



## Course Specification Document

<b>Title</b>	Further Topics in Real Analysis
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<b>Credits</b>	7 ECTS
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<b>Aims</b>	This course aims to introduce the student to the concept of Taylor expansion of a function and its applications in studying a real function and in calculating a limit, and to the concept of integration and its applications in calculating areas and volumes. It also aims to provide the student with the knowledge and skills related to studying the convergence of sequences and series and calculating the limit of a sequence and the sum of a series.
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<b>Intended learning outcomes</b>
On successful completion of this course, the student will be able to: <ul style="list-style-type: none"><li>• Use Taylor expansion to find limits and asymptotes.</li><li>• Find the primitives of a continuous function and calculate integrals.</li><li>• Study the convergence of sequences and series.</li><li>• Calculate the limit of a sequence and the sum of a series.</li></ul>

<b>Syllabus</b>
<ul style="list-style-type: none"><li>• <b>Taylor expansion:</b> Comparing two function – using the "little o" and "big O" notations, Taylor theorem, expansions of useful functions, use of Taylor expansion to evaluate limits and to find asymptotes.</li><li>• <b>Integration:</b> Primitive of a function, indefinite integral, integration by parts, substitution in integrals, integral of rational functions, area under a curve, definite integrals, inequalities and integrals, integration involving trigonometric functions, volume of solids of revolution, length of a curve, some numerical methods to estimate integrals.</li><li>• <b>Numerical sequences:</b> Convergence, monotonic sequences, study of a sequence defined recursively, subsequences of a sequence, Bolzano-Weierstrass theorem, Cauchy's test for convergence of a sequence, use of sequences to study the limit of a function, Cauchy's criterion for existence of function limit.</li><li>• <b>Numerical series:</b> Partial sums, convergence of series, series with non-negative terms, comparison of series, useful series (Geometric series, Riemann Series), the root test and the ratio test, absolute convergence vs. conditional convergence, Abel's test, use of Taylor expansion in the study of convergence, Taylor expansion with integral remainder term, series expansion.</li></ul>