

Московский авиационный институт  
(Национальный исследовательский университет)  
Факультет прикладной математики и физики  
Кафедра вычислительной математики и программирования

Лабораторная работа 1-3  
по курсу «Базы данных»

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Группа: 80-306Б-18

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## Задание: Учет лабораторных работ

### База данных в FoxPro

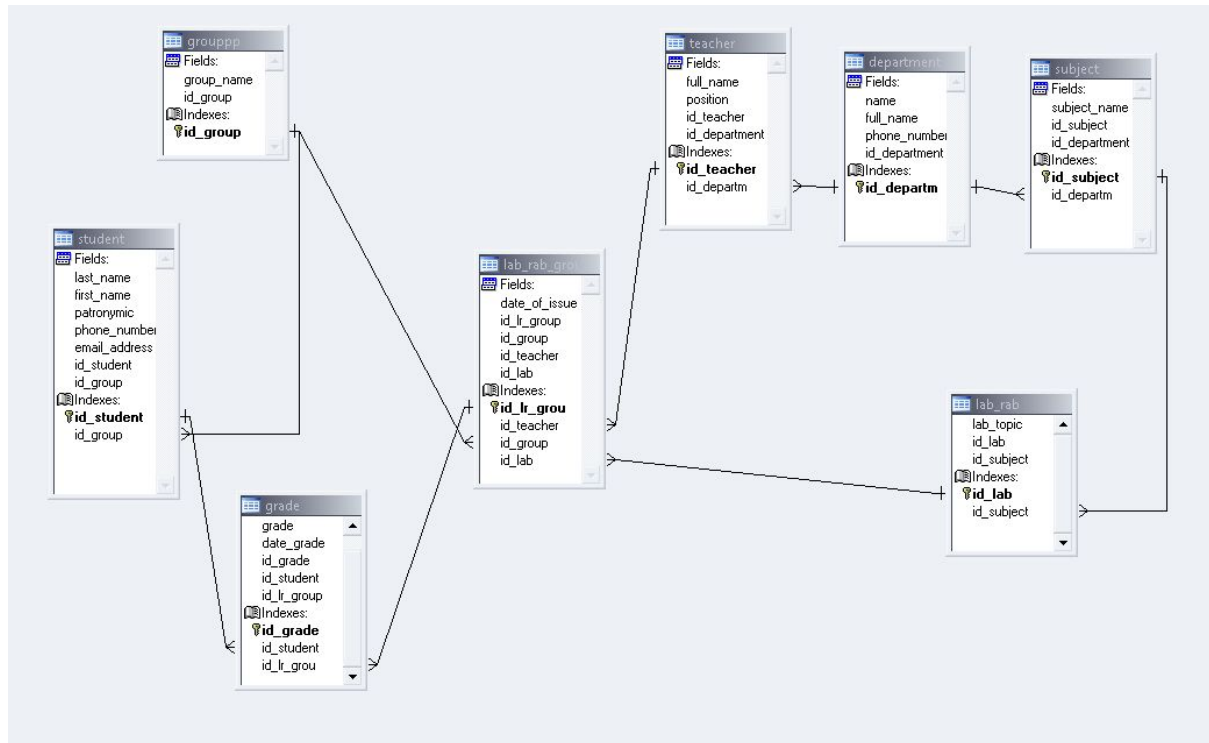


Таблица GROUPPP

Group_name	Id_group
M80-306	1
M80-307	2
M80-303	3
M80-304	4
M80-308	5

Таблица STUDENT

Last_name	First_name	Patronymic	Phone_number	Email_address	Id_student	Id_group
Chigorin	Mikhail	Ivanovich	79235464446	chimikha@mail.ru	1	1
Alekhin	Alexander	Alexandrovich	79233234123	alekhin.alex@rambler.ru	2	1
Botvinnik	Mikhail	Moiseevich	79343143415	botvamm@bk.ru	3	2
Smislov	Vasily	Vasilyevich	79251341235	smisle@gmail.com	4	2
Tal	Mikhail	Nekhemeyevich	77433254213	tal_mikhail@yandex.ru	5	2
Petrosyan	Tigran	Vartanovich	79123441235	tigran.petrosyan@mail.ru	6	3
Spasskiy	Boris	Vasilyevich	79343551341	spass.boris@mail.ru	7	3
Korchnoy	Victor	Lvovich	79431432354	korchvictor@yandex.ru	8	3
Karpov	Anatoliy	Evgenyevich	79543412341	anatoliy_karpov@mail.ru	9	4
Kasparov	Harry	Kimovich	79123413512	harry_kasparov@gmail.ru	10	5
Kramnik	Vladimir	Borisovich	79125234256	kramnik_fide@yandex.ru	11	5

Таблица DEPARTMENT

Name	Full_name	Phone_number	Id_department
dep. 801	Department of physics	79123412152	1
dep. 802	Department of theoretical mechanics	79123412342	2
dep. 806	Department of computational mathematics and programming	79123463453	3

Таблица TEACHER

Full_name	Position	Id_teacher	Id_department
