

# Outer Joins

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# Outer Joins

- A type of join operation that avoids the loss of information
- Unlike inner join, preserves non-matched tuples
- Uses *null* values to fill in the missing data

course_id	title	dept_name	credits
BIO-301	Genetics	Biology	4
CS-190	Game Design	Comp. Sci.	4
CS-315	Robotics	Comp. Sci.	3

course table [1]

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course_id	prereq_id
BIO-301	BIO-101
CS-190	CS-101
CS-347	CS-101

prereq table [1]

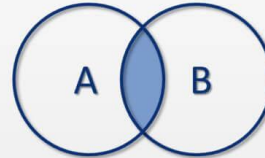


inner join

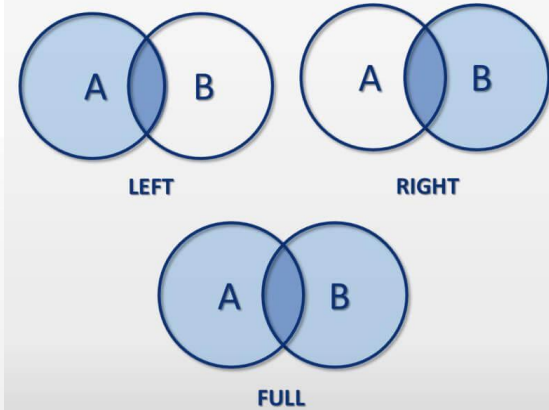
course_id	title	dept_name	credits	prereq_id
BIO-301	Genetics	Biology	4	BIO-101
CS-190	Game Design	Comp. Sci.	4	CS-101
CS-315	Robotics	Comp. Sci.	3	<i>null</i>
CS-347	<i>null</i>	<i>null</i>	<i>null</i>	CS-101

course **natural full outer join** prereq [1]

**INNER JOIN**



**OUTER JOIN**



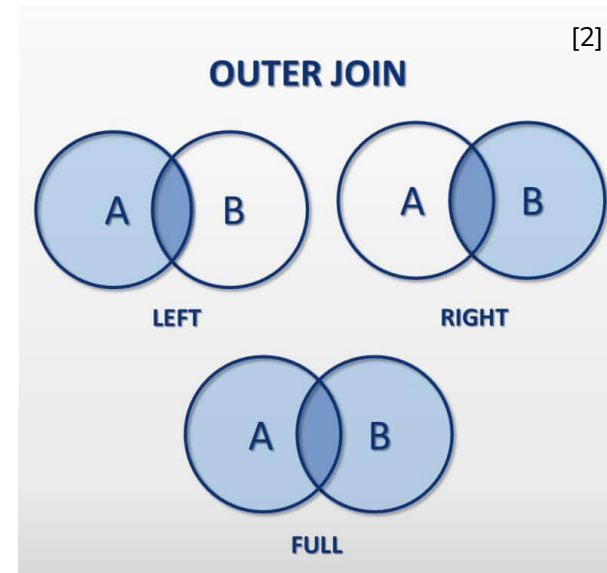
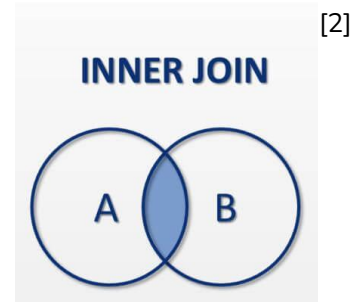


# Types of outer joins <sup>[1]</sup>

- **left outer join:** preserves tuples only in the relation named before (to the left of) the left outer join operation.
- 
- **right outer join** preserves tuples only in the relation named after (to the right of) the right outer join operation.
- 
- **full outer join** preserves tuples in both relations.

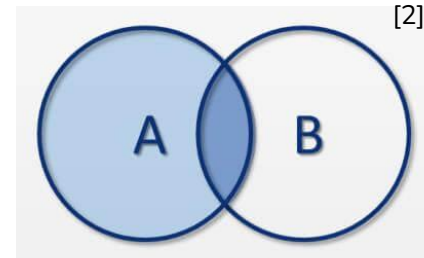
Example query:

```
select *  
from course natural left outer join prereq;
```



# Left outer join <sup>[1]</sup>

preserves tuples only in the relation named before (to the left of) the left outer join operation



