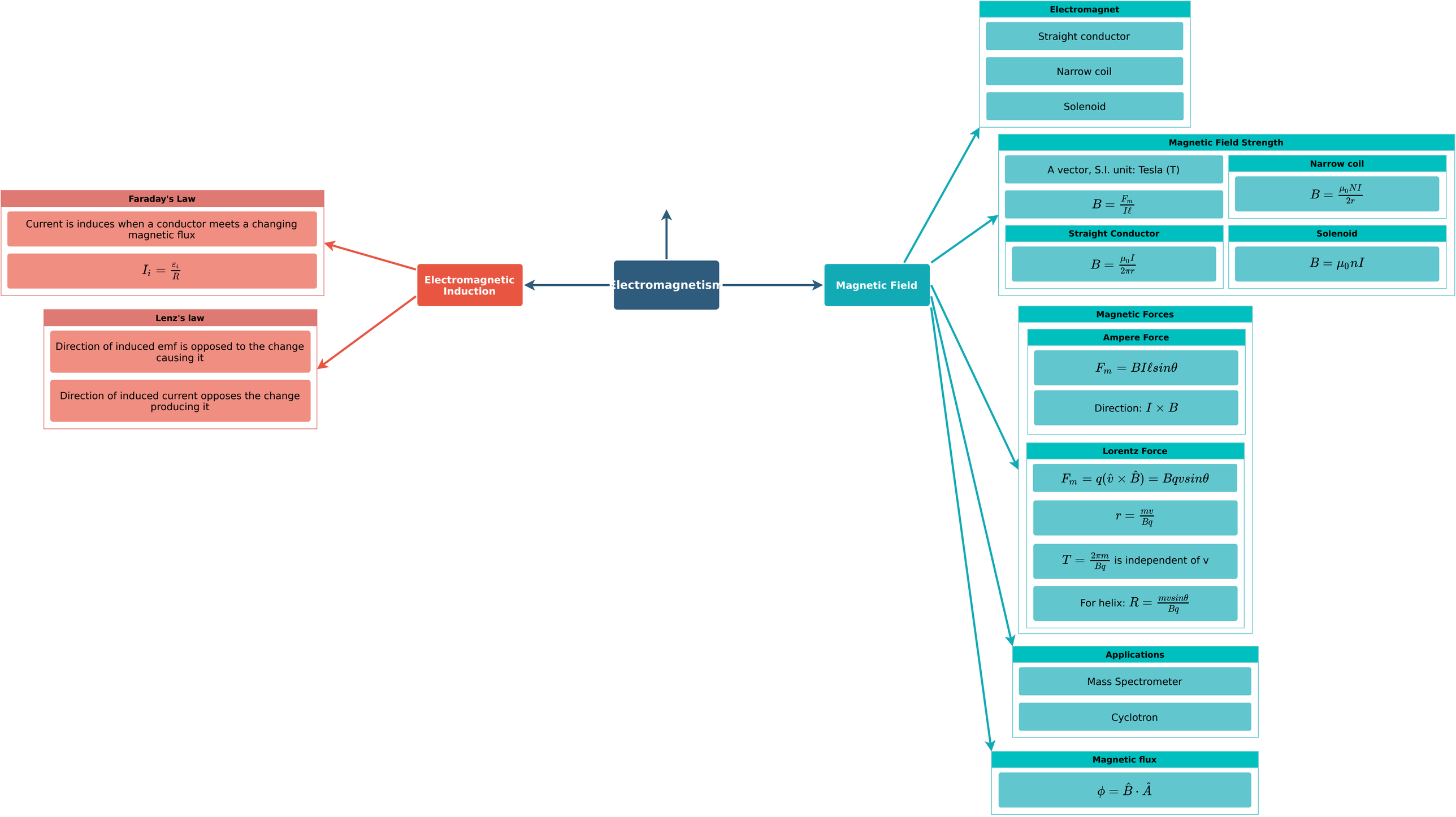
Electromagnetism
Electromagnetic Induction
Faraday's Law
Current is induces when a conductor meets a changing magnetic flux
$I_i = \frac{\varepsilon_i}{R}$
Lenz's law
Direction of induced emf is opposed to the change causing it
Direction of induced current opposes the change producing it
Magnetic Field
Electromagnet
Straight conductor
Narrow coil
Solenoid
Magnetic Field Strength
A vector, S.I. unit: Tesla (T)
$B = \frac{F_m}{I\ell}$
Narrow coil
$B = \frac{\mu_0 NI}{2r}$
Straight Conductor
$B = \frac{\mu_0 I}{2\pi r}$
Solenoid
$B = \mu_0 nI$
Magnetic Forces
Ampere Force
$F_m = BI\ell sin\theta$
Direction: $I \times B$
Lorentz Force
$F_m = q(\hat{v} \times \hat{B}) = Bqvsin\theta$
$r = \frac{mv}{Bq}$
$T = \frac{2\pi m}{Bq}$ is independent of v
For helix: $R = \frac{mvsin\theta}{Bq}$
Applications
Mass Spectrometer
Cyclotron
Magnetic flux
$\phi = \hat{B} \cdot \hat{A}$