Bases de Données Fall, 2024

#### TD REVIEW

- In this document, I list many queries and their results.
- You can try them out yourself by cutting-and-running these commands on postgreSQL.
- For each query, I give the tables required, so you don't have to keep going back to the page for the list of tables.
- There are many technical terms to understand: select, where, from, group by, having, order by, inner join on, inner join using, left outer join, right outer join, natural inner join, natural left outer join, with, avg, sum, count, min, max, exists, all, some, in, is . . .

Make sure you understand the logic behind each term.

- For each query, spend some time to see the input tables, and the result.
- For each query, important things to note are the rows in the output table, the attribute names, the order in which attributes appear in the output table.
- I have stopped using 'products' in the queries and only used joins. You should get used to using all types of joins.

The cut-and-paste code from this pdf file will work directly on the computer with postgreSQL, in case you want to try these queries.

Here are the tables we used in class:

	$course\_id$	title	$dept\_name$	credits
	BIO-101	Intro. to Biology	Biology	4
	BIO-301	Genetics	Biology	4
	BIO-399	Computational Biology	Biology	3
	CS-101	Intro. to Computer Science	Comp. Sci.	4
	CS-190	Game Design	Comp. Sci.	4
course	CS-315	Robotics	Comp. Sci.	3
course	CS-319	Image Processing	Comp. Sci.	3
	CS-347	Database System Concepts	Comp. Sci.	3
	EE-181	Intro. to Digital Systems	Elec. Eng.	3
	FIN-201	Investment Banking	Finance	3
	HIS-351	World History	History	3
	MU-199	Music Video Production	Music	3
	PHY-101	Physical Principles	Physics	4

	id	name	$dept\_name$	salary
	10101	Srinivasan	Comp. Sci.	65000.00
	12121	Wu	Finance	90000.00
	15151	Mozart	Music	40000.00
	22222	Einstein	Physics	95000.00
	32343	El Said	History	60000.00
teacher	33456	Gold	Physics	87000.00
	45565	Katz	Comp. Sci.	75000.00
	58583	Califieri	History	62000.00
	76543	Singh	Finance	80000.00
	76766	Crick	Biology	72000.00
	83821	Brandt	Comp. Sci.	92000.00
	98345	Kim	Elec. Eng.	80000.00

(a) course

(b) teacher

	id	name	$dept\_name$	$tot\_cred$
	00128	Zhang	Comp. Sci.	102
	12345	Shankar	Comp. Sci.	32
	19991	Brandt	History	80
	23121	Chavez	Finance	110
	44553	Peltier	Physics	56
student	45678	Levy	Physics	46
student	54321	Williams	Comp. Sci.	54
	55739	Sanchez	Music	38
	70557	Snow	Physics	0
	76543	Brown	Comp. Sci.	58
	76653	Aoi	Elec. Eng.	60
	98765	Bourikas	Elec. Eng.	98
	98988	Tanaka	Biology	120

section

	$course\_ia$	sec_na	semester	year	оинат	TTl	$time\_ta$
	BIO-101	1	Summer	2009	Painter	514	В
	BIO-301	1	Summer	2010	Painter	514	A
	CS-101	1	Fall	2009	Packard	101	H
	CS-101	1	Spring	2010	Packard	101	F
	CS-190	1	Spring	2009	Taylor	3128	E
	CS-190	2	Spring	2009	Taylor	3128	A
,	CS-315	1	Spring	2010	Watson	120	D
1	CS-319	1	Spring	2010	Watson	100	В
	CS-319	2	Spring	2010	Taylor	3128	C
	CS-347	1	Fall	2009	Taylor	3128	A
	EE-181	1	Spring	2009	Taylor	3128	C
	FIN-201	1	Spring	2010	Packard	101	В
	HIS-351	1	Spring	2010	Painter	514	C
	MU-199	1	Spring	2010	Packard	101	D
	DIIV 101	1	17-11	2000	337-4	100	Ι Δ

(c) student

(d) section

	id	$course\_id$	$sec\_id$	semester	year
	10101	CS-101	1	Fall	2009
	10101	CS-315	1	Spring	2010
	10101	CS-347	1	Fall	2009
	12121	FIN-201	1	Spring	2010
	15151	MU-199	1	Spring	2010
	22222	PHY-101	1	Fall	2009
teaches	32343	HIS-351	1	Spring	2010
cacnes	45565	CS-101	1	Spring	2010
	45565	CS-319	1	Spring	2010
	76766	BIO-101	1	Summer	2009
	76766	BIO-301	1	Summer	2010
	83821	CS-190	1	Spring	2009
	83821	CS-190	2	Spring	2009
	83821	CS-319	2	Spring	2010
	98345	EE-181	1	Spring	2009

takes

	. 1	. 1	. 7			7
	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
3	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

(e) teaches

department

$dept\_name$	building	budget
Biology	Watson	90000.00
Comp. Sci.	Taylor	100000.00
Elec. Eng.	Taylor	85000.00
Finance	Painter	120000.00
History	Painter	50000.00
Music	Packard	80000.00
Physics	Watson	70000.00

(g) department

(f) takes

SELECT \*
FROM teacher NATURAL JOIN teaches;

id	name	$dept\_name$	salary	$course\_id$	sec_id	semester	year
10101	Srinivasan	Comp. Sci.	65000.00	CS-101	1	Fall	2009
10101	Srinivasan	Comp. Sci.	65000.00	CS-315	1	Spring	2010
10101	Srinivasan	Comp. Sci.	65000.00	CS-347	1	Fall	2009
12121	Wu	Finance	90000.00	FIN-201	1	Spring	2010
15151	Mozart	Music	40000.00	MU-199	1	Spring	2010
22222	Einstein	Physics	95000.00	PHY-101	1	Fall	2009
32343	El Said	History	60000.00	HIS-351	1	Spring	2010
45565	Katz	Comp. Sci.	75000.00	CS-101	1	Spring	2010
45565	Katz	Comp. Sci.	75000.00	CS-319	1	Spring	2010
76766	Crick	Biology	72000.00	BIO-101	1	Summer	2009
76766	Crick	Biology	72000.00	BIO-301	1	Summer	2010
83821	Brandt	Comp. Sci.	92000.00	CS-190	1	Spring	2009
83821	Brandt	Comp. Sci.	92000.00	CS-190	2	Spring	2009
83821	Brandt	Comp. Sci.	92000.00	CS-319	2	Spring	2010
98345	Kim	Elec. Eng.	80000.00	EE-181	1	Spring	2009

	T	id	name		$dept_{-}$	name	sale	ary
	10	0101	Srinivasa	n	Comp.	Sci.	65000	0.00
	1:	2121	Wu		Finance		90000	0.00
	1.	5151	Mozart	l	Music		40000	0.00
	2:	2222	Einstein	ı	Physics		95000	0.00
	3:	2343	El Said	ı	History		60000	0.00
teacher	3	3456	Gold	İ	Physics		87000	0.00
	4	5565	Katz		Comp.	Sci.	75000	0.00
	5	8583	Califieri	İ	History		62000	0.00
	7	6543	Singh	ı	Finance		80000	0.00
	7	6766	Crick	ı	Biology		72000	0.00
	8	3821	Brandt	İ	Comp.	Sci.	92000	0.00
	98	8345	Kim		Elec. E	ng.	80000	0.00
id		cor	urse_id		$sec\_id$	seme	ster	ye

				0	
	id	$course\_id$	$sec\_id$	semester	year
	10101	CS-101	1	Fall	2009
	10101	CS-315	1	Spring	2010
	10101	CS-347	1	Fall	2009
	12121	FIN-201	1	Spring	2010
	15151	MU-199	1	Spring	2010
	22222	PHY-101	1	Fall	2009
teaches	32343	HIS-351	1	Spring	2010
ocaciics	45565	CS-101	1	Spring	2010
	45565	CS-319	1	Spring	2010
	76766	BIO-101	1	Summer	2009
	76766	BIO-301	1	Summer	2010
	83821	CS-190	1	Spring	2009
	83821	CS-190	2	Spring	2009
	83821	CS-319	2	Spring	2010
	98345	EE-181	1	Spring	2009

