

King Saud University  
College of Science  
Department of Mathematics

## Course specification

Foundations of Euclidean and Non-Euclidean Geometry, MATH379

1432H/2011G

Institution : King Saud University

College/Department : College of Sciences / Mathematics department.

### A Course Identification and General Information

1. Course title and code: MATH379

Foundations of Euclidean and Non-Euclidean Geometry

2. Credit hours: 4 (3+1+0)

3. Program(s) in which the course is offered

Bachelor of Science in Mathematics

4. Name of faculty member responsible for the course

Dr. Mohammed Guediri.

5. Level/year at which this course is offered:

Eighth level/ Fourth year

6. Pre-requisites for this course (if any)

Vector Calculus (MATH202) and Linear Algebra (MATH246)

7. Co-requisites for this course (if any):

None

8. Location if not on main campus:

At Diriya, Main campus: College of Science, Building No. 4 for males

At Malaz for females.

### B Objectives

Students enrolled in this course will:

1. Learn the concepts of the Euclidean geometry and Euclid's postulates.
2. Learn the concepts of the non-Euclidean geometry (the geometry of the hyperbolic plane).
3. Learn the concepts of the affine geometry, and get a brief idea about the projective geometry.

1. Summary of the main learning outcomes for students enrolled in the course.
    - Using different kinds of transformations in the Euclidean plane, and using translations, rotations, reflections, dilations and isometries to solve specific problems
    - Distinguish between linear and affine transformations in affine geometry.
    - Distinguish between the notion of parallelism in Euclidean geometry and Hyperbolic geometry.
    - Find the geometric properties of the hyperbolic plane and its transformation group.
    - Understanding advanced (i.e. graduate) courses in differential geometry.
- 
2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field)
    - Using computers in teaching to support presenting the material.
    - Creating a Web site for the material to be available to all students at any time.
    - Homework assignments to be marked in order to keep the students following the course

**C. Course Description** (Note: General description in the form to be used for the Bulletin or Handbook should be attached)

1 Topics to be Covered		
List of Topics	No of Weeks	Contact hours
Axiomatic methods and Axiomatic systems.	2	6
Euclidean geometry: Euclid's postulates.	2	6
Transformations in the Euclidean plane; translations, rotations, reflections, dilations and isometries.	2	6
The parallel postulates and non-Euclidean geometry, the hyperbolic plane.	3	9
Affine geometry: Linear and affine transformations, isometries.	2	6

Finite affine planes.	2	6
A brief introduction to projective geometry.	2	6

2 Course components (total contact hours per semester):				
Lecture:	Tutorial:	Laboratory	Practical/Field work/Internship	Other:
45	30		///	///

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week)

5 hours a week for homework and revision.

4. Development of Learning Outcomes in Domains of Learning  
For each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- The methods of student assessment needed to be used in the course to evaluate learning outcomes in the concerned domain.

**a. Knowledge**

(i) Description of the knowledge to be acquired

- 1- Understanding the theory of non-Euclidean geometry.
- 2- Understanding the theory of Projective geometry.
- 3- Understanding advanced (i.e. graduate) courses in differential geometry.

(ii) Teaching strategies to be used to develop that knowledge

- Lectures
- Contact with Lecturers through office hours.
- Tutorial discussions.
- Homework assignments.

(iii) Methods of assessment of knowledge acquired

- Short quizzes in tutorial classes.
- Two mid term exams.
- Final exam.
- Evaluation of skills during lectures and tutorials.

### **b. Cognitive Skills**

(i) Description of cognitive skills to be developed

- Clarifying the main points of the course
- Ability to link previous knowledge to the new concepts through solving problems.
- Identifying how useful is the material in applications.

(ii) Teaching strategies to be used to develop these cognitive skills

- Lectures
- Directing the students as to how to think in formulating mathematical models through discussions during the lectures...
- Homework assignments.
- The use of modern technology.

(iii) Methods of assessment of students cognitive skills

- Discussions in the class, Quizzes, Homework assignments, and Exams.

### **c. Interpersonal Skills and Responsibility**

(i) Description of the interpersonal skills and capacity to carry responsibility to be developed

Directing students to the way of thinking, handling the material and encouraging them to discuss any minor problems related to the material.

