Mathematics 114 Module outline

Self-study: Revision of coordinate geometry & straight lines
These are topics that you should be familiar with from school. Some students forget some of this material by the time they start their first year, and therefore need to revise them. These topics are all required for Calculus topics later on.
Week 1: Sets and logic
Everything in mathematics builds on sets and logic.
Week 2 & 3: Numbers, inequalities, absolute values, trigonometry and radian measure, functions, inverse functions
We spend some time revising numbers, how to solve basic inequalities and trigonometry. We introduce radian measure, the absolute value function and solve some absolute value inequalities. Most students will have seen functions at high school, but for Calculus you will need an improved understanding of functions. We will discuss properties of functions that you may not have come across, relate them to sets and statements, and later revisit them from the point of view of Calculus. We introduce the concept of the inverse of a function and what it means to be injective (one-to-one).
Week 4: Limits
The concept of a limit is one of the most important concepts in the course and underlies two of the other important concepts, derivatives and definite integrals.
Week 5: Continuity & Derivatives, Basic Properties and Functions
We study continuity and introduce the derivative. It is the most important concept in this course, and most of the course revolves around it. First we define it and develop some properties, then we learn how to differentiate most elementary functions, and then we show how it can be applied.
Week 6: Induction & the Binomial Theorem
Induction is a proof technique that entails finding a pattern and explaining why it always continues. This is a very useful technique for finding and proving formulas for various things. We also study the Binomial Theorem and applications of it.
Week 7: Derivatives. Trigonometric Derivatives and Product/Quotient/Chain Laws
Here we develop the techniques that allow us to differentiate most elementary functions.
Week 8: Exponential & logarithmic functions & Related Rates
We show how to make sense of arbitrary exponential functions and define logarithmic functions as their inverses. We discuss an application of derivatives.

Week 9: Rates of Change, Max & Min values
The first section gives you some idea of how Calculus may be used in practice. We also begin develop the theory that allow us to use Calculus to find minimum and maximum values. This discussion continues into the next week.
Week 10: Mean Value Theorem, How derivatives affect the shape of a graph
Towards the end of the week we begin studying how derivatives affect the shape of a graph, the start of learning how to sketch and read a graph.
Week 11: Infinite limits, Horizontal asymptotes and Graph sketching
The reason for learning how to sketch graphs of functions is to consolidate the understanding of the relation between a function and its derivative and to be able to read a graph. As exercises you will need to sketch the graphs of some functions to see this principle in action.
Week 12: Anti-derivatives and Definite integrals
If you want to know if you understand something, see if you can do it in reverse. But that's not the only reason for introducing anti-derivatives. They will also provide a connection to integration. Definite integrals are a way of calculating areas.
Week 13: Fundamental Theorem of Calculus
The Fundamental Theorem provides a connection between differentiation and integration and is the most important result in Calculus, since it allows the efficient calculation of integrals.
Week 14: Optimisation, Newton's Method
As said earlier, optimisation is probably the main application of differentiation and is how it will mostly be applied in practice.