Engineering Scholarship Examinations 2017

Topics for XSCH3101 Engineering Science I: General mathematics and computer science

Coordinator: Assist. Prof. John Waldron (john.waldron@tcd.ie)

This paper contains 8 questions in two parts (Mathematics and Computing). Students to attempt 4 questions, with 2 questions from each part.

2 questions from 1E1, 1E2:
Chapters 6, 7, 8, 9 of the book Calculus by Anton, Bivens and Davis (10th ed) (the text for the course) and Chapter 1 of Elementary Linear Algebra – Applications Version, Anton and Rorres

2 Questions from 2E1:
Chapters 3 - 6 of Anton-Rorres' book "Elementary Linear Algebra (with applications)"

2 questions from 1E3:
Loops, functions and arrays. Any question will not require detailed specific knowledge of any part of the syllabus, but will be a general problem-solving question such as (from 2008 Foundation Scholarship exam) "Design a program to play othello ... and provide C++ code for specified small parts of the problem."

2 questions from 2E3:
Problem solving using C++ object orientated data structures and algorithms. Includes various number systems covered in 2E3 and binary arithmetic.

Topics for XSCH3102 Engineering Science II: General mechanics and materials

Coordinator: Prof. David Taylor (dtaylor@tcd.ie)

Principles of statics and dynamics, Forces and moments, Structural analysis, Hydrostatics, Friction, Newton's laws, General motion and coordinate systems, Relative motion, Energy and momentum methods, 2D rigid body dynamics, Harmonic motion, Thermal Systems, Thermodynamics and kinetics of chemical reactions, Optics, Atomic structure, Phase diagrams, Properties of Materials, Compound stress and strain, Virtual work, Failure criteria, Beam analysis, Design and analysis of pin jointed structures, Dynamics of machines..

These topics roughly follow the courses and labs associated with 1E4; 1E5; 1E7; 1E10; 2E4.

The paper will have 7 questions, 4 to be attempted.

Topics for XSCH3103 Engineering Science III: General electronics, electricity and instrumentation

Coordinator: Prof. Frank Boland (fboland@tcd.ie)

1E11 Experimental Methods (2015-16 Syllabus Profs Geraghty, Burke, Caulfield)
Static and Dynamic Characteristics of instruments; Quantifying experimental error and line fitting; Data Conversion: analogue-to-digital conversion; Surveying.

1E6 Electrical Engineering (2015-16 Syllabus, Prof Boland)

2E6 Electronics (2016-17 Syllabus, Prof Foley)
Number representation and binary arithmetic; signed numbers; Boolean algebra and standard forms; Karnaugh map minimisation; combinational design and standard combinational elements. CMOS digital circuits. Signals and signal characterisation; resistor networks; signal amplifiers; operational amplifier basics and linear applications.

The paper will have 5 questions, 4 to be attempted