Moseev Dmitry Sergeevich	Assistant professor	1	1
Kodikova Elena Sergeevna	Assistant professor	2	1
Braun Alexander Georgievich	Professor	3	1
Morozov Alexander Valeryevich	Assistant professor	4	3
Filippov Alexey Anatolyevich	Professor	5	3
Kosenko Ivan Ivanovich	Professor	6	2
Belichenko Mikhail Valerievich	Assistant professor	7	2
Kuznetsova Elena Vladimirovna	Assistant professor	8	3
Kindinova Viktoria Valerievna	Assistant professor	9	3

Таблица GRADE

	Grade	Date_grade	Id_grade	Id_student	Id_lr_group
	4	11/13/20	1	1	1
	3	11/30/20	2	1	2
	3	12/31/20	3	1	3
	3	01/01/21	4	1	4
	3	01/04/21	5	1	5
	3	11/13/20	6	2	1
	4	11/30/20	7	2	2
	3	12/31/20	8	2	3
	3	01/03/20	9	2	4
	5	11/15/20	10	3	6
	5	12/01/20	11	3	7
	4	11/10/20	12	3	8
	5	10/14/20	13	3	9
	5	11/20/20	14	3	10
	4	11/15/20	15	4	6
	4	12/01/20	16	4	7
	5	11/10/20	17	4	8
	5	10/14/20	18	4	9
	5	11/20/20	19	4	10
	3	11/15/20	20	5	6
	5	11/05/20	21	5	8
	5	10/14/20	22	5	9
	5	11/20/20	23	5	10
	2	12/01/20	24	5	7
	3	10/03/20	25	6	11
	5	10/14/20	26	6	12
	5	11/24/20	27	6	15
	4	10/03/20	28	7	11
	4	10/14/20	29	7	12
	5	12/10/20	30	7	13
	5	12/24/20	31	7	14
	5	11/20/20	32	7	15
	4	11/24/20	33	8	15
	4	11/22/20	34	9	16
	4	10/13/20	35	9	17
	5	11/29/20	36	9	18
	3	11/26/20	37	9	19
	5	10/12/20	38	9	20
	5	11/27/20	39	10	21
	5	10/07/20	40	10	22
	5	10/21/20	41	10	23
	5	10/15/20	42	10	24
	5	11/12/20	43	10	25
	3	11/27/20	44	11	21
	4	10/07/20	45	11	22
	4	10/21/20	46	11	23
	5	10/15/20	47	11	24
	2	11/12/20	48	11	25

Таблица LAB\_RAB

	Lab_topic	Id_lab	Id_subject
►	Data bases. Basics.	1	4
	Simple light models	2	3
	Electrostatic field study	3	1
	Solenoid magnetic field study	4	1
	Study of external photoeffect	5	1
	Dynamic system modelling	6	2
	Splines	7	4