## SELECT \* FROM student NATURAL JOIN takes;

id	name	$dept\_name$	tot_cred	$course\_id$	$sec\_id$	semester	year	grade
00128	Zhang	Comp. Sci.	102	CS-101	1	Fall	2009	A
00128	Zhang	Comp. Sci.	102	CS-347	1	Fall	2009	A-
12345	Shankar	Comp. Sci.	32	CS-101	1	Fall	2009	C
12345	Shankar	Comp. Sci.	32	CS-190	2	Spring	2009	A
12345	Shankar	Comp. Sci.	32	CS-315	1	Spring	2010	A
12345	Shankar	Comp. Sci.	32	CS-347	1	Fall	2009	A
19991	Brandt	History	80	HIS-351	1	Spring	2010	В
23121	Chavez	Finance	110	FIN-201	1	Spring	2010	C+
44553	Peltier	Physics	56	PHY-101	1	Fall	2009	В-
45678	Levy	Physics	46	CS-101	1	Fall	2009	F
45678	Levy	Physics	46	CS-101	1	Spring	2010	B+
45678	Levy	Physics	46	CS-319	1	Spring	2010	В
54321	Williams	Comp. Sci.	54	CS-101	1	Fall	2009	A-
54321	Williams	Comp. Sci.	54	CS-190	2	Spring	2009	B+
55739	Sanchez	Music	38	MU-199	1	Spring	2010	A-
76543	Brown	Comp. Sci.	58	CS-101	1	Fall	2009	A
76543	Brown	Comp. Sci.	58	CS-319	2	Spring	2010	A
76653	Aoi	Elec. Eng.	60	EE-181	1	Spring	2009	C
98765	Bourikas	Elec. Eng.	98	CS-101	1	Fall	2009	C-
98765	Bourikas	Elec. Eng.	98	CS-315	1	Spring	2010	В
98988	Tanaka	Biology	120	BIO-101	1	Summer	2009	A
98988	Tanaka	Biology	120	BIO-301	1	Summer	2010	

	id	name	$dept\_name$	tot_cred
	00128	Zhang	Comp. Sci.	102
	12345	Shankar	Comp. Sci.	32
	19991	Brandt	History	80
	23121	Chavez	Finance	110
	44553	Peltier	Physics	56
student	45678	Levy	Physics	46
student	54321	Williams	Comp. Sci.	54
	55739	Sanchez	Music	38
	70557	Snow	Physics	0
	76543	Brown	Comp. Sci.	58
	76653	Aoi	Elec. Eng.	60
	98765	Bourikas	Elec. Eng.	98
	98988	Tanaka	Biology	120

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

SELECT \*
FROM student INNER JOIN takes USING (id);

id	name	$dept\_name$	tot_cred	$course\_id$	sec_id	semester	year	grade
00128	Zhang	Comp. Sci.	102	CS-101	1	Fall	2009	A
00128	Zhang	Comp. Sci.	102	CS-347	1	Fall	2009	A-
12345	Shankar	Comp. Sci.	32	CS-101	1	Fall	2009	C
12345	Shankar	Comp. Sci.	32	CS-190	2	Spring	2009	A
12345	Shankar	Comp. Sci.	32	CS-315	1	Spring	2010	A
12345	Shankar	Comp. Sci.	32	CS-347	1	Fall	2009	A
19991	Brandt	History	80	HIS-351	1	Spring	2010	В
23121	Chavez	Finance	110	FIN-201	1	Spring	2010	C+
44553	Peltier	Physics	56	PHY-101	1	Fall	2009	В-
45678	Levy	Physics	46	CS-101	1	Fall	2009	F
45678	Levy	Physics	46	CS-101	1	Spring	2010	B+
45678	Levy	Physics	46	CS-319	1	Spring	2010	В
54321	Williams	Comp. Sci.	54	CS-101	1	Fall	2009	A-
54321	Williams	Comp. Sci.	54	CS-190	2	Spring	2009	B+
55739	Sanchez	Music	38	MU-199	1	Spring	2010	A-
76543	Brown	Comp. Sci.	58	CS-101	1	Fall	2009	A
76543	Brown	Comp. Sci.	58	CS-319	2	Spring	2010	A
76653	Aoi	Elec. Eng.	60	EE-181	1	Spring	2009	C
98765	Bourikas	Elec. Eng.	98	CS-101	1	Fall	2009	C-
98765	Bourikas	Elec. Eng.	98	CS-315	1	Spring	2010	В
98988	Tanaka	Biology	120	BIO-101	1	Summer	2009	A
98988	Tanaka	Biology	120	BIO-301	1	Summer	2010	

	id	name	$dept\_name$	tot_cred
	00128	Zhang	Comp. Sci.	102
	12345	Shankar	Comp. Sci.	32
	19991	Brandt	History	80
	23121	Chavez	Finance	110
	44553	Peltier	Physics	56
student	45678	Levy	Physics	46
Student	54321	Williams	Comp. Sci.	54
	55739	Sanchez	Music	38
	70557	Snow	Physics	0
	76543	Brown	Comp. Sci.	58
	76653	Aoi	Elec. Eng.	60
	98765	Bourikas	Elec. Eng.	98
	98988	Tanaka	Biology	120

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	В-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

SELECT \*
FROM student INNER JOIN takes ON student.id = takes.id;

id	name	$dept\_name$	$tot\_cred$	id	course_id	$sec\_id$	semester	year	grade
00128	Zhang	Comp. Sci.	102	00128	CS-101	1	Fall	2009	A
00128	Zhang	Comp. Sci.	102	00128	CS-347	1	Fall	2009	A-
12345	Shankar	Comp. Sci.	32	12345	CS-101	1	Fall	2009	С
12345	Shankar	Comp. Sci.	32	12345	CS-190	2	Spring	2009	A
12345	Shankar	Comp. Sci.	32	12345	CS-315	1	Spring	2010	A
12345	Shankar	Comp. Sci.	32	12345	CS-347	1	Fall	2009	A
19991	Brandt	History	80	19991	HIS-351	1	Spring	2010	В
23121	Chavez	Finance	110	23121	FIN-201	1	Spring	2010	C+
44553	Peltier	Physics	56	44553	PHY-101	1	Fall	2009	В-
45678	Levy	Physics	46	45678	CS-101	1	Fall	2009	F
45678	Levy	Physics	46	45678	CS-101	1	Spring	2010	B+
45678	Levy	Physics	46	45678	CS-319	1	Spring	2010	В
54321	Williams	Comp. Sci.	54	54321	CS-101	1	Fall	2009	A-
54321	Williams	Comp. Sci.	54	54321	CS-190	2	Spring	2009	B+
55739	Sanchez	Music	38	55739	MU-199	1	Spring	2010	A-
76543	Brown	Comp. Sci.	58	76543	CS-101	1	Fall	2009	A
76543	Brown	Comp. Sci.	58	76543	CS-319	2	Spring	2010	A
76653	Aoi	Elec. Eng.	60	76653	EE-181	1	Spring	2009	С
98765	Bourikas	Elec. Eng.	98	98765	CS-101	1	Fall	2009	C-
98765	Bourikas	Elec. Eng.	98	98765	CS-315	1	Spring	2010	В
98988	Tanaka	Biology	120	98988	BIO-101	1	Summer	2009	A
98988	Tanaka	Biology	120	98988	BIO-301	1	Summer	2010	

	id	name	$dept\_name$	tot_cred
	00128	Zhang	Comp. Sci.	102
	12345	Shankar	Comp. Sci.	32
	19991	Brandt	History	80
	23121	Chavez	Finance	110
	44553	Peltier	Physics	56
student	45678	Levy	Physics	46
student	54321	Williams	Comp. Sci.	54
	55739	Sanchez	Music	38
	70557	Snow	Physics	0
	76543	Brown	Comp. Sci.	58
	76653	Aoi	Elec. Eng.	60
	98765	Bourikas	Elec. Eng.	98
	98988	Tanaka	Biology	120

