The Global Electric Drive and New Products Organization focuses on Analyzing, Designing, Testing and Validating the world's leading Electric Propulsion Systems for GM's EV / HEV applications. Our responsibilities include motor design, analysis and testing, power electronics specification, design and testing, and the design, development and testing of the software control algorithms and calibrations that bring the hardware to life.

Contacts:

Anthony Howard
Electrification Controls
anthony.howard@gm.com

General Criteria

Entry Level positions

Pending or Recent (< 1yr.) graduate

GPA 3.0

Passion to work in the Automotive Industry

Must be Authorized to work in the USA. (No exceptions)

All positions are in Southeastern Michigan

Create your candidate profile at careers.gm.com

1) From top navigation menu, select Worldwide Locations -> North America -> United States
2) From United States navigation menu, select Search and Apply
3) Scroll down to Candidate Profile and click Update
4) Read and accept privacy statement, then register as New User
5) Click "Access my profile" and follow the prompts.

Your candidate profile must be completed in order for GM Talent Acquisition to follow up with you .

GENERAL MOTORS

ELECTRIC DRIVE AND NEW PRODUCTS ORGANIZATION

Career Opportunities

Development Validation Engineer—Electric Motors & Power Electronics

Description:
- Develop, coordinate, and oversee execution of validation activities for automotive electric drive components and systems
- Track development / validation progress
- Assess performance and reliability of components / systems
- Analyze failure modes and feed back design improvements
- Troubleshoot complex test systems

Qualifications:
- BSEE/BSME or equivalent
- Familiar with basic statistics and reliability assessment

Preferred Skills:
- Product validation and or program management experience
- MSEE / MSME

Mechanical Design Engineer–Electric Motors / Power Electronics

Description:
- Mechanical design and packaging of surface and interior mounted permanent magnet motors, induction motors, or power electronics
- Develop motor/power electronics component technical drawings
- Support Bill of Design development
- Ensure appropriate CFD and/or FEA is completed to justify design decisions
- Stay abreast of new technology/competition

Qualifications:
- BSME

Preferred Skills:
- Experience in the design of electric machines or power electronics
- Experience with design, CFD, and/or FEA software
- Experience with Matlab/Simulink

Electric Power Conversion Software Engineer

Description:
- Develop embedded control software for interior mounted permanent magnet and induction machines
- Generate software for digital controls of high voltage power electronics
- Implement, integrate, and support software for power electronics controls

Qualifications:
- BS in Computer Science or Electrical Engineering
- Experience in ANSI C programming
- Experience in embedded software development

Preferred Skills:
- Exposure to various microcontroller architectures
- Co-op experience

Software-in-the-loop Engineer

Description:
- Develop and optimize software-in-the-loop simulation system. Includes maximizing simulation speed, ensuring proper plant model fidelity, and improving tools and user interface
- Provide virtual environment that supports development and analysis, including: embedded controls development, energy and drive quality assessments, system thermal evaluations, and dynamic behavior of new electrified propulsion systems

Qualifications:
- BS Computer Science, Computer Engineering, Electrical Engineering, or Mechanical Engineering
- Experience in model based systems engineering, system simulation, or controls system development

Preferred Skills:
- MS or PhD

Power Electronics Design Engineer

Description:
- Responsible for execution of power electronic requirements and evaluation of designs
- Work cooperatively with and provide technical guidance to Tier 1 and Tier 2 suppliers of power electronics
- Develop engineering designs and generate technical solutions for advanced and production hardware
- Synthesis and analysis for power electronics & controller electronics design
- Circuit design and technical drawings

Qualifications:
- BS or MS degree in EE or equivalent
- Ability to troubleshoot and problem solve
- High level of interpersonal skills to work effectively with others
- High level of project management, communication, and presentation skills

Energy Modelling Systems Engineer

Description:
- Model, simulate, and analyze new electrified propulsion systems
- Quantify effects of hybridization/electrification on vehicle fuel economy, performance, and drivability for various propulsion system configurations
- Support product teams and leadership in defining next generation electrification propulsion systems with analytical evaluation

Qualifications:
- BSME/BSEE
- High level of interpersonal and communication skills to work effectively with others

Preferred Skills:
- Matlab/Simulink experience
- Understanding of engineering theory, principles of design, and the design process
- Familiarity with electrified propulsion system architectures and control strategies.