Таблица LAB\_RAB\_GROUP

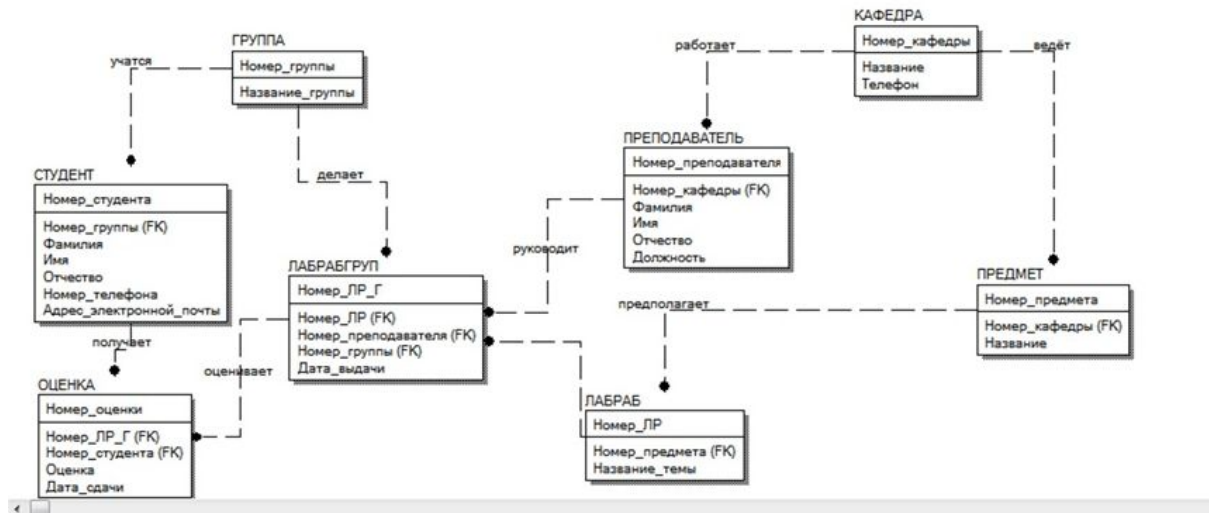
	Date_of_issue	Id_lr_group	Id_group	Id_teacher	Id_lab
	11/13/20	1	1	2	3
	11/30/20	2	1	2	4
	11/15/20	3	1	8	1
	10/14/20	4	1	4	2
	12/10/20	5	1	4	7
	11/15/20	6	2	1	3
	12/01/20	7	2	1	4
	11/10/20	8	2	8	1
	10/14/20	9	2	5	2
	11/20/20	10	2	5	7
	10/03/20	11	3	2	5
	10/14/20	12	3	4	2
	12/10/20	13	3	4	7
	12/31/20	14	3	6	6
	11/24/20	15	3	9	1
	11/22/20	16	4	9	1
	10/13/20	17	4	5	2
	11/29/20	18	4	7	6
	11/26/20	19	4	5	7
	10/12/20	20	4	3	5
	11/27/20	21	5	8	1
	10/07/20	22	5	1	3
	10/21/20	23	5	1	4
	10/15/20	24	5	5	2
►	11/12/2020	25	5	5	7

