MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

VIDYAVARDHINI’S BHAUSAHEB VARTAK POLYTECHNIC

MICRO PROJECT

Academic year: 2020-21

Title of Micro Project:

Magnetic Circuits

Program/Code: Computer Engineering (CO) **Semester:** Second

Course/Code: Elements of Electrical Engineering (22215)

Group No: 2

Roll No: 411-420

Name of Faculty: Mr. Nagnath Kavhale

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION

<u>Certificate</u>

This is to certify that Group 2

Roll No 411-420 of **Second** Semester of Diploma in **Computer Engineering (CO)** of Institute, B.V. POLYTECHNIC (Code: **0093**) has completed the **Micro Project** satisfactorily in **Subject – Elements of Electrical Engineering (22215)** for the academic year 2020- 2021 as prescribed in the curriculum.

Place: Vasai **Enrolment No:** ____________________________

Date: _____________________ **Exam. Seat No:** ___________________________

Subject Teacher **Head of the Department** **Principal**

seal of the institute

Annexure - I

Part A: Micro Project Proposal

1.1 Aim/Benefits of the Micro-Project:

1. The Aim of Micro Project is to study magnetic circuits
   It will help us to understand the concepts of this topic.

2.1 Course Outcomes integrated:

1. Use principles of Magnetic circuits.

3.1 Proposed Methodology:

1. Literature survey.
2. Collect information through different sources
3. Analysis of data.
4. Compilation of collected data.

4.0 Action Plan

Sr. No.	Details of the activity	Planned Start date	Planned Finish date	Name of Members
1	Formation of Group & Topic Selection			All members
2	Submission of Proposed Plan			All members
3	Preparation of Report			All members
4	Final valuation of a working Report			All members
5	Presentation of Report			All members
6	Submission of Final Report			All members

5.0 Resource Required:

Sr. No.	Name of resources/Material	Specifications	Qty	Remarks
1.	Computer	Processor: i3 RAM: 4.00GB	**1**	
2.	Microsoft Word	Word -2016		
3.	Printer	Hp LaserJet	**1**	
4.	Refer Book			
5	Site’s name			

6.0 Name of Team Members

Sr. No	Roll No	Name of Students	Process and Product assessment (06)	Individual Presentation (04)	Total (10)
01	411	Chavan Meet Dinesh			
02	412	Salvi Sujal Dinesh			
03	413	Dmello Precious Philip			
04	414	Jadhav Aary Vijay			
05	415	Dabre Reyan Vijay			
06	416	Raut Hardik Sanjay			
07	417	Vinherkar Hrishita Santosh			
08	418	Dadhaniya Devang Rajnikant			
09	419	Pagi Prathamesh Dattatray			
10	420	Gaikwad Kaustubh Kiran			

Name & Signature of Faculty: Nagnath Kavhale

Annexure- II

Final Micro Project Report

Title: Types of Network

1.0 Rationale: To understand the concept of magnetic circuits

2.1 Aim/Benefits of the Micro-Project:

The Aim of Micro Project is to study magnetic circuits.

3.1 Course Outcomes Integrated:

1 Use principles of Magnetic circuits.

4.0 Actual Procedure Followed.

1 Discussion about topic with guide and among group members
2 Literature survey
3 Information collection
4 Compilation of content
5 Editing and revising content
6 Report Preparation

5.0: Actual Resources Required:

Sr. No.	Name of resources/Material	Specifications	Qty	Remarks
1.	Computer	Processor: i3 RAM: 4.00 GB	1	
2.	Microsoft Word	Word -2016		
3.	Printer	Hp LaserJet	1	
4	Refer Book			
5	Site’s name			

7.0 Skill Developed/Learning outcomes of this Micro-Project

The following skills were developed:

1. **Teamwork:** Learned to work in a team and boost individual confidence.
2. **Problem-Solving:** Developed good problem-solving habits.
3. **Technical Writing:** Preparing the report of proposed plan and the final report.

Annexure - III

Rubrics for Assessment of Micro-Project

Title: Integral Calculus

Institute Code: 0093

Academic year: 2020-21

Program: CO-I

Course & Code: EEC (22215)

Group No: 2

Roll No: 411 - 420

Semester: Second

Name of Faculty: Prof. Nagnath Kavhale

Sr. No.	**Characteristic to be Assessed**	**Poor** (Marks 1-3)	**Average** (Marks 4-5)	**Good** (Marks 6-8)	**Excellent** (Marks 9-10)
1.	Relevance to the Course				
2.	Literature Survey/Information Collection				
3.	Project Proposal				
4.	Completion of the Target as per Project Proposal				
5.	Analysis of Data and Representation				
6.	Quality of Prototype/Model				
7.	Report Preparation				
8.	Presentation				
9.	Viva				