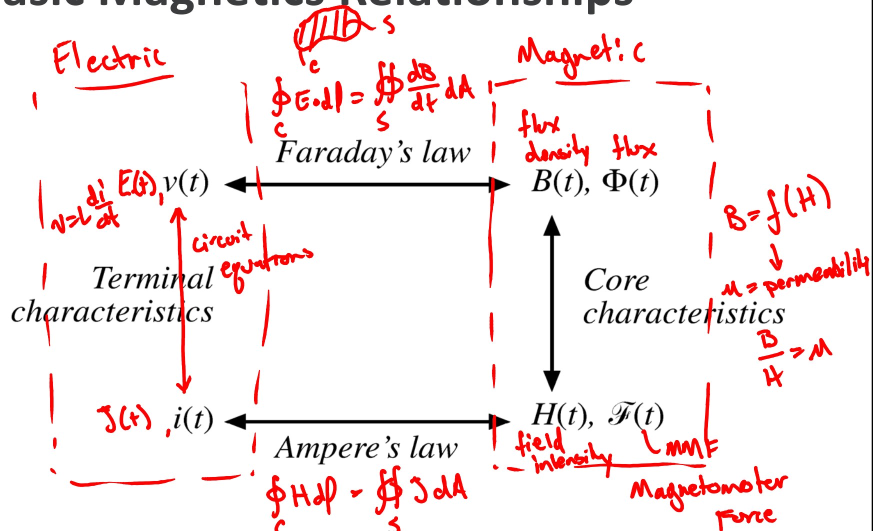
CURENT
CENTER FOR ULTRA-WIDE-AREA RESILIENT ELECTRIC ENERGY TRANSMISSION NETWORKS

announces a new
DOE Traineeship Program for
Hands-On Experiences with
Wide Bandgap
Power Electronics

Details:
- Fellowships available for M.S. or Ph.D. students
- Pay is $30,000 / year plus tuition waiver
- Six new fellowships are available starting Fall 2016
- Applicants must be U.S. citizens

Power Electronics Labs: Open House, Friday, Nov. 20th ~12:00

Basic Magnetics Relationships



Fundamentals of Power Electronics 4 Chapter 13: Basic Magnetics Theory

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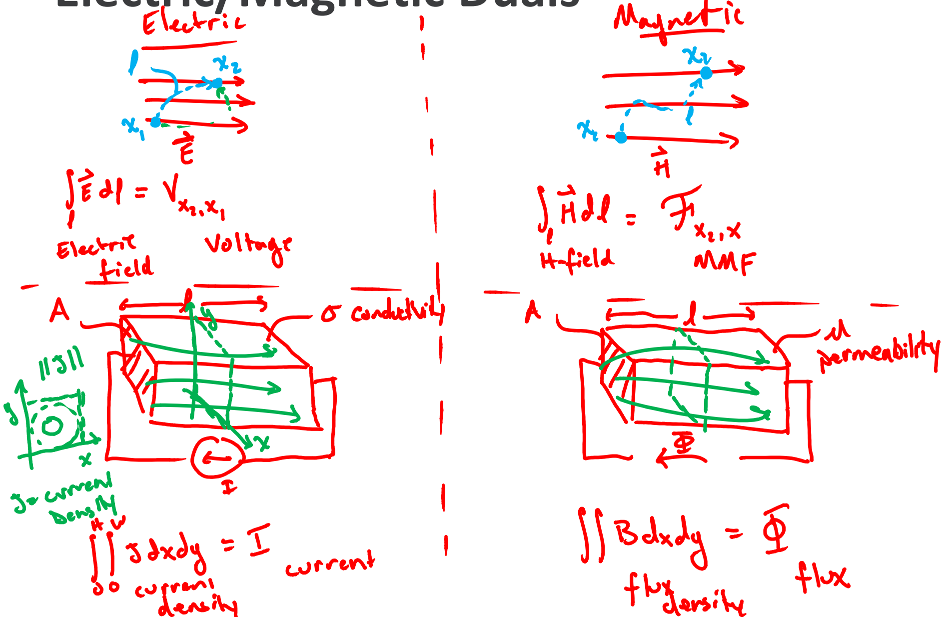
Electric/Magnetic Duals



Faraday's Law

$$v = \oint_C E\, dl = \iint_S \frac{dB}{dt}\, dA = \frac{\partial \Phi}{dt}$$

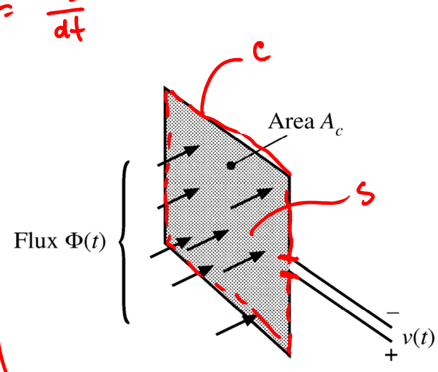
Voltage $v(t)$ is induced in a loop of wire by change in the total flux $\Phi(t)$ passing through the interior of the loop, according to

$$v(t) = \frac{d\Phi(t)}{dt}$$

For uniform flux distribution, $\Phi(t) = B(t)A_c$ and hence

$$v(t) = A_c \frac{dB(t)}{dt}$$

Approximately simplify



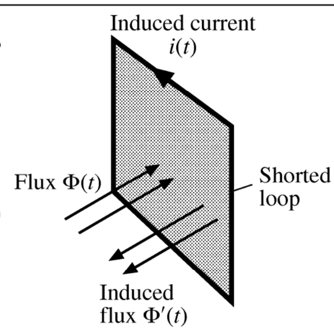
Lenz's Law

Right hand rule

The voltage $v(t)$ induced by the changing flux $\Phi(t)$ is of the polarity that tends to drive a current through the loop to counteract the flux change.