Таблица SUBJECT

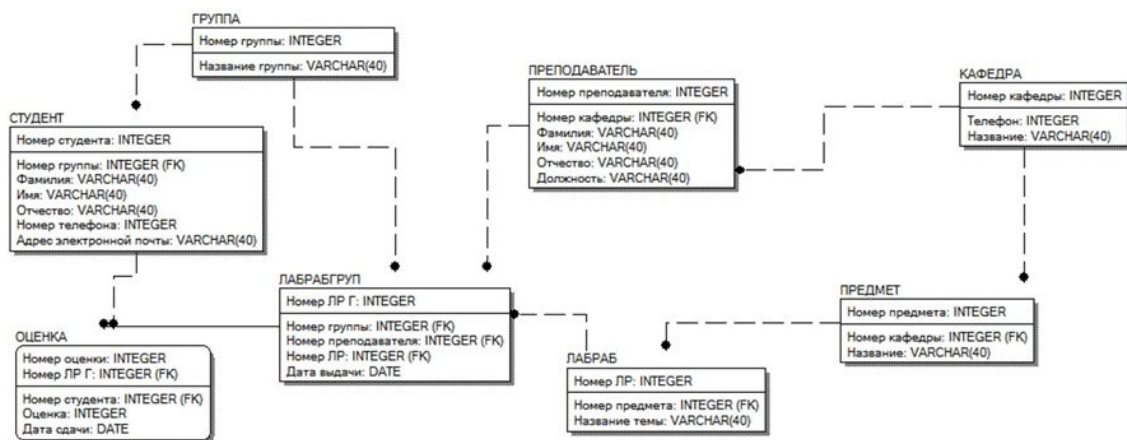
	Subject_name	Id_subject	Id_department
►	Physics	1	1
	Object-oriented modelling	2	2
	Computer graphics	3	3
	Data bases	4	3

# Модель ErWin

## 1) Логическая



## 2) Физическая



CREATE TABLE ГРУППА

```
(  
    Номер_группы      Numeric NOT NULL,  
    Название_группы   Character(20) NULL  
);
```

CREATE TABLE СТУДЕНТ

```
(  
    Номер_студента     Numeric NOT NULL,  
    Номер_группы        Numeric NOT NULL,  
    Фамилия            Character(20) NULL,  
    Имя                Character(20) NULL,  
    Отчество           Character(30) NULL,  
    Номер_телефона       Numeric NULL,  
    Адрес_электронной_почты Character(40) NULL  
);
```

CREATE TABLE ОЦЕНКА

```
(  
    Номер_оценки        Numeric NOT NULL,  
    Номер_студента       Numeric NOT NULL,  
    Номер_ЛР_Г           Numeric NULL,  
    Оценка              Numeric NULL,  
    Дата_сдачи          Date NULL  
);
```

CREATE TABLE КАФЕДРА

```
(  
    Номер_кафедры        Numeric NOT NULL,  
    Название             Character(60) NULL,  
    Телефон              Numeric NULL  
);
```

CREATE TABLE ЛАБРАБ

```
(  
    Номер_ЛР          Numeric NOT NULL,  
    Номер_предмета     Numeric NOT NULL,  
    Название_темы      Character(60) NULL  
);
```

CREATE TABLE ЛАБРАБГРУП

```
(  
    Номер_ЛР_Г         Numeric NOT NULL,  
    Номер_группы        Numeric NOT NULL,  
    Номер_преподавателя  Numeric NOT NULL,  
    Номер_ЛР            Numeric NOT NULL,  
    Дата_выдачи        Date NULL  
);
```

CREATE TABLE ПРЕДМЕТ

```
(  
    Номер_предмета      Numeric NOT NULL,  
    Номер_кафедры       Numeric NOT NULL,  
    Название           Character(20) NULL  
);
```

CREATE TABLE ПРЕПОДАВАТЕЛЬ

```
(  
    Номер_преподавателя  Numeric NOT NULL,  
    Номер_кафедры       Numeric NOT NULL,  
    Фамилия            Character(20) NULL,  
    Имя                Character(20) NULL,  
    Отчество           Character(30) NULL,  
    Должность          Character(40) NULL  
);
```



## Сложные запросы

### 1) Пары преподавателей одной кафедры заданной должности

```
SELECT Teacher.full_name, Teacher.id_department, Teacher.position,;
       Department.name;
FROM ;
       department,;
       teacher;
WHERE Department.id_department = Teacher.id_department;
INTO CURSOR tmp

SELECT a.full_name, b.full_name, a.id_department, a.name;
FROM tmp as a, tmp as b;
WHERE a.id_department == b.id_department;
      AND (a.full_name > b.full_name OR a.full_name < b.full_name);
      AND a.position = b.position;
      AND a.position = 'Assistant professor'|
```

