COURSE SPECIFICATION FORM

for new course proposals and course amendments

DEPARTMENT OF MATHEMATICS				**Academic Session: 2017-18**	
Course Code:	MT2800	**Course Value:**	0.5	**Status:**	Mandatory for Mathematics, Mathematics majors, and Mathematics joints other than LG11 and NG31 for which it is optional
Course Title:	Linear Algebra and a Group Project			**Availability:** *(state which teaching terms)*	Term 1
Prerequisites:	MT1820			**Recommended:**	none
Co-ordinator:					
Course Staff:					
Aims:	• To develop the matrix theory covered in MT1820. • To learn how to put together different aspects of mathematics via a project. • To improve spoken and written communication.				
Learning Outcomes:	On completion of the course, the student should be able to: • understand rank and nullity of a linear map and the connection between them; • calculate orthonormal bases; • diagonalise real symmetric matrices; • check positivity of a real symmetric matrix in various ways; • apply the least squares method; • work in a team to prepare a (mathematical) report and a presentation.				
Course Content:	**Linear algebra:** Laplace expansion of determinants, minors and cofactors. Bases and change of basis. Linear maps and their matrix representations. Range and kernel. Row rank, column rank, rank and nullity. Sylvester's law of nullity. Diagonalisation of a diagonalisable matrix. Algebraic and geometric multiplicities. Introduction to Jordan normal form. Abstract definition of an inner product. Orthonormal bases. Gram-Schmidt orthogonalisation procedure. Symmetric and positive definite matrices. Quadratic and positive definite forms. Bringing a quadratic form into canonical form. Sylvester's law of inertia. Testing positivity of a real symmetric matrix. Change between orthonormal bases. Orthogonal matrices. Spectral theorem. Singular value decomposition of real matrices. Least squares approximation. Moore-Penrose inverse. **Project:** Do's and dont's of giving an effective presentation. Preparation of a small project on a mathematical topic chosen from an approved list, together with three or four other students. Writing of an agreed project on the project, and a joint oral presentation on the project.				
Teaching & Learning Methods:	28 hours of lectures and examples classes, 10 hours of problem workshops, 12 hours of group study and preparation of report and oral presentation 100 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:	Linear Algebra: a Modern Introduction – D Poole (Brooks-Cole) *512.3 POO Friedberg, Insel, Spence 'Linear Algebra'*				
Formative Assessment & Feedback:	Formative assignments in the form of 8 problem sheets. The students will receive feedback as written comments on their attempts. For the project, the students in each group will receive 30 minutes of guidance from a staff member, who may comment on one draft.				
Summative Assessment:	**Exam** (%) A two-hour paper: 80% **Coursework** (%) Group project (see above): oral presentation in which each student must participate (max 20 minutes total) 10%; written report 10%. The written report must be word-processed and no more than 3000 words in length. Two copies will be required. It should be submitted jointly, with all group members signing a form to indicate that it was their agreed work. In addition, each student must submit a signed short statement (no more than a page of A4) indicating in general terms their own contribution to the project. In order to pass the course, the group project must be passed (IPR). **Deadlines:** Report deadline: Monday of the second from last week of teaching, oral presentation during final week of term 1.				