1. **ASIGNATURA / COURSE TITLE**

**ECUACIONES DIFERENCIALES / DIFFERENTIAL EQUATIONS**

1.1. **Código / Course number**

18873

1.2. **Materia/ Content area**

Differential Equations

1.3. **Tipo /Course type**

Required

1.4. **Nivel / Course level**

Bachelor (first cycle)

1.5. **Year**

2nd

1.6. **Semester**

2nd

1.7. **Credit allotment**

6 ECTS credits

1.8. **Prerequisites**

Some previous knowledge of CALCULUS I and CALCULUS II is highly advisable. Students should be familiar with the notions acquired in SETS AND NUMBERS and LINEAR ALGEBRA.
1.9. **Minimum attendance requirement**

Attendance is obligatory

1.10. **Faculty data**

**Coordinator:**
Ernesto Nungesser  
Módulo 17, Despacho 213 / Module 17, Office 213  
Teléfono 91 497 4946 / Phone: 91 497 4946  
e-mail: ernesto.nungesser@icmat.es  
Horario de atención: previa cita / Office hours: by appointment

**Discussion Class:**
Daniel Estévez Sánchez  
Módulo 17, Despacho 103 / Module 17, Office 103  
Teléfono 91 497 2806 / Phone: 91 497 2806  
e-mail: daniel.estevez@uam.es  
Horario de atención: previa cita / Office hours: by appointment

1.11. **Course objectives**

In this course, we study ordinary differential equations. Solutions are obtained using analytic, geometric and numerical techniques. All three approaches have their advantages, and we will learn when to use the appropriate technique. We begin by deriving a few classical examples with an emphasis on the phenomena that they model. We then discuss first-order equations using all of the techniques mentioned above. Next we study first-order systems. Using techniques from linear algebra, we derive a systematic approach to the solution of linear systems. Unfortunately, nonlinear systems are more difficult to investigate. However, we learn how to apply what we know from the linear case to the nonlinear case. The course concludes with a discussion of the method of separation of variables and the use of Fourier series. Our goal is to be able to say as much as possible about the solutions of a differential equation even if those solutions cannot be expressed in terms of the standard elementary functions (polynomials, rational functions, trigonometric functions, etc.).
1.12. Course contents

1. INTRODUCTION TO DIFFERENTIAL EQUATIONS.
2. ELEMENTARY INTEGRATION.
3. LINEAR SYSTEMS.
4. EXISTENCE, UNIQUENESS AND NUMERICAL METHODS.
5. AUTONOMOUS SYSTEMS IN THE PLANE.
6. INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS.

1.13. Course bibliography


2. Teaching methodology

The teaching consists in lectures, discussion, practical lab and office hours. There will be three hour lectures per week or two one and a half hour lectures per week, depending on the schedule. Discussion is one hour per week.

3. Evaluation procedures and weight of components in the final grade

We will have two in-class midterm exams during the semester. They will be held at usual class time. In addition to the in-class exams, you will be required to submit written homework during the semester. Letter grades will be determined by applying the following weighting schemes to your grades.
Course: DIFFERENTIAL EQUATIONS  
Code: 18873  
Location: Faculty of Sciences  
Degree: Science & Engineering Program Boston University-Faculty of Science UAM  
Fall 2017-Spring 2018  
Type: Compulsory subject  
Number of credits: 6  

Your best in-class exam .................................. 28%  
The other in-class exam .................................. 12%  
The final exam ............................................ 30%  
Homework .................................................. 30%  

In-class exam I  Friday, March 10  
In-class exam I  Thursday, April 27  
Final Exam  Tuesday, May 14  

4. **Course calendar**

<table>
<thead>
<tr>
<th>Week</th>
<th>Contents</th>
<th>Presental Hours</th>
<th>Non Presental Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Part 1</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td>Part 2</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Part 2</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Part 3</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>Part 3</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>Part 3</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>Part 4</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>8</td>
<td>Part 4</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>Part 4</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>Part 5</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>11</td>
<td>Part 5</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>12</td>
<td>Part 5</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>13</td>
<td>Part 6</td>
<td>3+1</td>
<td>6</td>
</tr>
<tr>
<td>14</td>
<td>Part 6</td>
<td>3+1</td>
<td>6</td>
</tr>
</tbody>
</table>

*This is orientative.*