	Full_name_a	Full_name_b	Id_department	Name	
▶	Kodikova Elena Sergeevna	Moseev Dmitriy Sergeevich	1	dep. 801	
	Moseev Dmitriy Sergeevich	Kodikova Elena Sergeevna	1	dep. 801	
	Kindinova Viktoria Valerievna	Morozov Alexander Valeryevich	3	dep. 806	
	Kuznetsova Elena Vladimirovna	Morozov Alexander Valeryevich	3	dep. 806	
	Morozov Alexander Valeryevich	Kuznetsova Elena Vladimirovna	3	dep. 806	
	Kindinova Viktoria Valerievna	Kuznetsova Elena Vladimirovna	3	dep. 806	
	Morozov Alexander Valeryevich	Kindinova Viktoria Valerievna	3	dep. 806	
	Kuznetsova Elena Vladimirovna	Kindinova Viktoria Valerievna	3	dep. 806	

## 2) Преподаватели, которые не ведут заданный предмет

```

SELECT DISTINCT Teacher.full_name;
FROM ;
    lab_rab_group,;
    lab_rab,;
    subject,;
    teacher;
WHERE ( ( Lab_rab.id_lab = Lab_rab_group.id_lab;
AND Subject.id_subject = Lab_rab.id_subject );
AND Teacher.id_teacher = Lab_rab_group.id_teacher );
AND Subject.subject_name = ( "Physics" );
INTO CURSOR tmp

SELECT Teacher.full_name;
FROM ;
    teacher;
WHERE Teacher.full_name NOT IN (SELECT tmp.full_name FROM tmp)|

```

	Full_name	
►	Belichenko Mikhail Valerievich	
	Filippov Alexey Anatolyevich	
	Kindinova Viktoria Valerievna	
	Kosenko Ivan Ivanovich	
	Kuznetsova Elena Vladimirovna	
	Morozov Alexander Valeryevich	

## 3) Преподаватель, у которого максимальное кол-во предметов в заданном семестре

```

SELECT DISTINCT Teacher.full_name, Teacher.id_teacher,;
COUNT(DISTINCT Subject.id_subject) AS sub;
FROM ;
    lab_rab_group,;
    lab_rab,;
    subject,;
    teacher;
WHERE ( ( ( Lab_rab.id_lab = Lab_rab_group.id_lab;
AND Subject.id_subject = Lab_rab.id_subject );
AND Teacher.id_teacher = Lab_rab_group.id_teacher );
AND DATE(2020,9,1) <= Lab_rab_group.date_of_issue );
AND Lab_rab_group.date_of_issue <= DATE(2020,12,31);
GROUP BY Teacher.full_name, Teacher.id_teacher;
INTO CURSOR tmp

SELECT DISTINCT tmp.full_name, tmp.sub FROM tmp;|
WHERE sub = (SELECT MAX(sub) FROM tmp);

```

	Full_name	Sub	
►	Filippov Alexey Anatolyevich	2	
	Morozov Alexander Valeryevich	2	

#### 4) Студенты, у которых оценка по заданной лабе выше средней по группе

```

SELECT Grouppp.group_name, Grouppp.id_group, AVG(Grade.grade) AS avgr;
FROM ;
    grouppp,;
    student,;
    grade;
WHERE Grouppp.id_group = Student.id_group;
    AND Student.id_student = Grade.id_student;
GROUP BY Grouppp.group_name, Grouppp.id_group;
INTO CURSOR tmp

SELECT student.first_name, student.last_name, tmp.avgr, grade.grade, tmp.group_name;
FROM ;
    tmp,;
    student,;
    grade,;
    lab_rab_group,;
    lab_rab;
WHERE (((lab_rab_group.id_lr_group = grade.id_lr_group;
AND grade.id_student = student.id_student);
AND tmp.id_group = student.id_group);|
AND lab_rab.id_lab = lab_rab_group.id_lab);
AND lab_rab.lab_topic = "Electrostatic field study";
AND grade.grade > tmp.avgr;