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

# SELECT \* FROM (student INNER JOIN department USING (dept\_name)) NATURAL JOIN takes;

id	$dept\_name$	name	$tot\_cred$	building	budget	$course\_id$	$sec\_id$	semester	year	grade
00128	Comp. Sci.	Zhang	102	Taylor	100000.00	CS-101	1	Fall	2009	A
00128	Comp. Sci.	Zhang	102	Taylor	100000.00	CS-347	1	Fall	2009	A-
12345	Comp. Sci.	Shankar	32	Taylor	100000.00	CS-101	1	Fall	2009	С
12345	Comp. Sci.	Shankar	32	Taylor	100000.00	CS-190	2	Spring	2009	A
12345	Comp. Sci.	Shankar	32	Taylor	100000.00	CS-315	1	Spring	2010	A
12345	Comp. Sci.	Shankar	32	Taylor	100000.00	CS-347	1	Fall	2009	A
19991	History	Brandt	80	Painter	50000.00	HIS-351	1	Spring	2010	В
23121	Finance	Chavez	110	Painter	120000.00	FIN-201	1	Spring	2010	C+
44553	Physics	Peltier	56	Watson	70000.00	PHY-101	1	Fall	2009	В-
45678	Physics	Levy	46	Watson	70000.00	CS-101	1	Fall	2009	F
45678	Physics	Levy	46	Watson	70000.00	CS-101	1	Spring	2010	B+
45678	Physics	Levy	46	Watson	70000.00	CS-319	1	Spring	2010	В
54321	Comp. Sci.	Williams	54	Taylor	100000.00	CS-101	1	Fall	2009	A-
54321	Comp. Sci.	Williams	54	Taylor	100000.00	CS-190	2	Spring	2009	B+
55739	Music	Sanchez	38	Packard	80000.00	MU-199	1	Spring	2010	A-
76543	Comp. Sci.	Brown	58	Taylor	100000.00	CS-101	1	Fall	2009	A
76543	Comp. Sci.	Brown	58	Taylor	100000.00	CS-319	2	Spring	2010	A
76653	Elec. Eng.	Aoi	60	Taylor	85000.00	EE-181	1	Spring	2009	С
98765	Elec. Eng.	Bourikas	98	Taylor	85000.00	CS-101	1	Fall	2009	C-
98765	Elec. Eng.	Bourikas	98	Taylor	85000.00	CS-315	1	Spring	2010	В
98988	Biology	Tanaka	120	Watson	90000.00	BIO-101	1	Summer	2009	A
98988	Biology	Tanaka	120	Watson	90000.00	BIO-301	1	Summer	2010	

	id	name	$dept\_name$	$tot\_cred$
	00128	Zhang	Comp. Sci.	102
	12345	Shankar	Comp. Sci.	32
	19991	Brandt	History	80
	23121	Chavez	Finance	110
	44553	Peltier	Physics	56
tudent	45678	Levy	Physics	46
duciii	54321	Williams	Comp. Sci.	54
	55739	Sanchez	Music	38
	70557	Snow	Physics	0
	76543	Brown	Comp. Sci.	58
	76653	Aoi	Elec. Eng.	60
	98765	Bourikas	Elec. Eng.	98
	98988	Tanaka	Biology	120

	$dept\_name$	building	budget
	Biology	Watson	90000.00
	Comp. Sci.	Taylor	100000.00
department	Elec. Eng.	Taylor	85000.00
depar emene	Finance	Painter	120000.00
	History	Painter	50000.00
	Music	Packard	80000.00
	Physics	Watson	70000.00
	Physics	Watson	70000.00

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	В-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

SELECT \*
FROM student LEFT OUTER JOIN takes USING (id);

id	name	$dept\_name$	tot_cred	$course\_id$	$sec\_id$	semester	year	grade
00128	Zhang	Comp. Sci.	102	CS-101	1	Fall	2009	A
00128	Zhang	Comp. Sci.	102	CS-347	1	Fall	2009	A-
12345	Shankar	Comp. Sci.	32	CS-101	1	Fall	2009	С
12345	Shankar	Comp. Sci.	32	CS-190	2	Spring	2009	A
12345	Shankar	Comp. Sci.	32	CS-315	1	Spring	2010	A
12345	Shankar	Comp. Sci.	32	CS-347	1	Fall	2009	A
19991	Brandt	History	80	HIS-351	1	Spring	2010	В
23121	Chavez	Finance	110	FIN-201	1	Spring	2010	C+
44553	Peltier	Physics	56	PHY-101	1	Fall	2009	В-
45678	Levy	Physics	46	CS-101	1	Fall	2009	F
45678	Levy	Physics	46	CS-101	1	Spring	2010	B+
45678	Levy	Physics	46	CS-319	1	Spring	2010	В
54321	Williams	Comp. Sci.	54	CS-101	1	Fall	2009	A-
54321	Williams	Comp. Sci.	54	CS-190	2	Spring	2009	B+
55739	Sanchez	Music	38	MU-199	1	Spring	2010	A-
76543	Brown	Comp. Sci.	58	CS-101	1	Fall	2009	A
76543	Brown	Comp. Sci.	58	CS-319	2	Spring	2010	A
76653	Aoi	Elec. Eng.	60	EE-181	1	Spring	2009	С
98765	Bourikas	Elec. Eng.	98	CS-101	1	Fall	2009	C-
98765	Bourikas	Elec. Eng.	98	CS-315	1	Spring	2010	В
98988	Tanaka	Biology	120	BIO-101	1	Summer	2009	A
98988	Tanaka	Biology	120	BIO-301	1	Summer	2010	
70557	Snow	Physics	0					

	id	name	$dept\_name$	tot_cred
	00128	Zhang	Comp. Sci.	102
	12345	Shankar	Comp. Sci.	32
	19991	Brandt	History	80
	23121	Chavez	Finance	110
	44553	Peltier	Physics	56
student	45678	Levy	Physics	46
Student	54321	Williams	Comp. Sci.	54
	55739	Sanchez	Music	38
	70557	Snow	Physics	0
	76543	Brown	Comp. Sci.	58
	76653	Aoi	Elec. Eng.	60
	98765	Bourikas	Elec. Eng.	98
	98988	Tanaka	Biology	120
: .7		: 1	: .1	

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

SELECT \*
FROM student RIGHT OUTER JOIN takes USING (id);

id	name	$dept\_name$	tot_cred	$course\_id$	sec_id	semester	year	grade
00128	Zhang	Comp. Sci.	102	CS-101	1	Fall	2009	A
00128	Zhang	Comp. Sci.	102	CS-347	1	Fall	2009	A-
12345	Shankar	Comp. Sci.	32	CS-101	1	Fall	2009	C
12345	Shankar	Comp. Sci.	32	CS-190	2	Spring	2009	A
12345	Shankar	Comp. Sci.	32	CS-315	1	Spring	2010	A
12345	Shankar	Comp. Sci.	32	CS-347	1	Fall	2009	A
19991	Brandt	History	80	HIS-351	1	Spring	2010	В
23121	Chavez	Finance	110	FIN-201	1	Spring	2010	C+
44553	Peltier	Physics	56	PHY-101	1	Fall	2009	В-
45678	Levy	Physics	46	CS-101	1	Fall	2009	F
45678	Levy	Physics	46	CS-101	1	Spring	2010	B+
45678	Levy	Physics	46	CS-319	1	Spring	2010	В
54321	Williams	Comp. Sci.	54	CS-101	1	Fall	2009	A-
54321	Williams	Comp. Sci.	54	CS-190	2	Spring	2009	B+
55739	Sanchez	Music	38	MU-199	1	Spring	2010	A-
76543	Brown	Comp. Sci.	58	CS-101	1	Fall	2009	A
76543	Brown	Comp. Sci.	58	CS-319	2	Spring	2010	A
76653	Aoi	Elec. Eng.	60	EE-181	1	Spring	2009	C
98765	Bourikas	Elec. Eng.	98	CS-101	1	Fall	2009	C-
98765	Bourikas	Elec. Eng.	98	CS-315	1	Spring	2010	В
98988	Tanaka	Biology	120	BIO-101	1	Summer	2009	A
98988	Tanaka	Biology	120	BIO-301	1	Summer	2010	

	id	name	$dept\_name$	tot_cred
	00128	Zhang	Comp. Sci.	102
	12345	Shankar	Comp. Sci.	32
	19991	Brandt	History	80
	23121	Chavez	Finance	110
	44553	Peltier	Physics	56
student	45678	Levy	Physics	46
	54321	Williams	Comp. Sci.	54
	55739	Sanchez	Music	38
	70557	Snow	Physics	0
	76543	Brown	Comp. Sci.	58
	76653	Aoi	Elec. Eng.	60
	98765	Bourikas	Elec. Eng.	98
	98988	Tanaka	Biology	120
1		. 1	. 1	1

	id	$course\_id$	$sec_{-id}$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	В-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