(ii) Teaching strategies to be used to develop these skills and abilities

-The use of different sources for the material
-Correcting home works and directing students to good presentation of these home works.
(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility
-Continuous checking to the students' skills.
-Encouraging students to participate in educational competitions.
<b>d. Communication, Information Technology and Numerical Skills</b>
(i) Description of the skills to be developed in this domain.
-The use of computational tools and presentation of homework.
(ii) Teaching strategies to be used to develop these skills
-Encouraging students to use the available different tools in studying the course.
(iii) Methods of assessment of students numerical and communication skills
Offering prizes to the meritorious students.
<b>e. Psychomotor Skills (if applicable)</b>
(i) Description of the psychomotor skills to be developed and the level of performance required
Not applicable
(ii) Teaching strategies to be used to develop these skills
Not applicable
(iii) Methods of assessment of students psychomotor skills
Not applicable

5. Schedule of Assessment Tasks for Students During the Semester			
Assessme	Assessment task (e.g. essay, test, group project,	Week due	Proportion

nt	examination etc.)		of Final Assessment
1	First midterm exam.	Week 6	20%
2	Second mid term exam.	Week 10	20%
3	Homework and tutorial activities	Over all weeks	10%
4	Final exam	end	50%

#### D. Student Support

1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)
  - 10 scheduled office hours per week
  - 5 hours weekly for academic advice through the academic guidance unit in the department.

#### E Learning Resources

##### 1. Required Text(s):

Linear Geometry, by Artzy Rafael, Dover (2008).

##### 2. Essential References:

Linear Geometry, by K.W. Gruenberg and A. J. Weir, Springer Verlag (1977).

##### 3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)

##### 4- Electronic Materials, Web Sites etc

##### 5- Other learning material such as computer-based programs/CD, professional standards/regulations

#### F. Facilities Required

Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)

##### 1. Accommodation (Lecture rooms, laboratories, etc.)

A maximum of 20 students in each class.

##### 2. Computing resources

Computer labs., modern computers.

##### 3. Other resources (specify --eg. If specific laboratory equipment is required, list

requirements or attach list)

## **G Course Evaluation and Improvement Processes**

### **1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching**

Course evaluation by the students at the end of the semester

### **2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department**

- Analysing the course evaluation conducted by students at the end of the semester
- Observations of the group of faculty teaching the course.
- Discussions within the specialized committee in the department.

### **3 Processes for Improvement of Teaching**

- Workshops on teaching and learning methods conducted by the deanship of skills development.
- Discussing the teaching methods by the group of faculty members teaching the course at the beginning of each semester.

### **4. Processes for Verifying Standards of Student Achievement (eg. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)**

- Check the marking of a sample of student answer sheets in the final exam by an independent faculty member
- Unified exams and group marking when there is more than one group.

### **5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.**

- Reviewing the course contents every five years.
- Updating the text book and references.



**King Saud University  
College of Science  
Mathematics Department**

## **COURSE SPECIFICATION**

**MATH379: Foundations of Euclidean and Non-Euclidean Geometry**

**Kingdom of Saudi Arabia**

**The National Commission for Academic Accreditation &  
Assessment**

Foundations of Euclidean and Non-Euclidean Geometry

Math379

**COURSE SPECIFICATION**

**Revised October 2009**

## Foundations of Euclidean and Non-Euclidean Geometry, MATH379

Institution : King Saud University
College/Department : College of Sciences / Mathematics department.

### A Course Identification and General Information

1. Course title and code: MATH379 Foundations of Euclidean and Non-Euclidean Geometry
2. Credit hours 4 (3+1+0)
3. Program(s) in which the course is offered B.Sc. in Mathematics
4. Name of faculty member responsible for the course <b>Dr Mohammed Guediri.</b>
5. Level/year at which this course is offered Fourth year- eighth level
6. Pre-requisites for this course (if any) MATH202 (Vector calculus) and MATH246 (Linear algebra)
7. Co-requisites for this course (if any) Non
8. Location if not on main campus

### B Objectives

1. Summary of the main learning outcomes for students enrolled in the course. 1- Providing an elementary and geometric introduction to Non-Euclidean Geometry (especially, the geometry of the hyperbolic plane). 2- Understanding advanced (i.e. graduate) courses in differential geometry.
2. Briefly describe any plans for developing and improving the course that are being implemented. (eg increased use of IT or web based reference material, changes in content as a result of new research in the field) - Using computers in teaching to support presenting the material. -Creating a Web site for the material to be available to all students at any time. - Home works and assignments to be marked in order to keep the students following the course

**C. Course Description** (Note: General description in the form to be used for the Bulletin or Handbook should be attached)

1 Topics to be Covered		
List of Topics	No of Weeks	Contact hours
Axiomatic methods and Axiomatic systems.		6
Euclidean geometry: Euclid's postulates.		6
Transformations in the Euclidean plane; translations, rotations, reflections, dilations and isometries.		6
The parallel postulates and non-Euclidean geometry, the hyperbolic plane.		9
Affine geometry: Linear and affine transformations, isometries.		6
Finite affine planes.		6
A brief introduction to projective geometry.		6

4

2 Course components (total contact hours per semester):				
Lecture: 45 hours	Tutorial: 30 hours	Laboratory	Practical/Field work/Internship	Other:

3. Additional private study/learning hours expected for students per week. (This should be an average :for the semester not a specific requirement in each week)

5 hours a week for homework and revision.

