Government polytechnic Malab,Nuh

Applied Physics - II

Magnetic Effects of Electric Current

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MAGNET - A magnet is a material that produces a field that attracts or repels other such materials of magnetic nature. Lodestone is a naturally occurring magnet. It attracts materials like Iron.

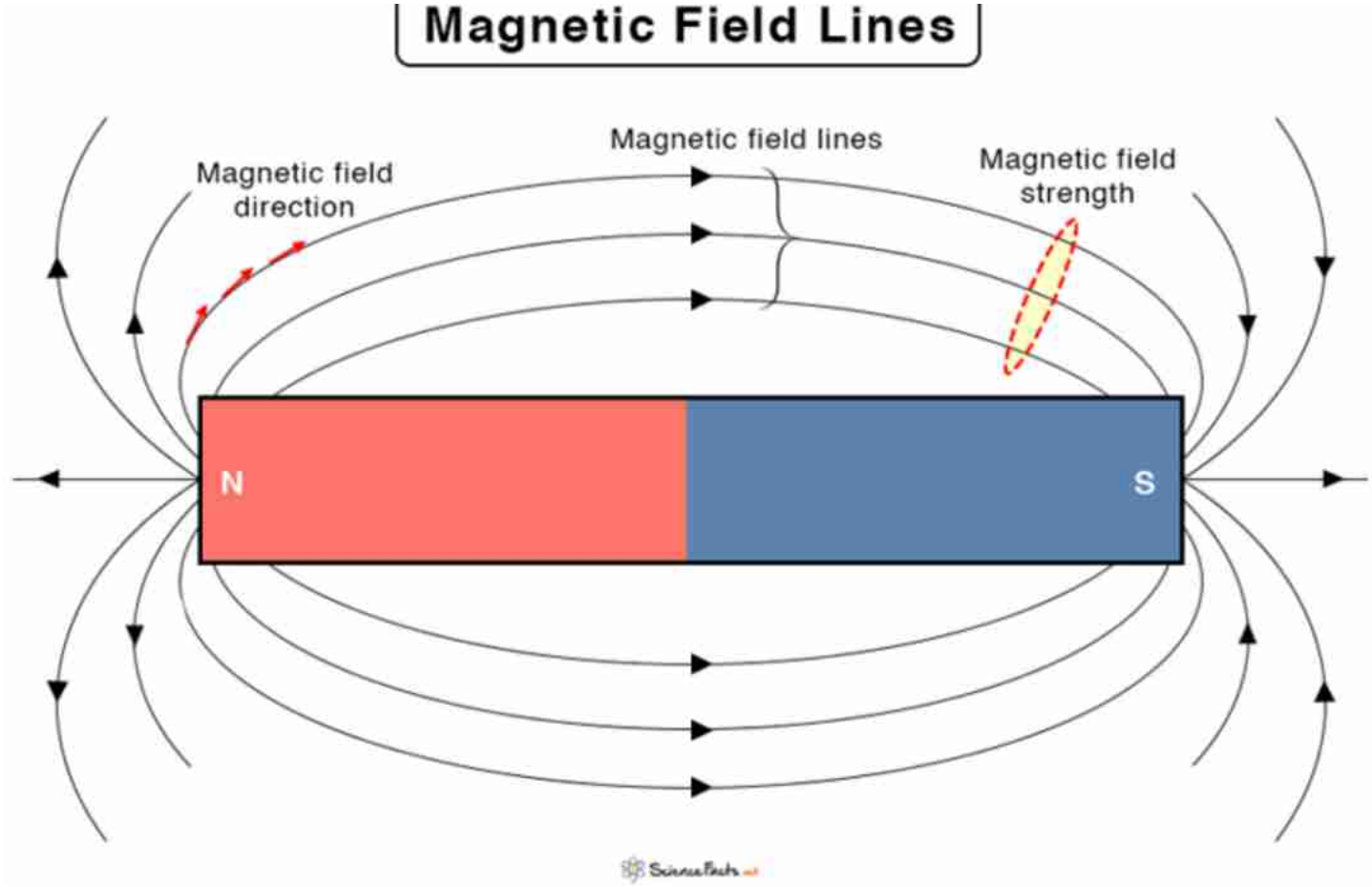
- North and South Poles - A magnet is always bipolar with poles named as north and south poles. These two poles always co-exist and cannot be separated. North pole of a magnet is the side which points to Earth's geographic north when it is freely suspended. Like poles repel and unlike poles attract similar to charges.

