Engineering Scholarship Examinations 2024/25

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

Coordinator: Assist. Prof. Glenn Strong (Glenn.Strong@scss.tcd.ie)

This paper contains 6 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

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

1 question from 1E3:
Loops, functions and multi-dimensional 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. Dermot O'Dwyer (dwodwyer@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; 1E12; 2E4.

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

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

Coordinator: Asst. Prof Justin King (justin.king@tcd.ie)

1E14 Experimental Methods and Data Centric Engineering (Profs. Kennedy, Clarke and Kilper)
Static and dynamic characteristics of instruments; Quantifying experimental error and line fitting; Data conversion: Analogue-to-digital conversion; Traffic demand and forecasting.

1E6 Electrical Engineering (Profs. Farhang and Zhao)
Resistance; capacitance; electrostatics; dc circuit analysis; Kirchhoff's laws; network theorems; analysis of RC circuit transients; number representation and binary arithmetic; signed numbers; Boolean algebra and standard forms; Karnaugh map minimisation; combinational design and standard combinational elements.

2E6 Electronics (Profs. King and Wetterling)
Analysis and classification of analogue electrical signals; introduction to classification and analysis of analogue electrical systems; linear amplifiers; operational amplifiers (op-amps) and their applications; ac network analysis; transient analysis; ac power; frequency response and filters.

The paper will have 5 questions, 4 are to be attempted.