**Content**

| Course Code | Course Name | Semester | Theory | Practice | Lab | Credit | ECTS |
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| ING251 | Advanced Mathematics I | 3 | 2 | 1 | 0 | 2.5 | 4 |

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| Prerequisites | |
| Admission Requirements | |
| Language of Instruction | French |
| Course Type | Compulsory |
| Course Level | Bachelor Degree |
| Objective | This course is the continuation of the Math I course.<br>In this context, the objectives of this course are:<br><br>- Demonstrate to the students the classical techniques [integration by parts and change of variables] to calculate a primitive,<br>- Teach students to handle the comparison relations "to be negligible in front of" and "to be equivalent to" on functions,<br>- Teach how to find a "" simple "" equivalent of a point function to find its limit,<br>- Demonstrate the different convergence criteria for the integrals of positive functions,<br>- Explain in which cases a limited expansion makes it possible to determine the nature of an integral,<br>- Demonstrate the different convergence criteria for series with positive terms,<br>- Explain in which cases a limited development makes it possible to determine the nature of a series |
| Content | 1. Primitives: Definition, properties and first examples.<br>2. Primitives: Calculation rules [integration by parts and change of variable]<br>3. Comparison relations: function negligible in front of another, function equivalent to another<br>4. Comparison relations: calculation rules, comparative growth of logarithms, powers and exponential in 0 and infinity.<br>5. Comparison relations: Application to the search for limits.<br>6. Generalized integrals: definition, properties and first examples [Riemann integrals and Bertrand integrals].<br>7. Generalized integrals: comparison theorems for positive functions.<br>8. Generalized integrals: case of functions of any sign.<br>9. Partial Examination / Ara sinav<br>10. Generalized integrals: Integrals depending on a parameter<br>11. Numerical series: definition, properties and first examples [Riemann series and Bertrand series].<br>12. Numerical series: comparison theorems for series with positive terms.<br>13. Numerical series: Case of series of any sign. Convergence criterion of alternating series.<br>14. Digital Series: Series depending on a parameter |
| References | 1. Lectures notes ans worksheets<br>2. http://braise.univ-rennes1.fr/braise.cgi<br>3. http://www.unisciel.fr |

**Theory Topics**

| Week | Weekly Contents |
|---|---|
| 1 | Reminders: Derivation, usual functions and limited developments |
| 2 | Primitives: Definition, Interpretation and Properties |
| 3 | Primitives: Calculation methods (integration by part) |
| 4 | Primitives: Calculation methods (integration by part) |
| 5 | Primitives: Calculation methods (cases requiring several successive methods) |
| 6 | Comparison of functions: Definition and interpretation |
| 7 | Comparing functions: Practical search for the equivalent of a function |
| 8 | Comparing functions: Practical search for the equivalent of a function (continued) |
| 9 | Midterm exam |
| 10 | Generalized integrals: Definition, Interpretation and Properties |
| 11 | Generalized integrals: Case of positive functions |
| 12 | Generalized integrals: Case of functions of any sign |
| 13 | Generalized integrals: Semi-convergent integrals |
| 14 | Preparing for the final exam |