SELECT \*
FROM student FULL OUTER JOIN takes USING (id);

id	name	$dept\_name$	$tot\_cred$	$course\_id$	$sec\_id$	semester	year	grade
00128	Zhang	Comp. Sci.	102	CS-101	1	Fall	2009	A
00128	Zhang	Comp. Sci.	102	CS-347	1	Fall	2009	A-
12345	Shankar	Comp. Sci.	32	CS-101	1	Fall	2009	С
12345	Shankar	Comp. Sci.	32	CS-190	2	Spring	2009	A
12345	Shankar	Comp. Sci.	32	CS-315	1	Spring	2010	A
12345	Shankar	Comp. Sci.	32	CS-347	1	Fall	2009	A
19991	Brandt	History	80	HIS-351	1	Spring	2010	В
23121	Chavez	Finance	110	FIN-201	1	Spring	2010	C+
44553	Peltier	Physics	56	PHY-101	1	Fall	2009	В-
45678	Levy	Physics	46	CS-101	1	Fall	2009	F
45678	Levy	Physics	46	CS-101	1	Spring	2010	B+
45678	Levy	Physics	46	CS-319	1	Spring	2010	В
54321	Williams	Comp. Sci.	54	CS-101	1	Fall	2009	A-
54321	Williams	Comp. Sci.	54	CS-190	2	Spring	2009	B+
55739	Sanchez	Music	38	MU-199	1	Spring	2010	A-
76543	Brown	Comp. Sci.	58	CS-101	1	Fall	2009	A
76543	Brown	Comp. Sci.	58	CS-319	2	Spring	2010	A
76653	Aoi	Elec. Eng.	60	EE-181	1	Spring	2009	С
98765	Bourikas	Elec. Eng.	98	CS-101	1	Fall	2009	C-
98765	Bourikas	Elec. Eng.	98	CS-315	1	Spring	2010	В
98988	Tanaka	Biology	120	BIO-101	1	Summer	2009	A
98988	Tanaka	Biology	120	BIO-301	1	Summer	2010	
70557	Snow	Physics	0					

	id	name	$dept\_name$	$tot\_cred$
	00128	Zhang	Comp. Sci.	102
	12345	Shankar	Comp. Sci.	32
	19991	Brandt	History	80
	23121	Chavez	Finance	110
	44553	Peltier	Physics	56
student	45678	Levy	Physics	46
student	54321	Williams	Comp. Sci.	54
	55739	Sanchez	Music	38
	70557	Snow	Physics	0
	76543	Brown	Comp. Sci.	58
	76653	Aoi	Elec. Eng.	60
	98765	Bourikas	Elec. Eng.	98
	98988	Tanaka	Biology	120
J	0.00100000		[ ]	24.0.00

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	В-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

SELECT \*
FROM student NATURAL FULL OUTER JOIN takes;

id	name	$dept\_name$	$tot\_cred$	$course\_id$	$sec\_id$	semester	year	grade
00128	Zhang	Comp. Sci.	102	CS-101	1	Fall	2009	A
00128	Zhang	Comp. Sci.	102	CS-347	1	Fall	2009	A-
12345	Shankar	Comp. Sci.	32	CS-101	1	Fall	2009	С
12345	Shankar	Comp. Sci.	32	CS-190	2	Spring	2009	A
12345	Shankar	Comp. Sci.	32	CS-315	1	Spring	2010	A
12345	Shankar	Comp. Sci.	32	CS-347	1	Fall	2009	A
19991	Brandt	History	80	HIS-351	1	Spring	2010	В
23121	Chavez	Finance	110	FIN-201	1	Spring	2010	C+
44553	Peltier	Physics	56	PHY-101	1	Fall	2009	B-
45678	Levy	Physics	46	CS-101	1	Fall	2009	F
45678	Levy	Physics	46	CS-101	1	Spring	2010	B+
45678	Levy	Physics	46	CS-319	1	Spring	2010	В
54321	Williams	Comp. Sci.	54	CS-101	1	Fall	2009	A-
54321	Williams	Comp. Sci.	54	CS-190	2	Spring	2009	B+
55739	Sanchez	Music	38	MU-199	1	Spring	2010	A-
76543	Brown	Comp. Sci.	58	CS-101	1	Fall	2009	A
76543	Brown	Comp. Sci.	58	CS-319	2	Spring	2010	A
76653	Aoi	Elec. Eng.	60	EE-181	1	Spring	2009	С
98765	Bourikas	Elec. Eng.	98	CS-101	1	Fall	2009	C-
98765	Bourikas	Elec. Eng.	98	CS-315	1	Spring	2010	В
98988	Tanaka	Biology	120	BIO-101	1	Summer	2009	A
98988	Tanaka	Biology	120	BIO-301	1	Summer	2010	
70557	Snow	Physics	0					

	id	name	$dept\_name$	$tot\_cred$
	00128	Zhang	Comp. Sci.	102
	12345	Shankar	Comp. Sci.	32
	19991	Brandt	History	80
student	23121	Chavez	Finance	110
	44553	Peltier	Physics	56
	45678	Levy	Physics	46
student	54321	Williams	Comp. Sci.	54
	55739	Sanchez	Music	38
	70557	Snow	Physics	0
	76543	Brown	Comp. Sci.	58
	76653	Aoi	Elec. Eng.	60
	98765	Bourikas	Elec. Eng.	98
	98988	Tanaka	Biology	120
id .	20212200	id 000	id a am a at am	21000

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

SELECT \*
FROM student FULL OUTER JOIN takes ON student.id = takes.id;

id	name	$dept\_name$	$tot\_cred$	id	$course\_id$	$sec\_id$	semester	year	grade
00128	Zhang	Comp. Sci.	102	00128	CS-101	1	Fall	2009	A
00128	Zhang	Comp. Sci.	102	00128	CS-347	1	Fall	2009	A-
12345	Shankar	Comp. Sci.	32	12345	CS-101	1	Fall	2009	С
12345	Shankar	Comp. Sci.	32	12345	CS-190	2	Spring	2009	A
12345	Shankar	Comp. Sci.	32	12345	CS-315	1	Spring	2010	A
12345	Shankar	Comp. Sci.	32	12345	CS-347	1	Fall	2009	A
19991	Brandt	History	80	19991	HIS-351	1	Spring	2010	В
23121	Chavez	Finance	110	23121	FIN-201	1	Spring	2010	C+
44553	Peltier	Physics	56	44553	PHY-101	1	Fall	2009	В-
45678	Levy	Physics	46	45678	CS-101	1	Fall	2009	F
45678	Levy	Physics	46	45678	CS-101	1	Spring	2010	B+
45678	Levy	Physics	46	45678	CS-319	1	Spring	2010	В
54321	Williams	Comp. Sci.	54	54321	CS-101	1	Fall	2009	A-
54321	Williams	Comp. Sci.	54	54321	CS-190	2	Spring	2009	B+
55739	Sanchez	Music	38	55739	MU-199	1	Spring	2010	A-
76543	Brown	Comp. Sci.	58	76543	CS-101	1	Fall	2009	A
76543	Brown	Comp. Sci.	58	76543	CS-319	2	Spring	2010	A
76653	Aoi	Elec. Eng.	60	76653	EE-181	1	Spring	2009	С
98765	Bourikas	Elec. Eng.	98	98765	CS-101	1	Fall	2009	C-
98765	Bourikas	Elec. Eng.	98	98765	CS-315	1	Spring	2010	В
98988	Tanaka	Biology	120	98988	BIO-101	1	Summer	2009	A
98988	Tanaka	Biology	120	98988	BIO-301	1	Summer	2010	
70557	Snow	Physics	0						

	id	name	$dept\_name$	$tot\_cred$
	00128	Zhang	Comp. Sci.	102
	12345	Shankar	Comp. Sci.	32
	19991	Brandt	History	80
	23121	Chavez	Finance	110
	44553	Peltier	Physics	56
student	45678	Levy	Physics	46
Student	54321	Williams	Comp. Sci.	54
	55739	Sanchez	Music	38
	70557	Snow	Physics	0
	76543	Brown	Comp. Sci.	58
	76653	Aoi	Elec. Eng.	60
	98765	Bourikas	Elec. Eng.	98
	98988	Tanaka	Biology	120
id	course i	id sec i	id semester	uear

