Math431 `Introduction to Modern Particle Theory’ introduces students to the basic theoretical ingredients that underlie modern particle physics.  The module is self contained and introduces all the basic concepts required. Basic knowledge of calculus MATH101 is in principle sufficient. Some familiarity with Math325 `Quantum Mechanics’ and Math326 ‘Relativity’ is useful, though not necessary. Most of the available experimental data in the subatomic domain is parametrised in terms of the Standard Model that utilises the concept of gauge symmetries and their breaking by the Higgs mechanism. The aim of the module is to describe the basic ingredients that underlie the Standard Model. By the end of the module the students will learn how the Higgs mechanism generates masses for the weak interaction vector bosons, while keeping the photon massless. The module starts out with introduction of the Lorentz and Poincare groups and the relation between unitary groups and Lie algebras. It continues with the an overview of classical Lagrangian and Hamiltonian formalisms; the concept of an action and its application to classical fields. The Klein-Gordon equation and its canonical quantisation are introduced, as well as the basic notion of Feynman diagrams. The concepts of global and local symmetries are introduced, which is a review of Maxwell equations and electromagnetism. The Dirac equation and its solutions are introduced as well as the bi-linear currents that can be formed and their properties under charge conjugation and parity transformation. The classification of hadronic resonances is discussed and the emergence of flavour symmetries and their violation by the weak interactions. The Higgs mechanism and its application in the Standard Model are introduced. The module sets the students on their path towards Research Connected Teaching (**RCT**) and introduces concepts and mathematics that underlie our contemporary fundamental understanding of Nature (**GC**).  The module provides the students with the concepts and mathematical tools to master the basic understanding of string theory and to independently solve problems therein (**C**).  Problems classes and tutorials are delivered in active learning (**AL**) mode to enhance students’ confidence and success, and the assessment emphasises both conceptual and problem-solving skills which are essential for further studies and research in the field, and invaluable beyond (**AA**).  The module is delivered by theoretical physicists, who throughout the course provide stimulating connections to active areas of research within the department and the international community.

(**GC** – **C** – **AL** – **AA** – **RCT**)