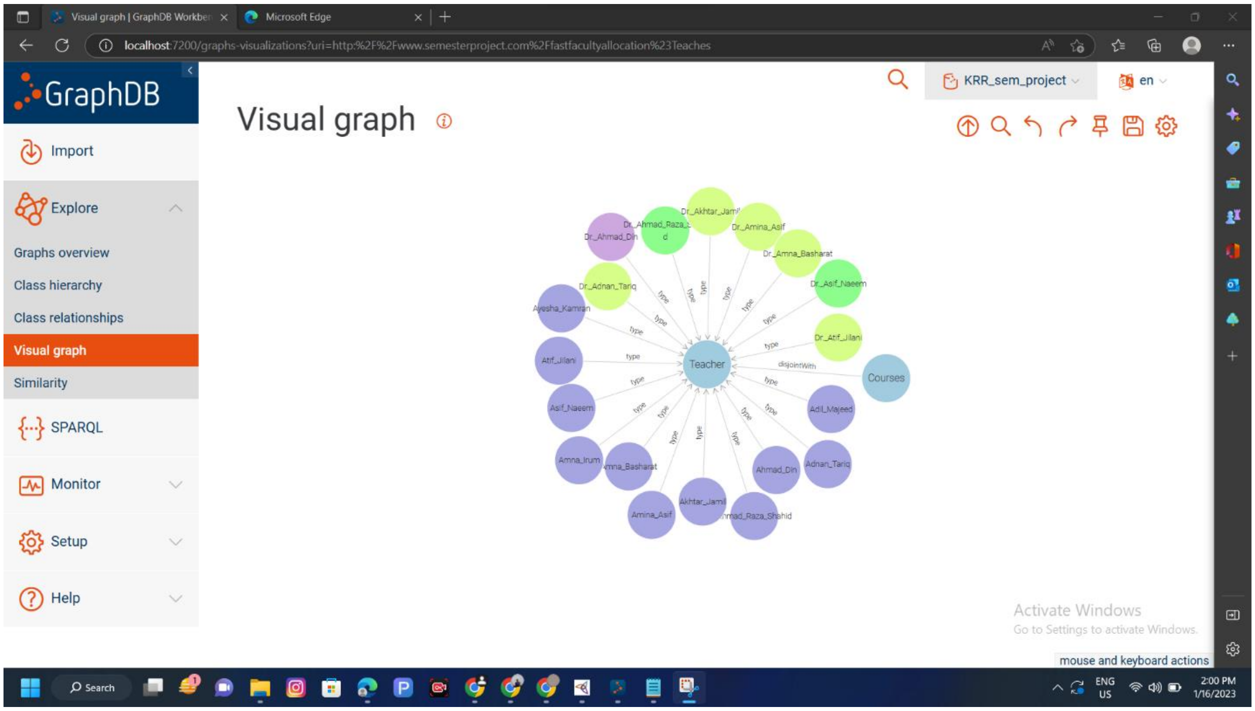


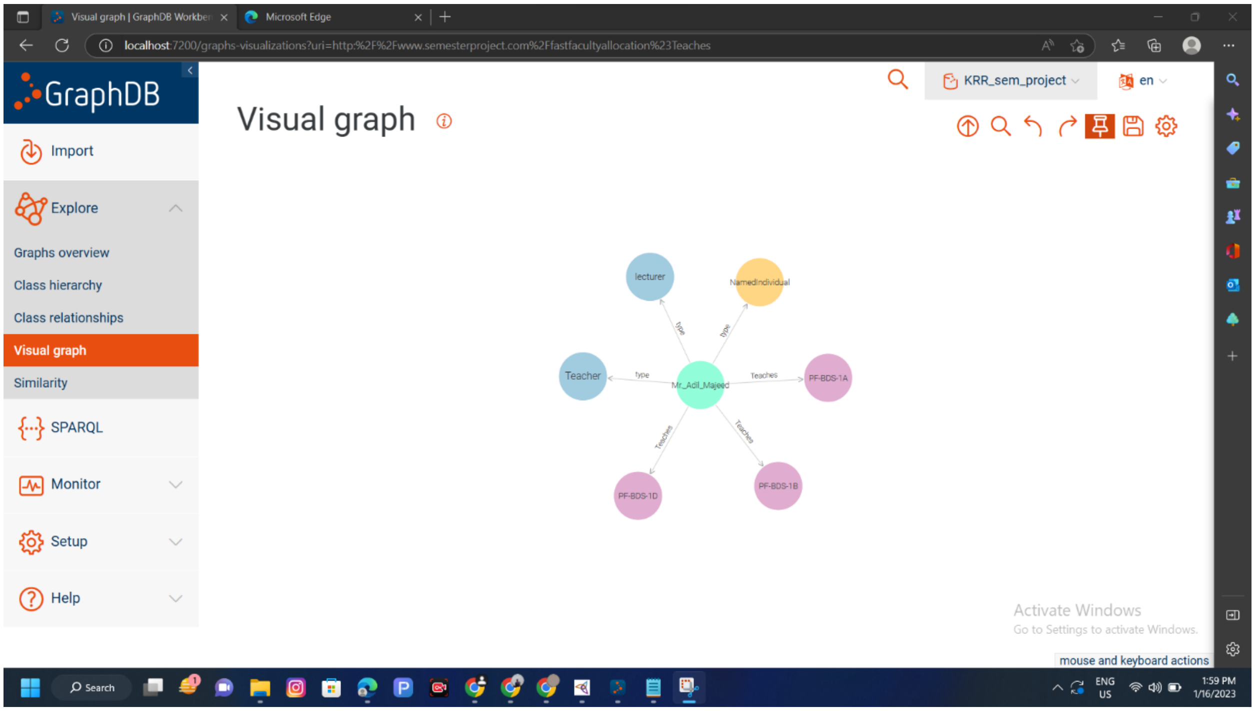
```
PREFIX : <http://www.semesterproject.com/fastfacultyallocation#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>

PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
select *
where{

    :Dr._Hammad_Majeed rdf:type ?RankOfTeacher
}
```