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

$course\_id$	$sec\_id$	semester	year	id	grade	id	id	name	$dept\_name$	salary
BIO-101	1	Summer	2009	98988	A	76766	76766	Crick	Biology	72000.00
BIO-301	1	Summer	2010	98988		76766	76766	Crick	Biology	72000.00
CS-101	1	Fall	2009	00128	A	10101	10101	Srinivasan	Comp. Sci.	65000.00
CS-101	1	Fall	2009	12345	С	10101	10101	Srinivasan	Comp. Sci.	65000.00
CS-101	1	Fall	2009	45678	F	10101	10101	Srinivasan	Comp. Sci.	65000.00
CS-101	1	Fall	2009	54321	A-	10101	10101	Srinivasan	Comp. Sci.	65000.00
CS-101	1	Fall	2009	76543	A	10101	10101	Srinivasan	Comp. Sci.	65000.00
CS-101	1	Fall	2009	98765	C-	10101	10101	Srinivasan	Comp. Sci.	65000.00
CS-101	1	Spring	2010	45678	B+	45565	45565	Katz	Comp. Sci.	75000.00
CS-190	2	Spring	2009	54321	B+	83821	83821	Brandt	Comp. Sci.	92000.00
CS-190	2	Spring	2009	12345	A	83821	83821	Brandt	Comp. Sci.	92000.00
CS-315	1	Spring	2010	12345	A	10101	10101	Srinivasan	Comp. Sci.	65000.00
CS-315	1	Spring	2010	98765	В	10101	10101	Srinivasan	Comp. Sci.	65000.00
CS-319	1	Spring	2010	45678	В	45565	45565	Katz	Comp. Sci.	75000.00
CS-319	2	Spring	2010	76543	A	83821	83821	Brandt	Comp. Sci.	92000.00
CS-347	1	Fall	2009	12345	A	10101	10101	Srinivasan	Comp. Sci.	65000.00
CS-347	1	Fall	2009	00128	A-	10101	10101	Srinivasan	Comp. Sci.	65000.00
EE-181	1	Spring	2009	76653	С	98345	98345	Kim	Elec. Eng.	80000.00
FIN-201	1	Spring	2010	23121	C+	12121	12121	Wu	Finance	90000.00
HIS-351	1	Spring	2010	19991	В	32343	32343	El Said	History	60000.00
MU-199	1	Spring	2010	55739	A-	15151	15151	Mozart	Music	40000.00
PHY-101	1	Fall	2009	44553	В-	22222	22222	Einstein	Physics	95000.00

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	. 1

	id	name	$dept\_name$	salary
	10101	Srinivasan	Comp. Sci.	65000.00
	12121	Wu	Finance	90000.00
	15151	Mozart	Music	40000.00
	22222	Einstein	Physics	95000.00
	32343	El Said	History	60000.00
teacher	33456	Gold	Physics	87000.00
	45565	Katz	Comp. Sci.	75000.00
	58583	Califieri	History	62000.00
	76543	Singh	Finance	80000.00
	76766	Crick	Biology	72000.00
	83821	Brandt	Comp. Sci.	92000.00
	98345	Kim	Elec. Eng.	80000.00

	id	$course\_id$	$sec\_id$	semester	year
	10101	CS-101	1	Fall	2009
	10101	CS-315	1	Spring	2010
	10101	CS-347	1	Fall	2009
	12121	FIN-201	1	Spring	2010
	15151	MU-199	1	Spring	2010
	22222	PHY-101	1	Fall	2009
teaches	32343	HIS-351	1	Spring	2010
teaches	45565	CS-101	1	Spring	2010
	45565	CS-319	1	Spring	2010
	76766	BIO-101	1	Summer	2009
	76766	BIO-301	1	Summer	2010
	83821	CS-190	1	Spring	2009
	83821	CS-190	2	Spring	2009
	83821	CS-319	2	Spring	2010
	98345	EE-181	1	Spring	2009

name	name	course_id
Crick	Tanaka	BIO-101
Crick	Tanaka	BIO-301
Srinivasan	Zhang	CS-101
Srinivasan	Shankar	CS-101
Srinivasan	Levy	CS-101
Srinivasan	Williams	CS-101
Srinivasan	Brown	CS-101
Srinivasan	Bourikas	CS-101
Katz	Levy	CS-101
Brandt	Williams	CS-190
Brandt	Shankar	CS-190
Srinivasan	Shankar	CS-315
Srinivasan	Bourikas	CS-315
Katz	Levy	CS-319
Brandt	Brown	CS-319
Srinivasan	Shankar	CS-347
Srinivasan	Zhang	CS-347
Kim	Aoi	EE-181
Wu	Chavez	FIN-201
El Said	Brandt	HIS-351
Mozart	Sanchez	MU-199
Einstein	Peltier	PHY-101

idname $dept\_name$ salary Comp. Sci. Finance 65000.00 90000.00 Srinivasan 12121 Wu 15151 Mozart 40000.00 Music Einstein El Said 22222 Physics 95000.00 60000.00 32343 History teacher 33456 Gold Physics 87000.00 Comp. Sci. 45565 Katz 75000.00 58583 Califieri History 62000.00 76543Singh Finance 80000.00 Biology Comp. Sci. Elec. Eng. 76766 Crick 72000.00 83821 Brandt 92000.00 9834580000.00

	id	$course\_id$	$sec\_id$	semester	year
	10101	CS-101	1	Fall	2009
	10101	CS-315	1	Spring	2010
	10101	CS-347	1	Fall	2009
	12121	FIN-201	1	Spring	2010
	15151	MU-199	1	Spring	2010
	22222	PHY-101	1	Fall	2009
teaches	32343	HIS-351	1	Spring	2010
teaches	45565	CS-101	1	Spring	2010
	45565	CS-319	1	Spring	2010
	76766	BIO-101	1	Summer	2009
	76766	BIO-301	1	Summer	2010
	83821	CS-190	1	Spring	2009
	83821	CS-190	2	Spring	2009
	83821	CS-319	2	Spring	2010
	98345	EE-181	1	Spring	2009

	id	name	$dept\_name$	$tot\_cred$
	00128	Zhang	Comp. Sci.	102
	12345	Shankar	Comp. Sci.	32
	19991	Brandt	History	80
	23121	Chavez	Finance	110
	44553	Peltier	Physics	56
student	45678	Levy	Physics	46
student	54321	Williams	Comp. Sci.	54
	55739	Sanchez	Music	38
	70557	Snow	Physics	0
	76543	Brown	Comp. Sci.	58
	76653	Aoi	Elec. Eng.	60
	98765	Bourikas	Elec. Eng.	98
	98988	Tanaka	Biology	120

