202: Principles of electrical science  
**Handout 10: Generation of an EMF**

**Learning outcome**

The learner will:

1. Understand the fundamental principles which underpin the relationship between magnetism and electricity.

**Assessment criteria**

The learner can:

5.3 describe the magnetic effects of electrical currents in terms of: (production of a magnetic field, force on a current-carrying conductor in a magnetic field, electromagnetism, electromotive force.).

**Generation of an EMF**

When a conductor cuts through a magnetic field, at right angles to the magnetic flux, an **EMF** (electromotive force) is induced in the conductor.

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| 01 generation.png |

The strength of the induced EMF is determined by:

* the strength of the magnetic flux density (between pole faces) –
* the length of the conductor in the magnetic field –
* the velocity or speed of the conductor through the magnetic field –

We can calculate the EMF by using the following formula.

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| Where: |  |  |  |
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**Example 1**

A conductor of 15cm in length is moved at 20 metre/second (m/s) perpendicularly through a magnetic field of flux density 2 teslas. Calculate the induced EMF.

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**Example 2**

A conductor of 0.5m in length is moved at 30 metre/second (m/s) perpendicularly through a magnetic field of flux density 3 teslas. Calculate the induced EMF.

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The direction of this current can be found by using:

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| **Fleming’s right hand generator rule** |

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| 02 generation.png |
| 06 generation.png |