Example: a shorted loop of wire

- Changing flux $\Phi(t)$ induces a voltage $v(t)$ around the loop
- This voltage, divided by the impedance of the loop conductor, leads to current $i(t)$
- This current induces a flux $\Phi'(t)$, which tends to oppose changes in $\Phi(t)$



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Ampere's Law

$$\oint_c H \cdot dl = \iint_S J\, dA = n\, i(t)$$

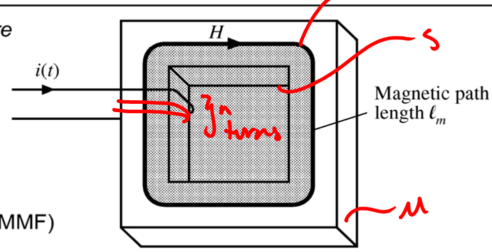
The net MMF around a closed path is equal to the total current passing through the interior of the path:

$$\oint_{\text{closed path}} \boldsymbol{H} \cdot d\boldsymbol{\ell} = \text{total current passing through interior of path}$$

Example: magnetic core. Wire carrying current $i(t)$ passes through core window.

- Illustrated path follows magnetic flux lines around interior of core
- For uniform magnetic field strength $H(t)$, the integral (MMF) is $H(t)\ell_m$. So

$$\mathscr{F}(t) = H(t)\ell_m = i(t)\, n$$



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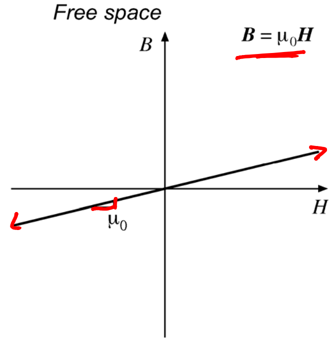
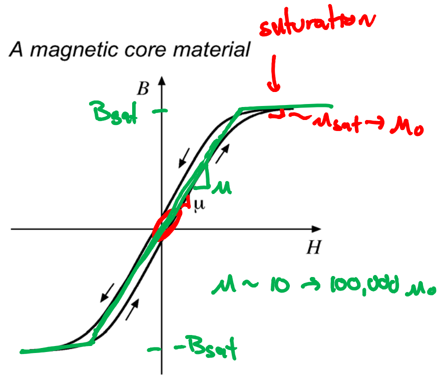
Core Material Characteristics

Free space



A magnetic core material



μ_0 = permeability of free space

= $4\pi \cdot 10^{-7}$ Henries per meter

Highly nonlinear, with hysteresis and saturation

Units

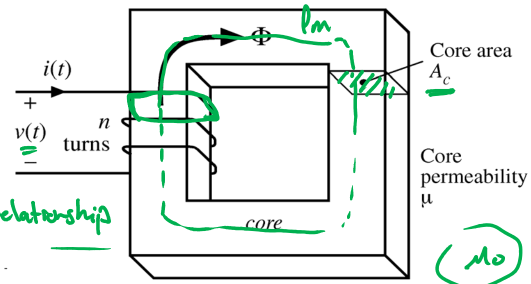
Table 12.1. Units for magnetic quantities

quantity	*MKS*	*unrationalized cgs*	*conversions*
core material equation	$B = \mu_0 \, \mu_r \, H$	$B = \mu_r \, H$	
B	Tesla	Gauss	$1\text{T} = 10^4\text{G}$
H	Ampere / meter	Oersted	$1\text{A/m} = 4\pi \cdot 10^{-3}$ Oe
Φ	Weber	Maxwell	$1\text{Wb} = 10^8$ Mx $1\text{T} = 1\text{Wb / m}^2$

Inductor Example

Simplifying Assumptions:

1. $\mu \gg \mu_0$
   → All flux stays within the core
2. H & B fields are constant within the core material
3. Linearized B-vs.-H relationship



Faradays law:

$v_{turn}(t) = A_c \frac{dB(t)}{dt}$

(A) $v(t) = n A_c \frac{dB(t)}{dt}$

Core characteristics:

(B) $B(t) = \begin{cases} \mu H(t) & \text{if } |B| < B_{sat} \text{ (not saturated)} \leftarrow \text{Assume} \\ B_{sat} & \text{otherwise (saturated)} \end{cases}$

Ampere's law:

(C) $H(t) l_m = n\, i(t)$

$\Rightarrow v(t) = n A_c \frac{d}{dt}\left(\mu H(t)\right)$

$v(t) = n A_c \frac{d}{dt}\left(\mu \frac{n\, i(t)}{l_m}\right)$

$v(t) = \frac{n^2 A_c \mu}{l_m} \frac{di}{dt}$

L → $\frac{n^2 A_c \mu}{l_m}$