2312 4455 4567 takes 4567 4567 5432

id $course\_id$  $sec\_id$ semestergradeyearCS-101 CS-347 Fall Fall 00128 2009 00128 2009 A-CS-101 CS-190 12345 1 2 Fall 2009 12345 Spring 2009 A A 12345 CS-315 2010 Spring 12345 CS-347 HIS-351 Fall 2009 A B 19991 Spring 2010 23121 FIN-201 C+ Spring 2010 44553PHY-101 1 Fall 2009 B-45678 CS-101 Fall 2009 45678 CS-101 2010 B+ 1 1 1 2 Spring CS-319 CS-101 45678Spring 2010 В 54321 Fall 2009 A-B+ 54321 CS-190 Spring 2009  $55739 \\ 76543$ 1 MU-199 Spring 2010 A-CS-101 Fall 2009 Α A C C-76543CS-319 2 Spring 201076653 EE-181 CS-101 Spring Fall 2009 98765 2009 98765 CS-315 Spring 2010 В BIO-101 98988 Summer 2009 Α BIO-301 Summer 2010

```
SELECT teacher.name, student.name, count(*)
FROM (teacher NATURAL JOIN teaches) INNER JOIN
        (takes NATURAL JOIN student) USING (course_id, sec_id, semester,
        year)
GROUP BY teacher.name, student.name;
```

name	name	count
Brandt	Brown	1
Brandt	Shankar	1
Brandt	Williams	1
Crick	Tanaka	2
Einstein	Peltier	1
El Said	Brandt	1
Katz	Levy	2
Kim	Aoi	1
Mozart	Sanchez	1
Srinivasan	Bourikas	2
Srinivasan	Brown	1
Srinivasan	Levy	1
Srinivasan	Shankar	3
Srinivasan	Williams	1
Srinivasan	Zhang	2
Wu	Chavez	1

	id	name	$dept\_name$	salary
	10101	Srinivasan	Comp. Sci.	65000.00
	12121	Wu	Finance	90000.00
	15151	Mozart	Music	40000.00
	22222	Einstein	Physics	95000.00
	32343	El Said	History	60000.00
teacher	33456	Gold	Physics	87000.00
	45565	Katz	Comp. Sci.	75000.00
	58583	Califieri	History	62000.00
	76543	Singh	Finance	80000.00
	76766	Crick	Biology	72000.00
	83821	Brandt	Comp. Sci.	92000.00
	98345	Kim	Elec. Eng.	80000.00

name	$dept\_name$	tot_cred
Zhang	Comp. Sci.	102
Shankar	Comp. Sci.	32
Brandt	History	80
Chavez	Finance	110
Peltier	Physics	56
Levy	Physics	46
Williams	Comp. Sci.	54
Sanchez	Music	38
Snow	Physics	0
Brown	Comp. Sci.	58
Aoi	Elec. Eng.	60
Bourikas	Elec. Eng.	98
Tanaka	Biology	120

student

	id	$course\_id$	$sec\_id$	semester	year
	10101	CS-101	1	Fall	2009
	10101	CS-315	1	Spring	2010
	10101	CS-347	1	Fall	2009
	12121	FIN-201	1	Spring	2010
	15151	MU-199	1	Spring	2010
	22222	PHY-101	1	Fall	2009
teaches	32343	HIS-351	1	Spring	2010
teaches	45565	CS-101	1	Spring	2010
	45565	CS-319	1	Spring	2010
	76766	BIO-101	1	Summer	2009
	76766	BIO-301	1	Summer	2010
	83821	CS-190	1	Spring	2009
	83821	CS-190	2	Spring	2009
	83821	CS-319	2	Spring	2010
	98345	EE-181	1	Spring	2009

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	В-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

## SELECT \* FROM takes NATURAL JOIN course;

$course\_id$	id	sec_id	semester	year	grade	title	$dept\_name$	credits
CS-101	00128	1	Fall	2009	A	Intro. to Computer Science	Comp. Sci.	4
CS-347	00128	1	Fall	2009	A-	Database System Concepts	Comp. Sci.	3
CS-101	12345	1	Fall	2009	С	Intro. to Computer Science	Comp. Sci.	4
CS-190	12345	2	Spring	2009	A	Game Design	Comp. Sci.	4
CS-315	12345	1	Spring	2010	A	Robotics	Comp. Sci.	3
CS-347	12345	1	Fall	2009	A	Database System Concepts	Comp. Sci.	3
HIS-351	19991	1	Spring	2010	В	World History	History	3
FIN-201	23121	1	Spring	2010	C+	Investment Banking	Finance	3
PHY-101	44553	1	Fall	2009	В-	Physical Principles	Physics	4
CS-101	45678	1	Fall	2009	F	Intro. to Computer Science	Comp. Sci.	4
CS-101	45678	1	Spring	2010	B+	Intro. to Computer Science	Comp. Sci.	4
CS-319	45678	1	Spring	2010	В	Image Processing	Comp. Sci.	3
CS-101	54321	1	Fall	2009	A-	Intro. to Computer Science	Comp. Sci.	4
CS-190	54321	2	Spring	2009	B+	Game Design	Comp. Sci.	4
MU-199	55739	1	Spring	2010	A-	Music Video Production	Music	3
CS-101	76543	1	Fall	2009	A	Intro. to Computer Science	Comp. Sci.	4
CS-319	76543	2	Spring	2010	A	Image Processing	Comp. Sci.	3
EE-181	76653	1	Spring	2009	С	Intro. to Digital Systems	Elec. Eng.	3
CS-101	98765	1	Fall	2009	C-	Intro. to Computer Science	Comp. Sci.	4
CS-315	98765	1	Spring	2010	В	Robotics	Comp. Sci.	3
BIO-101	98988	1	Summer	2009	A	Intro. to Biology	Biology	4
BIO-301	98988	1	Summer	2010		Genetics	Biology	4

	id		$urse\_id$	$sec_{-}id$	sem	ester	year	grade
	00128	CS-1		1	Fall		2009	A
	00128	CS-3	347	1	Fall		2009	A-
	12345	CS-1	101	1	Fall		2009	C
	12345	CS-1	190	2	Spring	S	2009	A
	12345	CS-3	315	1	Spring	S	2010	A
	12345	CS-3	347	1	Fall		2009	A
	19991	HIS-	351	1	Spring	S	2010	В
	23121	FIN-	-201	1	Spring	S	2010	C+
	44553	PHY	7-101	1	Fall		2009	B-
	45678	CS-1		1	Fall		2009	F
takes	45678	CS-1	101	1	Spring	S	2010	B+
	45678	CS-3	319	1	Spring	5	2010	В
	54321	CS-1	101	1	Fall		2009	A-
	54321	CS-1	190	2	Spring	5	2009	B+
	55739	MU-199		1	Spring		2010	A-
	76543	CS-101		1	Fall		2009	A
	76543	CS-319		2	Spring	S	2010	A
	76653	EE-	181	1	Spring	S	2009	C
	98765	CS-101		1	Fall		2009	C-
	98765	CS-315		1	Spring			В
	98988	BIO		1	Summ	er	2009	A
_	98988	BIO		1	Summer		2010	
	course	e_id	title				$\_name$	credits
	BIO-101		Intro. to	Biology		Biology		4
	BIO-301		Genetics			Biology		4
	BIO-399			tional Biolog		Biology		3
	CS-101			Computer S	cience	Comp.		4
	CS-190		Game De	esign		Comp.		4
ourse	CS-315		Robotics			Comp.		3
	CS-319		Image Pr			Comp.		3
	CS-347			System Cor		Comp.		3
	EE-181			Digital Syst	ems	Elec. E		3
	FIN-201			nt Banking		Financ		3
	HIS-351		World Hi			History	7	3
	MU-199			deo Producti	ion	Music		3
L	PHY-101		Physical	Principles		Physics	5	4

SELECT year, SUM(credits)
FROM takes NATURAL JOIN course
GROUP BY year;

year	sum
2010	29
2009	49

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	
	course	id title		dont	nama	credite

course

dept\_name credits
Biology 4 course\_id | title Intro. to Biology
Genetics
Computational Biology
Intro. to Computer Science
Game Design BIO-101 BIO-301 BIO-399 Biology 4 3 4 4 3 3 3 3 3 4 4 Biology
Biology
Comp. Sci.
Comp. Sci.
Comp. Sci.
Comp. Sci.
Comp. Sci.
Elec. Eng.
Finance BIO-399 CS-101 CS-190 CS-315 CS-319 CS-347 EE-181 FIN-201 Robotics Robotics Image Processing Database System Concepts Intro. to Digital Systems Investment Banking Finance HIS-351 MU-199 PHY-101 World History
Music Video Production
Physical Principles  $\operatorname{History}$ Music Physics