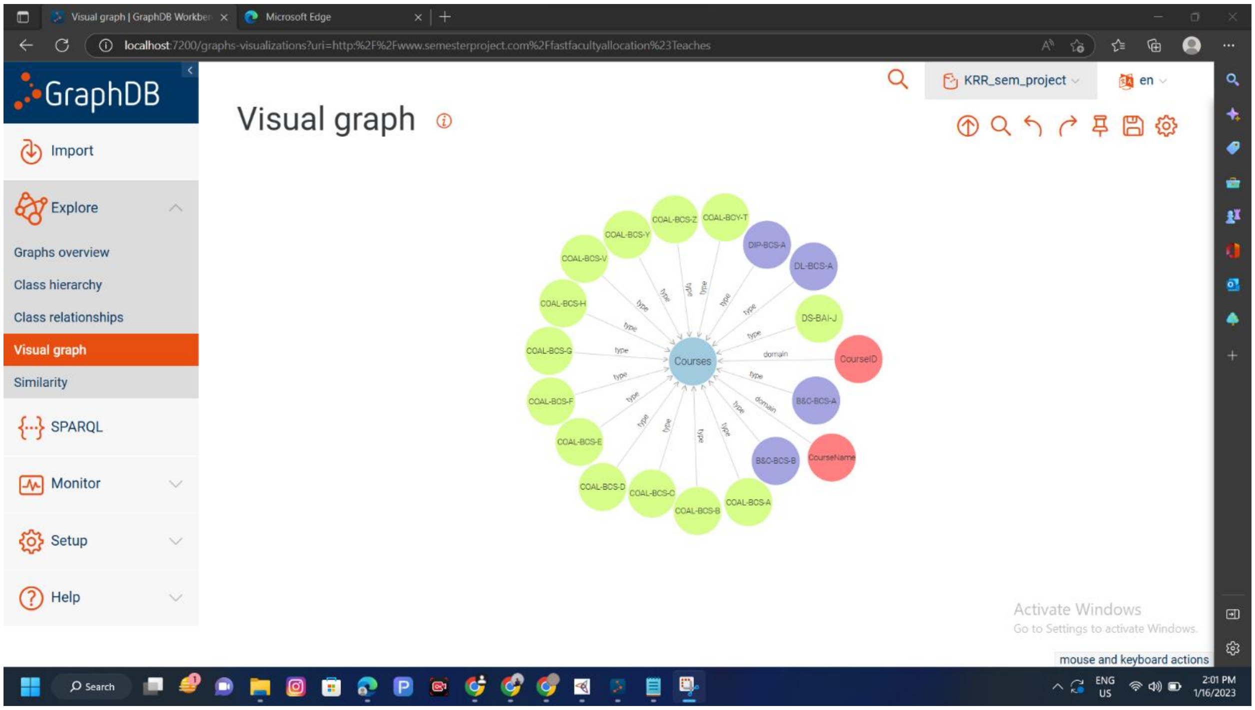
Showing results from 1 to 2 of 2. Query took 0.1s, moments ago.