```

	First_name	Last_name	Avgr	Grade	Group_name
▶	Mikhail	Chigorin	3	4	M80-306
	Mikhail	Botvinnik	4	5	M80-307
	Harry	Kasparov	4	5	M80-308

#### 5) Группа, у которой по заданной лабе у заданного преподавателя средняя оценка максимальна.

```

SELECT Grouppp.group_name, Grouppp.id_group, AVG(Grade.grade) AS avgr;
FROM ;
    grouppp,;
    student,;
    grade,;
    teacher,;
    lab_rab,;
    lab_rab_group;
WHERE ( ( ( ( ( Grouppp.id_group = Student.id_group;
AND Student.id_student = Grade.id_student );
AND Grade.id_lr_group = Lab_rab_group.id_lr_group );
AND Teacher.id_teacher = Lab_rab_group.id_teacher );
AND Lab_rab_group.id_lab = Lab_rab.id_lab );
AND Teacher.full_name = ( "Kuznetsova Elena Vladimirovna" ) );
AND Lab_rab.lab_topic = ( "Data bases. Basics." );
GROUP BY Grouppp.group_name, Grouppp.id_group;
INTO CURSOR tmp

SELECT tmp.group_name, tmp.avgr;
FROM ;
    tmp;
WHERE tmp.avgr = (SELECT MAX(tmp.avgr) FROM tmp)|

```

	Group_name	Avg	
▶	M80-308	4	
	M80-307	4	

6) Предметы, лабораторных работ по которым в заданном семестре выше среднего

```

SELECT Subject.subject_name,;
COUNT(DISTINCT Lab_rab.id_lab) AS countlb;
FROM ;
    subject,;
    lab_rab,;
    lab_rab_group;
WHERE ( ( Subject.id_subject = Lab_rab.id_subject;
AND Lab_rab_group.id_lab = Lab_rab.id_lab );
AND DATE(2020,9,1) <= Lab_rab_group.date_of_issue );
AND Lab_rab_group.date_of_issue <= DATE(2020,12,31);
GROUP BY Subject.subject_name;
INTO CURSOR tmp

SELECT tmp.subject_name, tmp.countlb;
FROM ;
    tmp;
WHERE tmp.countlb > (SELECT AVG(tmp.countlb) FROM tmp);

```

	Subject_name	Countlb	
▶	Data bases	2	
	Physics	3	

7) Придумать и реализовать запрос с предикатом на подзапросе с предложением ALL

Выбрать всех студентов, у которых оценка по заданной лабе выше, чем у любого студента из группы M8O-306

```
SELECT Student.first_name, Student.last_name, Grade.grade,;
       Lab_rab_group.id_lab, Groupppp.group_name;
FROM ;
       student,;
       grade,;
       groupppp,;
       lab_rab_group,;
       lab_rab;
WHERE ( ( ( Grade.id_student = Student.id_student;
AND Groupppp.id_group = Student.id_group );
AND Lab_rab_group.id_lr_group = Grade.id_lr_group );
AND Lab_rab_group.id_lab = Lab_rab.id_lab );
AND Lab_rab.lab_topic = ( "Data bases. Basics." );
INTO CURSOR tmp

SELECT tmp.first_name, tmp.last_name, tmp.grade,tmp.id_lab, tmp.group_name;
FROM ;
       tmp;
WHERE tmp.grade > ALL(SELECT tmp.grade FROM tmp WHERE tmp.group_name = "M8O-306")
```

	First_name	Last_name	Grade	Id_lab	Group_name
►	Mikhail	Botvinnik	4	1	M8O-307
	Vasiliy	Smislov	5	1	M8O-307
	Mikhail	Tal	5	1	M8O-307
	Tigran	Petrosyan	5	1	M8O-303
	Boris	Spasskiy	5	1	M8O-303
	Victor	Korchnoy	4	1	M8O-303
	Anatoliy	Karpov	4	1	M8O-304
	Harry	Kasparov	5	1	M8O-308