

# Unit 27: Further Electrical Principles

Learning hours: 60

NQF level 4: BTEC Higher Nationals – H2

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## Description of unit

This unit extends learners' knowledge beyond the circuit theory based topics in the core unit *Electrical and Electronic Principles*. It is intended especially, although not exclusively, for those learners who may progress to studies at Degree level.

The electrostatic and electromagnetic section is restricted to systems of symmetric geometry, thereby allowing an analytical treatment via the laws of Gauss and Ampère without requiring a full application of vector calculus. Non-symmetric systems could be investigated via the field plotting/computer methods.

Design of filters is based upon the classical prototype (constant k) methods or the more modern polynomial (Butterworth/Chebyshev) approximation methods.

The treatment of transmission lines is perhaps best limited to the steady-state sinusoidal response and focuses on the aspects of terminated lines and reflections.

The topological aspects of circuit analysis need not include a full cut-set matrix approach. The application of Euler's equation to the circuit graph is sufficient to establish the required number of mesh and nodal equations for circuit analysis.

## Summary of learning outcomes

To achieve this unit a learner must:

- 1 Analyse and describe **electrostatic and electromagnetic fields**
- 2 Design and evaluate **filters**
- 3 Investigate **transmission lines**
- 4 Apply topology to **circuit analysis**.