### 

$dept\_name$	cou	$urse\_id$	id	name	$tot\_cred$	sec_a	id	semeste	r	year	grade	ti	tle		credit
Comp. Sci.	CS-1	01	00128	Zhang	102	1		Fall		2009	A	Int	ro. to Computer S	cience	4
Comp. Sci.	CS-3	47	00128	Zhang	102	1		Fall	İ	2009	A-	Da	tabase System Con	cepts	3
Comp. Sci.	CS-1	01	12345	Shankar	32	1		Fall		2009	C	Int	ro. to Computer S	cience	4
Comp. Sci.	CS-1	90	12345	Shankar	32	2		Spring		2009	A	Ga	me Design		4
Comp. Sci.	CS-3	15	12345	Shankar	32	1		Spring		2010	A	Ro	botics		3
Comp. Sci.	CS-3		12345	Shankar	32	1		Fall		2009	A	Da	tabase System Con	cepts	3
History	HIS-	351	19991	Brandt	80	1		Spring		2010	В	Wo	orld History		3
Finance	FIN-	201	23121	Chavez	110	1		Spring		2010	C+	Inv	estment Banking		3
Physics	PHY	-101	44553	Peltier	56	1		Fall		2009	B-	Ph	ysical Principles		4
Comp. Sci.	CS-1	01	54321	Williams	54	1		Fall		2009	A-	Int	ro. to Computer S	cience	4
Comp. Sci.	CS-1	.90	54321	Williams	54	2		Spring		2009	B+	Ga	me Design		4
Music	MU-	199	55739	Sanchez	38	1		Spring	İ	2010	A-	Μu	isic Video Producti	ion	3
Comp. Sci.	CS-1	01	76543	Brown	58	1		Fall		2009	A	Int	ro. to Computer S	cience	4
Comp. Sci.	CS-3		76543	Brown	58	2		Spring		2010	A		age Processing		3
Elec. Eng.	EE-1	.81	76653	Aoi	60	1		Spring		2009	C	Int	ro. to Digital Syste	ems	3
Biology	BIO-		98988	Tanaka	120	1		Summer		2009	A		ro. to Biology		4
Biology	BIO-		98988	Tanaka	120	1		Summer		2010			netics		4
Biology	BIO-	-399										Co	mputational Biolog	gy	3
	id	name	dep	$t\_name$	$tot\_cred$		С	$course\_id$	$t_i$	itle			$dept\_name$	crea	lits
	00128	Zhang	Comp	. Sci.	102	Î	BI	O-101	Int	tro. to Bic	logy		Biology	4	
	12345	Shankar	Comp	. Sci.	32		BI	IO-301	Ge	enetics			Biology	4	
	19991	Brandt	Histor	y	80		BI	O-399	Co	mputation	nal Biology		Biology	3	
	23121	Chavez	Finan	ce	110		CS	S-101	Int	tro. to Co	mputer Scien	ce	Comp. Sci.	4	
	44553	Peltier	Physic	cs	56		CS	5-190	Ga	ame Design	n		Comp. Sci.	4	
student	45678	Levy	Physic	cs	46	course	CS	S-315	Ro	botics			Comp. Sci.	3	İ
Seadene	54321	Williams	Comp	. Sci.	54	course	CS	5-319	Im	age Proce	ssing		Comp. Sci.	3	
	55739	Sanchez	Music		38		CS	5-347	Da	atabase Sy	stem Concep	ts	Comp. Sci.	3	
	70557	Snow	Physic	CS	0		EI	E-181	Int	tro. to Dig	gital Systems		Elec. Eng.	3	
	76543	Brown	Comp		58			N-201		vestment I			Finance	3	
	76653	Aoi	Elec.	Eng.	60		H	IS-351	W	orld Histor	ry		History	3	1
	98765	Bourikas	Elec.	Eng.	98		M	U-199	Mı	usic Video	Production		Music	3	
i	98988	Tanaka	Biolog	gv	120		PΙ	HY-101	Ph	vsical Pri	nciples	İ	Physics	4	

101083		120		1 101	y Brown i iiii	orprob
	id	$course\_id$	$sec_{-}id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

```
WITH mytakes (student_id, course_id, sec_id, semester, year, grade) AS
    (SELECT id, course_id, sec_id, semester, year, grade
    FROM takes
    WHERE grade = 'A')

SELECT *
FROM (mytakes INNER JOIN teaches USING (course_id, sec_id, semester, year))
    RIGHT OUTER JOIN teacher USING (id)
```

id	$course\_id$	$sec\_id$	semester	year	$student\_id$	grade	name	$dept\_name$	salary
10101	CS-347	1	Fall	2009	12345	A	Srinivasan	Comp. Sci.	65000.00
10101	CS-315	1	Spring	2010	12345	A	Srinivasan	Comp. Sci.	65000.00
10101	CS-101	1	Fall	2009	00128	A	Srinivasan	Comp. Sci.	65000.00
10101	CS-101	1	Fall	2009	76543	A	Srinivasan	Comp. Sci.	65000.00
12121							Wu	Finance	90000.00
15151							Mozart	Music	40000.00
22222							Einstein	Physics	95000.00
32343							El Said	History	60000.00
33456							Gold	Physics	87000.00
45565							Katz	Comp. Sci.	75000.00
58583							Califieri	History	62000.00
76543							Singh	Finance	80000.00
76766	BIO-101	1	Summer	2009	98988	A	Crick	Biology	72000.00
83821	CS-319	2	Spring	2010	76543	A	Brandt	Comp. Sci.	92000.00
83821	CS-190	2	Spring	2009	12345	A	Brandt	Comp. Sci.	92000.00
98345							Kim	Elec. Eng.	80000.00

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

	id	$course\_id$	$sec\_id$	semester	year
	10101	CS-101	1	Fall	2009
	10101	CS-315	1	Spring	2010
	10101	CS-347	1	Fall	2009
	12121	FIN-201	1	Spring	2010
	15151	MU-199	1	Spring	2010
	22222	PHY-101	1	Fall	2009
teaches	32343	HIS-351	1	Spring	2010
COGCITOD	45565	CS-101	1	Spring	2010
	45565	CS-319	1	Spring	2010
	76766	BIO-101	1	Summer	2009
	76766	BIO-301	1	Summer	2010
	83821	CS-190	1	Spring	2009
	83821	CS-190	2	Spring	2009
	83821	CS-319	2	Spring	2010
	98345	EE-181	1	Spring	2009

	id	name	$dept\_name$	salary
	10101	Srinivasan	Comp. Sci.	65000.00
	12121	Wu	Finance	90000.00
	15151	Mozart	Music	40000.00
	22222	Einstein	Physics	95000.00
	32343	El Said	History	60000.00
teacher	33456	Gold	Physics	87000.00
	45565	Katz	Comp. Sci.	75000.00
	58583	Califieri	History	62000.00
	76543	Singh	Finance	80000.00
	76766	Crick	Biology	72000.00
	83821	Brandt	Comp. Sci.	92000.00
	98345	Kim	Elec. Eng.	80000.00

name	count
Srinivasan	10
Brandt	3
Katz	2
Crick	2
El Said	1
Kim	1
Wu	1
Mozart	1
Einstein	1

	id	name	$dept\_name$	salary
	10101	Srinivasan	Comp. Sci.	65000.00
	12121	Wu	Finance	90000.00
	15151	Mozart	Music	40000.00
	22222	Einstein	Physics	95000.00
	32343	El Said	History	60000.00
teacher	33456	Gold	Physics	87000.00
	45565	Katz	Comp. Sci.	75000.00
	58583	Califieri	History	62000.00
	76543	Singh	Finance	80000.00
	76766	Crick	Biology	72000.00
	83821	Brandt	Comp. Sci.	92000.00
	98345	Kim	Elec. Eng.	80000.00

	id	$course\_id$	$sec\_id$	semester	year
	10101	CS-101	1	Fall	2009
	10101	CS-315	1	Spring	2010
	10101	CS-347	1	Fall	2009
	12121	FIN-201	1	Spring	2010
	15151	MU-199	1	Spring	2010
	22222	PHY-101	1	Fall	2009
teaches	32343	HIS-351	1	Spring	2010
toderios	45565	CS-101	1	Spring	2010
	45565	CS-319	1	Spring	2010
	76766	BIO-101	1	Summer	2009
	76766	BIO-301	1	Summer	2010
	83821	CS-190	1	Spring	2009
	83821	CS-190	2	Spring	2009
	83821	CS-319	2	Spring	2010
	98345	EE-181	1	Spring	2009

