UCLouvain

# lmat2940

*2023*

# Advanced topics in mathematics 4

| 5.00 credits | 0 h + 22.5 h | Q2 |
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**This biannual learning is being organized in 2023-2024**

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| Teacher(s) | Ramos Gonzalez Julia ; |
| Language : | English |
| Place of the course | Louvain-la-Neuve |
| Prerequisites | Depending on the subject, mathematics skills at the level of the end of the Bachelor in Mathematics or first year Master in Mathematics. |
| Main themes | The topic considered varies from year to year depending on the research interests of the course instructor. |
| Learning outcomes | **At the end of this learning unit, the student is able to :**<br>1<br>Contribution of the course to learning outcomes in the Master in Mathematics programme. By the end of this activity, students will have made progress in:<br>• Show evidence of independent learning.<br>• Analyse a mathematical problem and suggest appropriate tools for studying it in depth.<br>• Begin a research project thanks to a deeper knowledge of one or more fields and their problematic issues in current mathematics. He will have made progress in:<br>• Develop in an independent way his mathematical intuition by anticipating the expected results (formulating conjectures) and by verifying their consistency with already existing results.<br>• Ask relevant and lucid questions on an advanced mathematical topic in an independent manner.<br>Learning outcomes specific to the course.<br>The course aims to initiate research in the field under consideration. Specific learning outcomes vary depending on the field. |
| Evaluation methods | Written + oral examination to assess the practical and theoretical skills acquired by the students. |
| Teaching methods | Lectures with active participation from the students. Some exercises will be suggested during the course and discussed in class if the students wish. |
| Content | 1. Broad introduction to Random Matrix Theory.<br>2. Random matrix models with unitary symmetry and their relation to Orthogonal Polynomials.<br>3. Brief introduction to Determinantal Point Processes.<br>4. Steepest descent method for contour integrals in the complex plane, applications to Airy and Hermite functions.<br>5. The Gaussian Unitary Ensemble: Wigner's semicircle law, local statistics in the bulk and at the edge of the spectrum.<br>6. Riemann-Hilbert approach to Orthogonal Polynomials and Universality for random matrix models with unitary symmetry. |
| Inline resources | Moodle page |
| Faculty or entity in charge | MATH |

| Programmes containing this learning unit (UE) | | | | |
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| Program title | Acronym | Credits | Prerequisite | Learning outcomes |
| Master [120] in Mathematics | MATH2M | 5 | | 🔍 |