MAGNETIC FIELD - The region around a magnet where its magnetic influence can be experienced is called a magnetic field. The direction and strength of a magnetic field are represented by magnetic lines of force.

Properties of magnetic field lines – 1) Magnet's magnetic field lines result in the formation of continuous/running closed loops. 2) The tangent to the field line at any given point indicates the direction of the total magnetic field at that point. 3) The greater the number of field lines crossing per unit area, the higher the intensity, the stronger the magnitude of the magnetic field. 4) Magnetic field lines never intersect.

MAGNETIC FIELD DUE TO A STRAIGHT CURRENT CARRYING CONDUCTOR - When current is passed through a straight current-carrying conductor, a magnetic field is produced around it. Using the iron filings, we can observe that they align themselves in concentric circles around the conductor.

RIGHT HAND THUMB RULE - If a straight conductor is held in the right hand in such a way that the thumb points along the direction of the current, then the tips of the fingers or the curl of the fingers show the direction of magnetic field around it.


Magnetic Field Lines
Magnetic field direction
Magnetic field lines
Magnetic field strength
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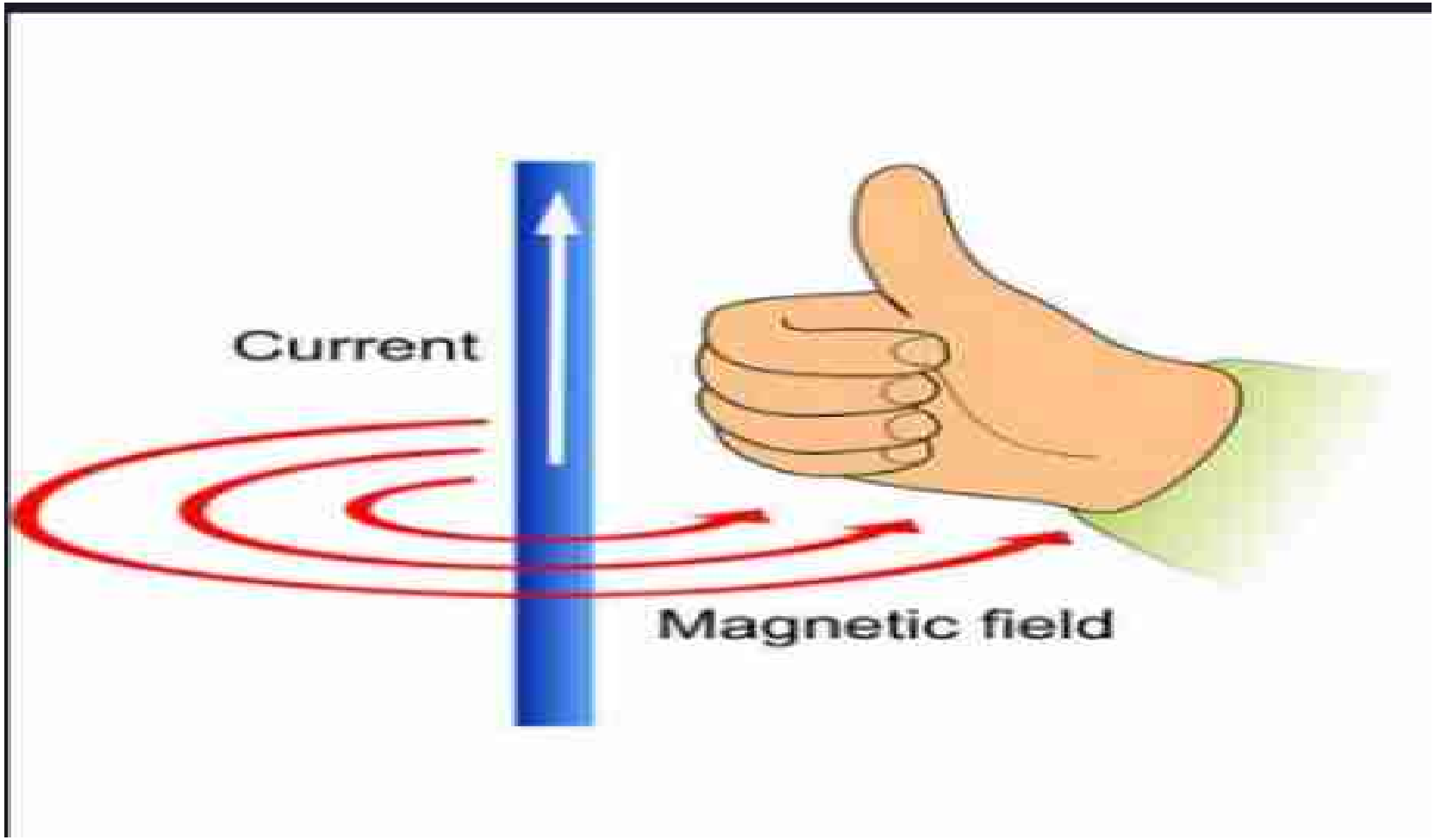
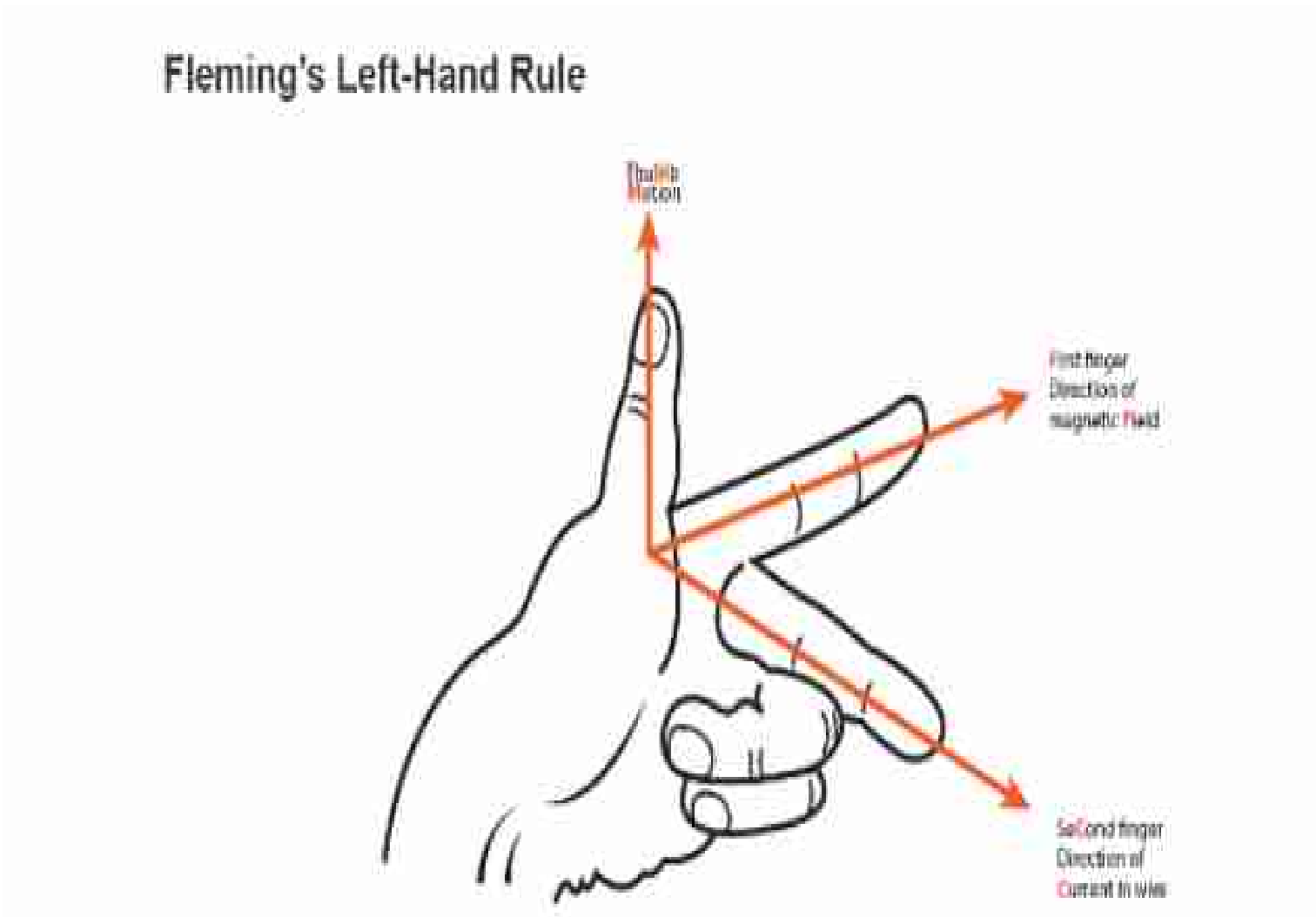

Current
Magnetic field

FORCE ON A STRAIGHT CURRENT CARRYING CONDUCTOR PLACED IN MAGNETIC FIELD -

Force on a straight current carrying conductor is mutually perpendicular to the magnetic field and the direction of the current.

