



Universidad  
Carlos III de Madrid  
www.uc3m.es

**COURSE: ROCKET MOTORS**  
**DEGREE: BACHELOR IN AEROSPACE ENGINEERING**

**2017-18**  
**YEAR: 4 TERM: 1**

**WEEKLY PLANNING**

| WEEK                                                                     | SESSION | DESCRIPTION                                                                                        | GROUPS<br>(mark X) |          | SPECIAL<br>ROOM<br>FOR<br>SESSION | the session<br>needs 2<br>teachers?<br>YES/NO | WEEKLY PROGRAMMING FOR STUDENT           |             |                                     |
|--------------------------------------------------------------------------|---------|----------------------------------------------------------------------------------------------------|--------------------|----------|-----------------------------------|-----------------------------------------------|------------------------------------------|-------------|-------------------------------------|
|                                                                          |         |                                                                                                    | LECTURES           | SEMINARS |                                   |                                               | OBSERVATIONS                             | CLASS HOURS | HOMEWORK<br>HOURS (Max.<br>7h week) |
| 1                                                                        | 1       | Introduction. Thrust generation in a rocket                                                        | X                  |          |                                   | NO                                            | Assigned course materials and exercises. | 1.7         | 3                                   |
| 2                                                                        | 2       | Equations of motion of a rocket. Launch trajectory. Rocket staging                                 |                    | X        |                                   | NO                                            | Assigned course materials and exercises. | 1.7         | 3                                   |
| 3                                                                        | 3       | Elements of orbital mechanics and propulsive maneuvers in space                                    | X                  |          |                                   | NO                                            | Assigned course materials and exercises. | 1.7         | 3                                   |
| 4                                                                        | 4       | Review of nozzle flows. Nozzle types. Characteristic velocity                                      |                    | X        |                                   | NO                                            | Assigned course materials and exercises. | 1.7         | 3                                   |
| 5                                                                        | 5       | Thrust coefficient. Real nozzle effects.                                                           | X                  |          |                                   | NO                                            | Assigned course materials and exercises. | 1.7         | 3                                   |
| 6                                                                        | 6       | <b>Laboratory session: water rockets</b>                                                           |                    | X        | X                                 | NO                                            | Do the preparation of lab report         | <b>1.7</b>  |                                     |
|                                                                          | 7       | Review of heat transfer. Reynold's analogy. Bartz' formula. Regenerative cooling. Ablative cooling | X                  |          |                                   | NO                                            | Study for the quiz                       | 1.7         | 3                                   |
| 7                                                                        | 8       | <b>Quiz</b>                                                                                        | X                  |          |                                   |                                               |                                          |             |                                     |
| 8                                                                        | 9       | Solid propellant rockets I                                                                         |                    | X        |                                   | NO                                            | Assigned course materials and exercises. | 1.7         | 3                                   |
| 9                                                                        | 10      | Solid propellant rockets II. Solid rocket design.                                                  | X                  |          |                                   | NO                                            | Assigned course materials and exercises. | 1.7         | 3                                   |
| 10                                                                       | 11      | Liquid rockets I.                                                                                  |                    | X        |                                   | NO                                            | Assigned course materials and exercises. | 1.7         | 3                                   |
| 11                                                                       | 12      | Liquid rockets II. Hybrid rockets                                                                  | X                  |          |                                   | NO                                            | Assigned course materials and exercises. | 1.7         | 3                                   |
| 12                                                                       | 13      | <b>Laboratory session: hybrid rocket test</b>                                                      |                    | X        | X                                 | NO                                            | Do the preparation of lab report         | 1.7         | 3                                   |
| 13                                                                       | 14      | Nuclear propulsion and electric propulsion I                                                       | X                  |          |                                   | NO                                            | Do the preparation of lab report         | 1.7         | 3                                   |
| 14                                                                       | 15      | Electric propulsion II                                                                             |                    | X        |                                   | NO                                            | Do the preparation of lab report         | 1.7         | 3                                   |
| <b>Subtotal 1</b>                                                        |         |                                                                                                    |                    |          |                                   |                                               |                                          | <b>23.4</b> | <b>39</b>                           |
| <b>Total 1 (Hours of class plus student homework between weeks 1-14)</b> |         |                                                                                                    |                    |          |                                   |                                               |                                          | <b>62.4</b> |                                     |
|                                                                          |         | Exam preparation                                                                                   |                    |          |                                   |                                               |                                          | 0           | 6                                   |

|  |                   |  |  |  |  |                                                                           |          |             |
|--|-------------------|--|--|--|--|---------------------------------------------------------------------------|----------|-------------|
|  | Exam preparation  |  |  |  |  |                                                                           | 0        | 6           |
|  | <b>FINAL EXAM</b> |  |  |  |  |                                                                           | <b>3</b> |             |
|  |                   |  |  |  |  | <b>Subtotal 2</b>                                                         | <b>3</b> | <b>12</b>   |
|  |                   |  |  |  |  | <b>Total 2 (Hours of class plus student homework between weeks 15-18)</b> |          | 15          |
|  |                   |  |  |  |  | <b>TOTAL (Total 1 + Total 2. <u>Maximum 90 horas</u>)</b>                 |          | <b>77.4</b> |