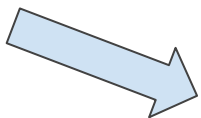
course_id	title	dept_name	credits
BIO-301	Genetics	Biology	4
CS-190	Game Design	Comp. Sci.	4
CS-315	Robotics	Comp. Sci.	3

course table <sup>[1]</sup>

+

course_id	prereq_id
BIO-301	BIO-101
CS-190	CS-101
CS-347	CS-101

prereq table <sup>[1]</sup>



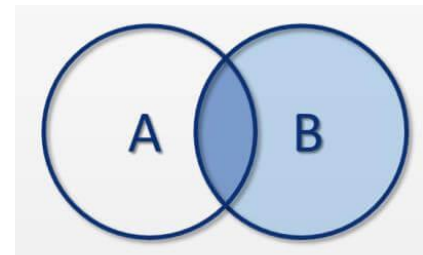
```
select *  
from course natural left outer join prereq;
```

course_id	title	dept_name	credits	prereq_id
BIO-301	Genetics	Biology	4	BIO-101
CS-190	Game Design	Comp. Sci.	4	CS-101
CS-315	Robotics	Comp. Sci.	3	<i>null</i>

course natural left outer join prereq <sup>[1]</sup>

# Right outer join <sup>[1]</sup>

preserves tuples only in the relation named after (to the right of) the right outer join operation



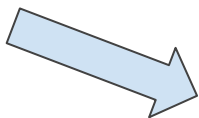
course_id	title	dept_name	credits
BIO-301	Genetics	Biology	4
CS-190	Game Design	Comp. Sci.	4
CS-315	Robotics	Comp. Sci.	3

course table

+

course_id	prereq_id
BIO-301	BIO-101
CS-190	CS-101
CS-347	CS-101

prereq table



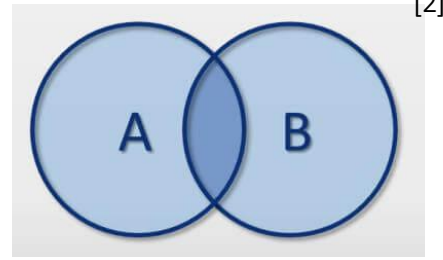
```
select *  
from course natural right outer join prereq;
```

course_id	title	dept_name	credits	prereq_id
BIO-301	Genetics	Biology	4	BIO-101
CS-190	Game Design	Comp. Sci.	4	CS-101
CS-347	<i>null</i>	<i>null</i>	<i>null</i>	CS-101

course natural right outer join prereq

# Full outer join [1]

A union of a left outer join and the corresponding right outer join, preserves tuples in both relations. Unlike cartesian, includes non-matched tuples only once.



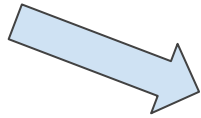
course_id	title	dept_name	credits
BIO-301	Genetics	Biology	4
CS-190	Game Design	Comp. Sci.	4
CS-315	Robotics	Comp. Sci.	3

course table

+

course_id	prereq_id
BIO-301	BIO-101
CS-190	CS-101
CS-347	CS-101

prereq table



```
select *  
from course natural full outer join prereq;
```

course_id	title	dept_name	credits	prereq_id
BIO-301	Genetics	Biology	4	BIO-101
CS-190	Game Design	Comp. Sci.	4	CS-101
CS-315	Robotics	Comp. Sci.	3	<i>null</i>
CS-347	<i>null</i>	<i>null</i>	<i>null</i>	CS-101

course natural full outer join prereq

[1]

# Additional Info

- The right outer join is symmetric to the left outer join
- Any form of join can be combined with any join condition.
- ON vs WHERE is different for outer joins, unlike for inner ones, because outer join adds null-padded tuples only for those tuples that do not contribute to the result of the corresponding “inner” join.
  - **on**: records will be filtered before joining
  - **where**: records will be filtered after joining

Join types
inner join
left outer join
right outer join
full outer join

Join conditions
natural
on < predicate >
using (A <sub>1</sub> , A <sub>2</sub> , ..., A <sub>n</sub> )

```
select *  
from student left outer join takes on  
student.ID = takes.ID;
```



```
select *  
from student left outer join takes on true  
where student.ID = takes.ID;
```

# References

[1] Silberschatz, A., Korth, H. F., Sudarshan, S. (2010). Database system concepts. New York: McGraw-Hill.

[2] Digital Guide Ionos, SQL OUTER JOINS: An overview of all types  
<https://www.ionos.com/digitalguide/hosting/technical-matters/sql-outer-join/>