FLEMING'S LEFT HAND RULE- Fleming's left hand rule states that the direction of force applied to a current carrying wire is perpendicular to both, the direction of current as well as the magnetic field.

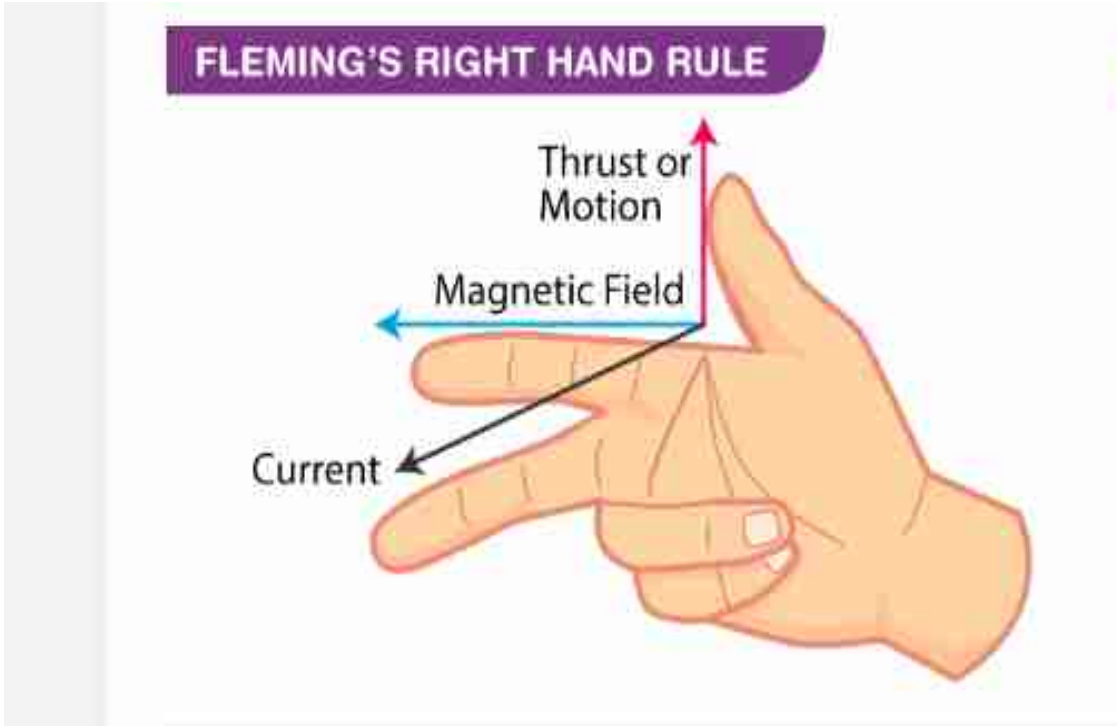
Fleming's Left-Hand Rule



FARADAY'S EXPERIMENT - Faraday discovered that a magnetic field interacts with an electric circuit by inducing a voltage known as EMF (electromotive force) by electromagnetic induction. Moving a magnet towards a coil sets up a current in the coil circuit, as indicated by deflection in the galvanometer needle.

ELECTROMAGNETIC INDUCTION - The phenomenon of electromagnetic induction is the production of induced EMF and thereby current in a coil, due to the varying magnetic field with time. The direction of the induced current is given by Fleming's right-hand rule.

FLEMING'S RIGHT HAND RULE - According to Fleming’s right-hand rule, the thumb, forefinger and middle finger of the right hand are stretched to be perpendicular to each other as indicated below, and if the thumb indicates the direction of the movement of conductor, fore-finger indicating direction of the magnetic field, then the middle finger indicates direction of the induced current.


FLEMING'S RIGHT HAND RULE
Thrust or
Motion
Magnetic Field
Current

Thank You