# Syllabus

## Subject

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|---|---|
| **Subject / Group** | 11357 - Advances in Nucleic Acid Chemistry: Beyond the Double Helix / 1 |
| **Degree** | Master's in Chemical Science and Technology |
| **Credits** | 3 |
| **Period** | 1st semester |
| **Language of instruction** | English |

### Professors

| **Lecturers** | **Office hours for students** | | | | | |
|---|---|---|---|---|---|---|
| | **Starting time** | **Finishing time** | **Day** | **Start date** | **End date** | **Office / Building** |
| Roberto De la Rica Quesada<br>roberto.drica@uib.es | You need to book a date with the professor in order to attend a tutoring session. | | | | | |

## Context

The course "Advances in Nucleic Acid Chemistry: Beyond the Double Helix" belongs to the Biological Chemistry module of the Master in Chemical Science and Technology. Nucleic acids such as DNA and RNA are versatile materials with a wide variety of functions that go beyond their original biological role. During these lectures the students will be able to familiarize with the utilization of nucleic acids as structural motifs in DNA nanotechnology, as electronic components of nanocircuits, as biorecognition elements in sensors and targeted drug delivery systems, and as biocatalysts. There will be a strong emphasis onrecent developments in this area, which has grown rapidly in the last 10 years.

## Requirements

## Skills

### Specific

* None

### Generic

* G1: being able to abstract, analyze and synthesize information G3: develop the ability of searching, processing and analyzing information from different sources



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## Basic

* You may consult the basic competencies students will have to achieve by the end of the Master's degree at the following address: http://estudis.uib.cat/master/comp_basiques/

## Content

### Range of topics

1. Nucleic acids as structural materials. 1. Nucleic acids as structural materials
   Base pairing. DNA-programmed self-assembly of nanomaterials. Holliday junctions. Self-assembly of DNA nanoobjects. DNA origami.
2. Nucleic acids as electronic materials. 2. Nucleic acids as electronic materials
   Redox properties of nucleic acids. Circuit components made of nucleic acids. DNA nanowires.
3. Nucleic acids as biorecognition elements. 3. Nucleic acids as biorecognition elements
   Aptamers. SELEX. Aptamers for the development of biosensors. Aptamers in drug delivery and drug discovery.
4. Nucleic acids as biocatalysts. 4. Nucleic acids as biocatalysts
   Ribozymes. RNAzymes and DNAzymes. Amplification reactions for ultrasensitive biosensors.

## Teaching methodology

### In-class work activities (0.72 credits, 18 hours)

| Modality | Name | Typ. Grp. | Description | Hours |
|---|---|---|---|---|
| Theory classes | Theoretical lectures | Large group (G) | During these lectures the students will acquire new theoretical knowledge on the subjects described in the "skills" section.<br>M1: expositive method (master class), M3: case study. A1: theoretical lecture | 11 |
| Practical classes | Practical work | Medium group (M) | The students will use the previously acquired theoretical knowledge to solve problems. They will also be prompted to expose their findings in front of an audience.<br>M4: learning based on problem solving. A2: pratical lectures | 7 |

At the beginning of the semester a schedule of the subject will be made available to students through the UIBdigital platform. The schedule shall at least include the dates when the continuing assessment tests will be conducted and the hand-in dates for the assignments. In addition, the lecturer shall inform students as to whether the subject work plan will be carried out through the schedule or through another way included in the Aula Digital platform.



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## Distance education tasks (2.28 credits, 57 hours)

| Modality | Name | Description | Hours |
|---|---|---|---|
| Individual self-study | Literature research project | The students will have to develop in depth one particular theme of the module. This activityinvolves searching for information in databases<br>A24: literature search, data treatment and thesis writing. M10: personal tutoring M11: thesis writing | 27 |
| Individual self-study | literature review | The students will write a literature review.A24: literature search, data treatment and thesis writing. M10: personal tutoring M11: thesis writing | 30 |

## Specific risks and protective measures

The learning activities of this course do not entail specific health or safety risks for the students and therefore no special protective measures are needed.

# Student learning assessment

## Frau en elements d'avaluació

In accordance with article 33 of Regulation of academic studies, "regardless of the disciplinary procedure that may be followed against the offending student, the demonstrably fraudulent performance of any of the evaluation elements included in the teaching guides of the subjects will lead, at the discretion of the teacher, a undervaluation in the qualification that may involve the qualification of "suspense 0" in the annual evaluation of the subject".

### Practical work

| | |
|---|---|
| Modality | Practical classes |
| Technique | Papers and projects **(non-retrievable)** |
| Description | The students will use the previously acquired theoretical knowledge to solve problems. They will also be prompted to expose their findings in front of an audience. M4: learning based on problem solving. A2: pratical lectures |
| Assessment criteria | Participates in discussions. A2 practical lectures. M2: problem solving. Competences: G1 and G3. |

Final grade percentage: 25%with a minimum grade of 5



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### Literature research project

| | |
|---|---|
| Modality | Individual self-study |
| Technique | Papers and projects **(retrievable)** |
| Description | The students will have to develop in depth one particular theme of the module. This activityinvolves searching for information in databases A24: literature search, data treatment and thesis writing. M10: personal tutoring M11: thesis writing |
| Assessment criteria | Finds relevant information, shows critical thinking. A24. literature search, data treatment and thesis writing. M11 thesis writing.Competences: G1 and G3. |

Final grade percentage: 35%with a minimum grade of 5

### literature review

| | |
|---|---|
| Modality | Individual self-study |
| Technique | Papers and projects **(retrievable)** |
| Description | The students will write a literature review.A24: literature search, data treatment and thesis writing. M10: personal tutoring M11: thesis writing |
| Assessment criteria | Well-written and easy-to-follow assay.A24. literature search, data treatment and thesis writing. M11 thesis writing.Competences: G1 and G3. |

Final grade percentage: 40%with a minimum grade of 5

## Resources, bibliography and additional documentation

The bibliography consists in research papers that will be provided to the students during the lectures.



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