

## Content

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

Prerequisites	
Admission Requirements	

Language of Instruction	French
Course Type	Compulsory
Course Level	Bachelor Degree
Objective	<p>This course is the continuation of the Math I course. In this context, the objectives of this course are:</p> <ul style="list-style-type: none"> <li>- Demonstrate to the students the classical techniques [integration by parts and change of variables] to calculate a primitive,</li> <li>- Teach students to handle the comparison relations "to be negligible in front of" and "to be equivalent to" on functions,</li> <li>- Teach how to find a "" simple "" equivalent of a point function to find its limit,</li> <li>- Demonstrate the different convergence criteria for the integrals of positive functions,</li> <li>- Explain in which cases a limited expansion makes it possible to determine the nature of an integral,</li> <li>- Demonstrate the different convergence criteria for series with positive terms,</li> <li>- Explain in which cases a limited development makes it possible to determine the nature of a series</li> </ul>
Content	<ol style="list-style-type: none"> <li>1. Primitives: Definition, properties and first examples.</li> <li>2. Primitives: Calculation rules [integration by parts and change of variable]</li> <li>3. Comparison relations: function negligible in front of another, function equivalent to another</li> <li>4. Comparison relations: calculation rules, comparative growth of logarithms, powers and exponential in 0 and infinity.</li> <li>5. Comparison relations: Application to the search for limits.</li> <li>6. Generalized integrals: definition, properties and first examples [Riemann integrals and Bertrand integrals].</li> <li>7. Generalized integrals: comparison theorems for positive functions.</li> <li>8. Generalized integrals: case of functions of any sign.</li> <li>9. Partial Examination / Ara sinav</li> <li>10. Generalized integrals: Integrals depending on a parameter</li> <li>11. Numerical series: definition, properties and first examples [Riemann series and Bertrand series].</li> <li>12. Numerical series: comparison theorems for series with positive terms.</li> <li>13. Numerical series: Case of series of any sign. Convergence criterion of alternating series.</li> <li>14. Digital Series: Series depending on a parameter</li> </ol>
References	<ol style="list-style-type: none"> <li>1. Lectures notes ans worksheets</li> <li>2. <a href="http://braise.univ-rennes1.fr/braise.cgi">http://braise.univ-rennes1.fr/braise.cgi</a></li> <li>3. <a href="http://www.unisciel.fr">http://www.unisciel.fr</a></li> </ol>

## 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)

Week	Weekly Contents
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