4. Development of Learning Outcomes in Domains of Learning  
For each of the domains of learning shown below indicate:

- A brief summary of the knowledge or skill the course is intended to develop;
- A description of the teaching strategies to be used in the course to develop that knowledge or skill;
- The methods of student assessment needed to be used in the course to evaluate learning outcomes in the concerned domain.

<b>a. Knowledge</b>
<p>(i) Description of the knowledge to be acquired</p> <ol style="list-style-type: none"> <li>1- Understanding the theory of non-Euclidean geometry.</li> <li>2- Understanding the theory of Projective geometry.</li> <li>3- Understanding advanced (i.e. graduate) courses in differential geometry.</li> </ol>
<p>(ii) Teaching strategies to be used to develop that knowledge</p> <ul style="list-style-type: none"> <li>- Contact with Lecturers through office hours.</li> <li>- Tutorial discussions.</li> <li>-Homework assignments.</li> </ul>
<p>(iii) Methods of assessment of knowledge acquired</p> <ul style="list-style-type: none"> <li>- Short quizzes in tutorial classes.</li> <li>- Two mid term exams.</li> <li>- Final exam.</li> </ul> <p>- Evaluation of skills during lectures and tutorials.</p>
<b>b. Cognitive Skills</b>
<p>(i) Description of cognitive skills to be developed</p> <p>Reminding the students of what they already studied in related courses to show them how the new concepts make them understand the old concepts and how some of them are generalization of those concepts.</p> <p>Clarifying the main points of the course and linking previous knowledge to the lectures through solving problems.</p>
<p>(ii) Teaching strategies to be used to develop these cognitive skills</p> <ul style="list-style-type: none"> <li>-Directing the students to how to think in formulating mathematical models through discussions during the lectures..</li> <li>- Home works.</li> <li>-The use of modern technology.</li> </ul>
<p>(iii) Methods of assessment of students cognitive skills</p> <ul style="list-style-type: none"> <li>- Communications in class, Quizzes, Tutorials and Exams.</li> </ul>

<b>c. Interpersonal Skills and Responsibility</b>
(i) Description of the interpersonal skills and capacity to carry responsibility to be developed Directing students to the way of thinking, handling the material and encouraging them to discuss Any minor problems related to the material.
(ii) Teaching strategies to be used to develop these skills and abilities -The use of different sources for the material -Correcting home works and directing students to good presentation of these home works.
(iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility -Continuous checking to the students' skills. -Encouraging students to participate in educational competitions.
<b>d. Communication, Information Technology and Numerical Skills</b>
(i) Description of the skills to be developed in this domain. -The use of computational tools and presentation of homework.
(ii) Teaching strategies to be used to develop these skills -Encouraging students to use the available different tools in studying the course.
(iii) Methods of assessment of students numerical and communication skills Offering prizes to the meritorious students.
<b>e. Psychomotor Skills (if applicable)</b>
(i) Description of the psychomotor skills to be developed and the level of performance required Not applicable
(ii) Teaching strategies to be used to develop these skills Not applicable
(iii) Methods of assessment of students psychomotor skills Not applicable

5. Schedule of Assessment Tasks for Students During the Semester			
Assessment	Assessment task (e.g. essay, test, group project, examination etc.)	Week due	Proportion of Final Assessment
1	First midterm exam.	Week 6	20%
2	Second mid term exam.	Week 10	20%
3	Homework and tutorial activities	Over all weeks	10%
4	Final exam	end	50%

### D. Student Support

<p>1. Arrangements for availability of faculty for individual student consultations and academic advice. (include amount of time faculty are available each week)</p> <p style="text-align: center;">Two office hours/week</p>
--

### E Learning Resources

<p>1. Required Text(s):</p> <p>Linear Geometry, by Artzy Rafael, Dover (2008).</p>
<p>2. Essential References:</p> <p>Linear Geometry, by K.W. Gruenberg and A. J. Weir, Springer Verlag (1977).</p>
<p>3- Recommended Books and Reference Material (Journals, Reports, etc) (Attach List)</p>
<p>4- Electronic Materials, Web Sites etc</p>
<p>5- Other learning material such as computer-based programs/CD, professional standards/regulations</p>

### F. Facilities Required

<p>Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.)</p>
<p>1. Accommodation (Lecture rooms, laboratories, etc.) A maximum of 20 students in each class.</p>
<p>2. Computing resources Computer labs., modern computers.</p>
<p>3. Other resources (specify --eg. If specific laboratory equipment is required, list requirements or attach list)</p>

## G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching
2 Other Strategies for Evaluation of Teaching by the Instructor or by the Department
3 Processes for Improvement of Teaching
4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent faculty member of a sample of student work, periodic exchange and remarking of a sample of assignments with a faculty member in another institution)
5. Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.