	RankOfTeacher
1	:professor
2	owl:NamedIndividual

Graph Visualization



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Visual graph
Import
Explore
Graphs overview
Class hierarchy
Class relationships
Visual graph
Similarity
SPARQL
Monitor
Setup
Help
COAL-BCS-Z
COAL-BCY-T
COAL-BCS-Y
DIP-BCS-A
COAL-BCS-V
DL-BCS-A
COAL-BCS-H
DS-BAI-J
COAL-BCS-G
Courses
CourseID
COAL-BCS-F
B&C-BCS-A
COAL-BCS-E
B&C-BCS-B
CourseName
COAL-BCS-D
COAL-BCS-C
COAL-BCS-B
COAL-BCS-A
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domain
Activate Windows
Go to Settings to activate Windows.
mouse and keyboard actions
Search
ENG
US
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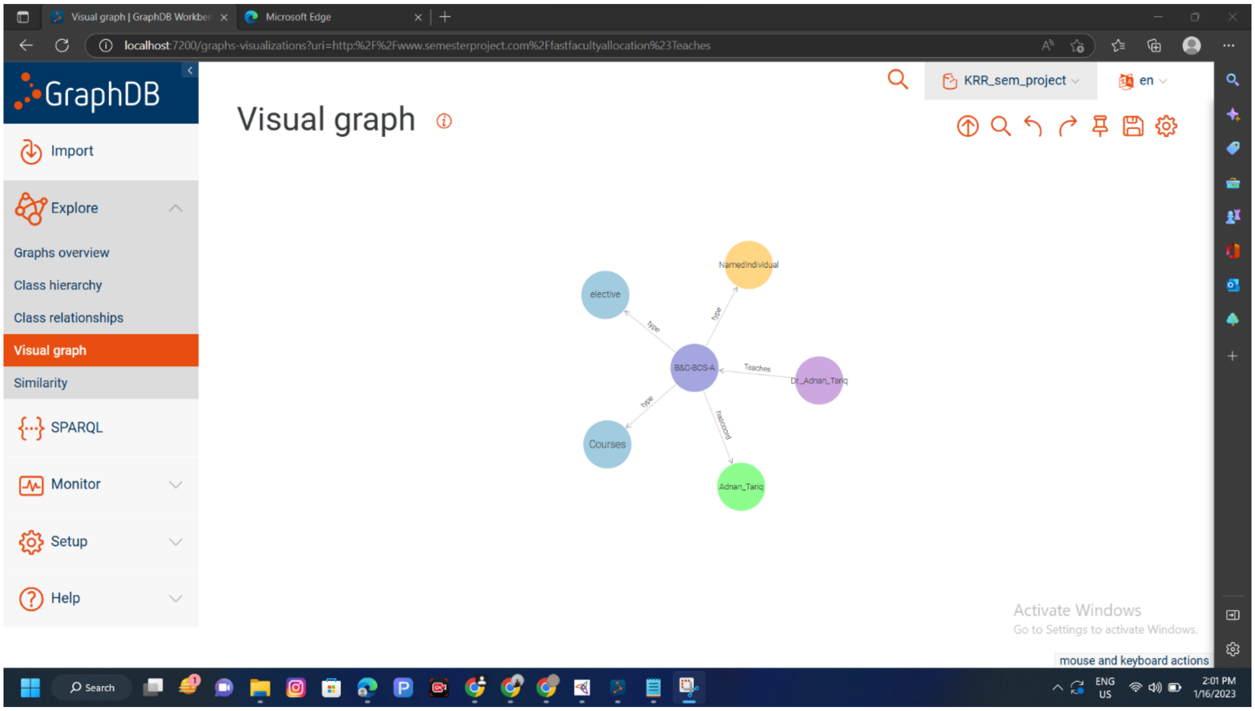
1/16/2023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mouse and keyboard actions
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1/16/2023

Reflects

Creating an ontology using a tool like Protégé allows us to organize and structure knowledge in a way that can be easily understood and shared with others. One important learning from the process is the importance of clearly defining classes and their relationships to one another in order to create a coherent and logical hierarchy. Additionally, utilizing Protégé's built-in reasoning capabilities allows for inferencing and deducing new knowledge from the information represented in the ontology. Converting the ontology into RDF triples allows for the representation of the knowledge in a format that can be easily integrated and shared with other systems on the web. We also learned about the RDF format, which is a standard for representing and linking data on the web using a directed graph model. It is important to keep the URIs unique and consistent across the ontology so that it can be linked to and understood by other systems. Overall the process of creating an ontology in Protégé and then converting it into RDF triples provided a valuable understanding of how knowledge can be structured, represented, shared, and integrated across different systems.