Scientific project design in cell and developmental biology

Gönczy Pierre, Oates Andrew Charles

<table>
<thead>
<tr>
<th>Cursus</th>
<th>Sem.</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioingénierie</td>
<td>MA1, MA3</td>
<td>Opt.</td>
</tr>
<tr>
<td>Sciences du vivant</td>
<td>MA1, MA3</td>
<td>Opt.</td>
</tr>
<tr>
<td>Sciences et technologies du vivant</td>
<td>MA1</td>
<td>Opt.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Language</th>
<th>English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credits</td>
<td>5</td>
</tr>
<tr>
<td>Withdrawal</td>
<td>Unauthorized</td>
</tr>
<tr>
<td>Session</td>
<td>Winter</td>
</tr>
<tr>
<td>Semester</td>
<td>Fall</td>
</tr>
<tr>
<td>Exam</td>
<td>During the semester</td>
</tr>
<tr>
<td>Workload</td>
<td>150h</td>
</tr>
<tr>
<td>Weeks</td>
<td>14</td>
</tr>
<tr>
<td>Hours</td>
<td>5 weekly</td>
</tr>
<tr>
<td>Lecture</td>
<td>2 weekly</td>
</tr>
<tr>
<td>Exercises</td>
<td>3 weekly</td>
</tr>
</tbody>
</table>

Remarque
only one registration per student to a scientific thinking course

Summary
Students are lead to understand selected concepts in cell and developmental biology, primarily through the analysis of scientific literature, and then to apply these concepts to the design and execution of a group project in the Gönczy or Oates laboratory.

Content
Students are introduced to different model systems and experimental approaches that are used to address fundamental questions in cell and developmental biology; the importance of control experiments is emphasized. Students will read, analyze and discuss scientific literature (see Teaching Methods section below for more information). Topics covered in 2018 include: cell cycle, spindle assembly, motor proteins, intraflagellar transport, asymmetric cell division, early embryonic development, cell death, signaling, organizer function, somite formation. During the last four weeks of the course, students will harness the knowledge acquired during the preceding weeks to design and execute a scientific group project in the Gönczy or Oates laboratory.

Keywords
Cell biology, developmental biology, yeast, Xenopus, C. elegans, Drosophila, mouse, zebrafish, embryo, experimental approaches, research strategies, scientific literature analysis, scientific project design.

Learning Prerequisites

Required courses
Bachelor, preferably in the Life Sciences, but motivated students from other disciplines are welcome, as are doctoral students.

Recommended courses
None

Important concepts to start the course
None

Learning Outcomes
By the end of the course, the student must be able to:
• Recognize strengths and weaknesses of different experimental systems
• Explain figures of a scientific paper
• Realize the importance of control experiments
• Deduce conclusions from experimental data
• Distinguish key experiments from less important ones
• Propose next experiments to be conducted in a scientific study
• Use acquired knowledge to design and execute a scientific project

Transversal skills
• Access and evaluate appropriate sources of information.
• Summarize an article or a technical report.
• Take feedback (critique) and respond in an appropriate manner.

Teaching methods
The course is organized as follows in most weeks: in the first 60 minutes, scientific literature that has been read and analyzed by the students will be presented by them and discussed; in the last 30 minutes, the teacher introduces the topic of the following week and provides 1 or 2 (depending on the week) scientific paper(s) to read and analyze for the following week.
During the last four weeks of the course, students form groups and use the knowledge gained until then to design and execute a small scientific project embedded in the research conducted in the Gőnczy and Oates laboratories.

Expected student activities
In addition to attending class, students are expected to thoroughly read and analyze the papers, so that they can participate actively in the presentations and discussions. Moreover, they are expected to show dedication during the project design and execution in the last four weeks. Four hours of personal study per week are expected on average.

Assessment methods
Students will be evaluated during the semester on the quality of the presentations and discussions in class (1/3 of the grade), on a continuous evaluation in the middle of the semester (1/3 of the grade), and on the scientific project design and execution component (1/3 of the grade).

Supervision
Office hours | Yes
Assistants | No
Forum | No
Others | By email appointment

Resources
Bibliography
Scientific papers will be made available through Moodle.

Notes/Handbook
The lectures slides will also be made available through Moodle.