COURSE SPECIFICATION FORM

DEPARTMENT OF: Mathematics				Academic Session: 2017-18	
Course Code:	MT1210	**Course Value:**	0.5	**Status:**	Optional
Course Title:	Introduction to Applied Mathematics			**Availability:** *(state which teaching terms)*	Term 2
Prerequisites:	MT1710			**Recommended:**	
Co-ordinator:					
Course Staff					
Aims:	The aim of this course is to provide an introduction to some key ideas and methods of classical mechanics, chaos theory and special relativity. The course covers Newton's equations of motion for a single particle, shows how these equations can give rise to chaotic behaviour, and shows how they need to be modified for velocities close to the speed of light.				
Learning Outcomes:	On completion of the course, the student should be able to: • solve Newton's equations of motion for a variety of problems, including the damped, driven harmonic oscillator; • use Mathematica where a closed solution cannot be found; • use the conservation laws for energy and momentum; • work with co-ordinate systems that accelerate or rotate; • explain how chaos arises for the forced pendulum; • state Einstein's principle of relativity and explain how it leads to special relativity; • use the Lorentz transformation and draw Minkowski diagrams.				
Course Content:	**Classical Dynamics:** Dimensional analysis, units, forces. Newton's laws, One dimensional motion; Conservation of energy and momentum. Stable and unstable equilibrium points. Simple Harmonic motion, damped and harmonic forced motion. Three dimensional motion. Projectile in the presence of friction. Circular motion. Angular momentum. Numerical solution of Newton's equation, application to planetary motion, Coriolis force. **Chaos**: The damped forced pendulum. Limit cycles, attractors. Period doubling. Chaotic motion of three gravitating bodies. **Special Relativity:** Galilean invariance. Inertial systems. Einstein's principle of relativity. The Lorentz transformation. Length contraction, time dilation, the twin paradox. The geometry of space-time. Energy-mass equivalence $E = mc^2$.				
Teaching & Learning Methods:	33 hours of lectures and examples classes, 8 hours of workshops. 109 hours of private study, including work on problem sheets and examination preparation. This may include discussions with the course leader if the student wishes.				
Key Bibliography:	Mechanics – P Smith & R C Smith (Wiley) 2nd edition. *Library Ref. 531 SMI*				
Formative Assessment & Feedback:	Formative assignments in the form of 8 problem sheets. The students will receive feedback as written comments on their attempts.				
Summative Assessment:	**Exam** (%) A two-hour paper: 75% **Coursework** (25%) Attempting problem sheets 10% Writing skills group project 10% Explorations in Mathematica 5%				

The information contained in this course outline is correct at the time of publication, but may be subject to change as part of the Department's policy of continuous improvement and development. Every effort will be made to notify you of any such changes.