COURSE DETAILS
Course Code: F17SH
Full Course Title: Mathematics for Scientists 2
SCQF Level: 7
SCAF Credits: 15
Available as Elective: Yes

DELIVERY LEVEL
Undergraduate: Yes
Postgraduate Taught: No
Postgraduate Research: No
Additional Information:

COURSE AIMS
This course provides an introduction to mathematics and its use in physical and life sciences, aimed at students who have not specialized in mathematics:

- Give an overview of differentiation rules
- Apply differentiation to functions with relevance to physical sciences
- Illustrate the use of differentiation in identifying maxima and minima and rates of processes
- Provide an introduction to integration, integration techniques.
- Illustrate applications of integrals and integration
- Introduce vectors, and scalar multiples, scalar and cross product
- Describe elementary manipulation of matrices and their use in solving sets of linear equations
- Introduce the basic concepts of complex numbers
### LEARNING OUTCOMES – SUBJECT MASTERY

By the end of the course, students should be able to:

- differentiate elementary and composite functions
- understand the geometric interpretation of the derivative of a function as the slope of its graph
- compute higher derivatives of a function and interpret them geometrically
- use techniques of differentiation in curve sketching and in solving problems arising in the natural sciences
- check if a given function satisfies an ordinary differential equation
- calculate indefinite and definite integrals of elementary function
- understand the geometrical meaning of a definite integral
- apply the technique of integration by substitution and parts to simple examples
- apply techniques of integration to compute expectation values and averages
- understand the concept of a vector
- add vectors and multiply them by scalars
- compute inner products and lengths of vectors, as well as angles between two vectors
- use vectors and inner products to compute geometric properties of three-dimensional objects
- add, subtract, multiply and divide complex numbers
- draw complex numbers in the Argand diagram
- compute the complex conjugate and modulus of a complex number
- represent and manipulate complex numbers in modulus-argument form

### LEARNING OUTCOMES – PERSONAL ABILITIES

- Demonstrate the ability to learn independently
- Demonstrate knowledge of an area of mathematics.
- Manage time, work to deadlines and prioritise workloads

### SYLLABUS

**Differentiation:** Derivatives of elementary functions, the product, quotient and chain rules, increasing and decreasing functions, higher derivatives, maxima and minima, rates of various processes

**Integration:** Indefinite and definite integrals, integrals of elementary functions, area under a curve, integration by substitution and by parts, the average and expectation value, introduction to differential equations

**Vectors:** Concept of a vector, addition and multiplication by scalar, inner product of vectors, length, unit vectors, angle between vectors

**Complex numbers:** Real and imaginary parts, arithmetic of complex numbers, complex conjugate, modulus and argument
F17SH Mathematics for Scientists 2

Note: Higher Maths at grade C or equivalent is required to gain entry onto this course

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