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

name	count
Srinivasan	10
Brandt	3
Katz	2
Crick	2
El Said	1
Kim	1
Wu	1
Mozart	1
Einstein	1

	id	name	$dept\_name$	salary
	10101	Srinivasan	Comp. Sci.	65000.00
	12121	Wu	Finance	90000.00
	15151	Mozart	Music	40000.00
	22222	Einstein	Physics	95000.00
	32343	El Said	History	60000.00
teacher	33456	Gold	Physics	87000.00
	45565	Katz	Comp. Sci.	75000.00
	58583	Califieri	History	62000.00
	76543	Singh	Finance	80000.00
	76766	Crick	Biology	72000.00
	83821	Brandt	Comp. Sci.	92000.00
	98345	Kim	Elec. Eng.	80000.00

	id	$course\_id$	$sec\_id$	semester	year
	10101	CS-101	1	Fall	2009
	10101	CS-315	1	Spring	2010
	10101	CS-347	1	Fall	2009
	12121	FIN-201	1	Spring	2010
	15151	MU-199	1	Spring	2010
	22222	PHY-101	1	Fall	2009
teaches	32343	HIS-351	1	Spring	2010
CCGCITCD	45565	CS-101	1	Spring	2010
	45565	CS-319	1	Spring	2010
	76766	BIO-101	1	Summer	2009
	76766	BIO-301	1	Summer	2010
	83821	CS-190	1	Spring	2009
	83821	CS-190	2	Spring	2009
	83821	CS-319	2	Spring	2010
	98345	EE-181	1	Spring	2009

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

name	e	f
Crick	98988	A
Crick	98988	
Srinivasan	00128	A
Srinivasan	12345	С
Srinivasan	45678	F
Srinivasan	54321	A-
Srinivasan	76543	A
Srinivasan	98765	C-
Katz	45678	B+
Brandt	54321	B+
Brandt	12345	A
Srinivasan	12345	A
Srinivasan	98765	В
Katz	45678	В
Brandt	76543	A
Srinivasan	12345	A
Srinivasan	00128	A-
Kim	76653	С
Wu	23121	C+
El Said	19991	В
Mozart	55739	A-
Einstein	44553	B-

	id	name	$dept\_name$	salary
	10101	Srinivasan	Comp. Sci.	65000.00
	12121	Wu	Finance	90000.00
	15151	Mozart	Music	40000.00
	22222	Einstein	Physics	95000.00
	32343	El Said	History	60000.00
teacher	33456	Gold	Physics	87000.00
	45565	Katz	Comp. Sci.	75000.00
	58583	Califieri	History	62000.00
	76543	Singh	Finance	80000.00
	76766	Crick	Biology	72000.00
	83821	Brandt	Comp. Sci.	92000.00
	98345	Kim	Elec. Eng.	80000.00

	id	$course\_id$	$sec\_id$	semester	year
	10101	CS-101	1	Fall	2009
	10101	CS-315	1	Spring	2010
	10101	CS-347	1	Fall	2009
	12121	FIN-201	1	Spring	2010
	15151	MU-199	1	Spring	2010
	22222	PHY-101	1	Fall	2009
teaches	32343	HIS-351	1	Spring	2010
teaches	45565	CS-101	1	Spring	2010
	45565	CS-319	1	Spring	2010
	76766	BIO-101	1	Summer	2009
	76766	BIO-301	1	Summer	2010
	83821	CS-190	1	Spring	2009
	83821	CS-190	2	Spring	2009
	83821	CS-319	2	Spring	2010
	98345	EE-181	1	Spring	2009
			4	•	

	id	$course\_id$	$sec\_id$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

```
SELECT A.name, B.name, course_id
FROM (student NATURAL INNER JOIN takes) as A INNER JOIN
     (student NATURAL INNER JOIN takes) as B USING (course_id, sec_id,
  semester, year)
WHERE A.id <> B.id AND A.id < B.id
```

name	name	$course\_id$
Zhang	Shankar	CS-101
Zhang	Levy	CS-101
Zhang	Williams	CS-101
Zhang	Brown	CS-101
Zhang	Bourikas	CS-101
Shankar	Levy	CS-101
Shankar	Williams	CS-101
Shankar	Brown	CS-101
Shankar	Bourikas	CS-101
Levy	Williams	CS-101
Levy	Brown	CS-101
Levy	Bourikas	CS-101
Williams	Brown	CS-101
Williams	Bourikas	CS-101
Brown	Bourikas	CS-101
Shankar	Williams	CS-190
Shankar	Bourikas	CS-315
Zhang	Shankar	CS-347

id	name	$dept\_name$	$tot\_cred$
00128	Zhang	Comp. Sci.	102
12345	Shankar	Comp. Sci.	32
19991	Brandt	History	80
23121	Chavez	Finance	110
44553	Peltier	Physics	56
45678	Levy	Physics	46
54321	Williams	Comp. Sci.	54
55739	Sanchez	Music	38
70557	Snow	Physics	0
76543	Brown	Comp. Sci.	58
76653	Aoi	Elec. Eng.	60
98765	Bourikas	Elec. Eng.	98
98988	Tanaka	Biology	120
	00128 12345 19991 23121 44553 45678 54321 55739 70557 76543 76653 98765	00128 Zhang 12345 Shankar 19991 Brandt 23121 Chavez 44553 Peltier 45678 Levy 54321 Williams 55739 Sanchez 70557 Snow 765543 Brown 76653 Aoi 98765 Bourikas	00128         Zhang         Comp. Sci.           12345         Shankar         Comp. Sci.           19991         Brandt         History           23121         Chavez         Finance           44553         Peltier         Physics           54821         Williams         Comp. Sci.           55739         Sanchez         Music           70557         Snow         Physics           76543         Brown         Comp. Sci.           76653         Aoi         Elec. Eng.           98765         Bourikas         Elec. Eng.

	ia	$course\_\imath a$	sec_ia	semester	year	graae
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
akes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	

```
SELECT A.name, B.name
FROM (student NATURAL INNER JOIN takes) as A INNER JOIN
      (student NATURAL INNER JOIN takes) as B USING (course_id, sec_id, semester, year)
WHERE A.id <> B.id AND A.id < B.id
GROUP BY A.id, A.name, B.id, B.name
HAVING COUNT(*) >= 1;
```

name	name
Zhang	Shankar
Zhang	Levy
Zhang	Williams
Zhang	Brown
Zhang	Bourikas
Shankar	Levy
Shankar	Williams
Shankar	Brown
Shankar	Bourikas
Levy	Williams
Levy	Brown
Levy	Bourikas
Williams	Brown
Williams	Bourikas
Brown	Bourikas

	id	name	$dept\_name$	tot_cred
	00128	Zhang	Comp. Sci.	102
	12345	Shankar	Comp. Sci.	32
	19991	Brandt	History	80
	23121	Chavez	Finance	110
	44553	Peltier	Physics	56
student	45678	Levy	Physics	46
student	54321	Williams	Comp. Sci.	54
	55739	Sanchez	Music	38
	70557	Snow	Physics	0
	76543	Brown	Comp. Sci.	58
	76653	Aoi	Elec. Eng.	60
	98765	Bourikas	Elec. Eng.	98
	98988	Tanaka	Biology	120
	course i	id sec a	id   semester	near

	ia	$course\_id$	$sec_{-id}$	semester	year	grade
	00128	CS-101	1	Fall	2009	A
	00128	CS-347	1	Fall	2009	A-
	12345	CS-101	1	Fall	2009	C
	12345	CS-190	2	Spring	2009	A
	12345	CS-315	1	Spring	2010	A
	12345	CS-347	1	Fall	2009	A
	19991	HIS-351	1	Spring	2010	В
	23121	FIN-201	1	Spring	2010	C+
	44553	PHY-101	1	Fall	2009	B-
	45678	CS-101	1	Fall	2009	F
takes	45678	CS-101	1	Spring	2010	B+
	45678	CS-319	1	Spring	2010	В
	54321	CS-101	1	Fall	2009	A-
	54321	CS-190	2	Spring	2009	B+
	55739	MU-199	1	Spring	2010	A-
	76543	CS-101	1	Fall	2009	A
	76543	CS-319	2	Spring	2010	A
	76653	EE-181	1	Spring	2009	C
	98765	CS-101	1	Fall	2009	C-
	98765	CS-315	1	Spring	2010	В
	98988	BIO-101	1	Summer	2009	A
	98988	BIO-301	1	Summer	2010	