Name & Signature of Faculty: Nagnath Kavhale

Annexure- IV

Micro-Project Evaluation Sheet

Title: Integral Calculus
Institute Code: 0093
Academic year: 2020-21
Program: CO-I
Course & Code: EEC (22215)
Group No: 2
Roll No: 411-420
Semester: Second
Name of Faculty: Prof. Nagnath Kavhale

Course Outcomes Achieved:

1. Use principles of Magnetic circuits.

Evaluation as per Suggested Rubric for Assessment of Micro Project:

Sr. No.	Characteristic to be assessed	Poor Marks 1-3	Average Marks 4-5	Good Marks 6-8	Excellent Marks 9-10	Sub Total
(A) Process and product assessment Out Of 6						
1	Relevance to the course					
2	Literature Survey Information Collection		.			
3	Completion of the Target as per project proposal					
4	Analysis of Data and representation					
5	Quality of Prototype/Model/ Content					
6	Report Preparation					
(B) Individual Presentation/Viva Out of 4						
7	Presentation	.				
8	Viva					
Name and designation of the Faculty Member: Prof. Nagnath Kavhale						

Weekly Activity Sheet

Topic: Types of Network

Institute Code: 0093

Academic year: 2020-21

Program: CO-I

Course & Code: EEC (22215)

Group No: 2

Roll No: 411-420

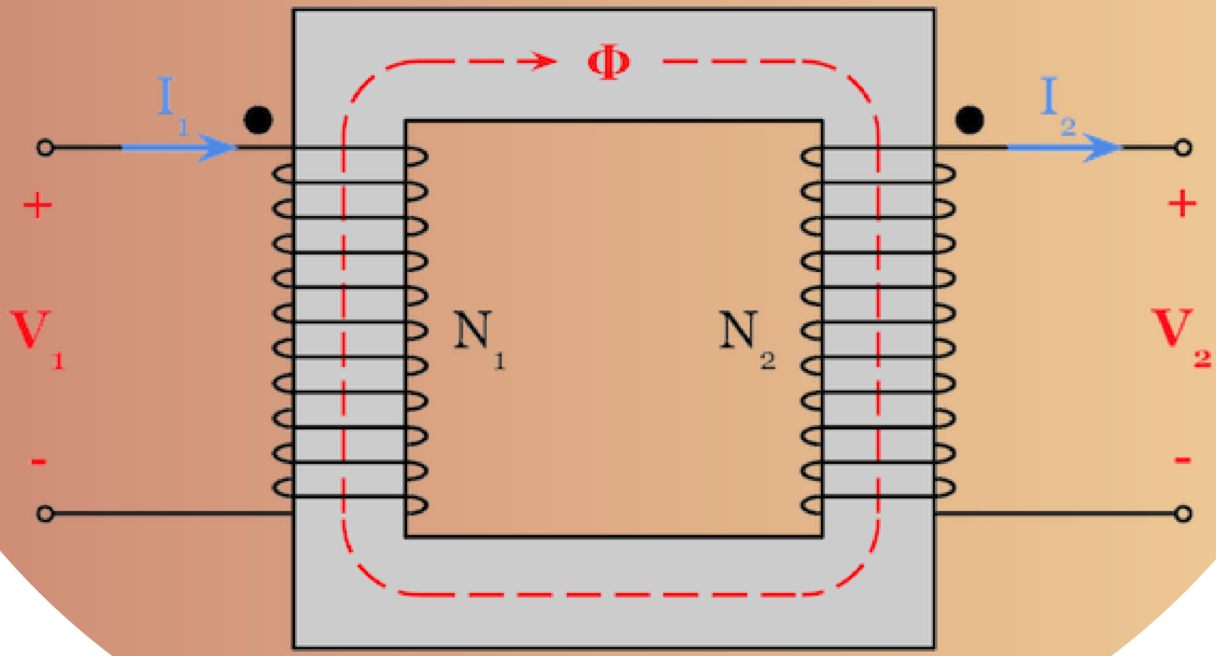
Semester: Second

Name of Faculty: Prof. Nagnath Kavhale

SR. NO	WEEK	ACTIVITY PERFORMED
1.	1st Week	Discussion and Finalization of Topic
2.	2nd Week	Literature Review
3.	3rd Week	Submission of Proposed Plan
4	4th Week	Information Collection
5.	5th Week	Analysis of Data
6.	6th Week	Compilation of content
7.	7th Week	Editing and Revising the Content
8.	8th Week	Report Presentation
9.	9th Week	Report Presentation
10.	10th- 12th Week	Presentation

Signature of Student

Dated Signature of Faculty



Magnetic Circuits

Subject: EEC (22215)
Class: FYCO
Group No: 2
Roll No: 411-420

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Introduction

A magnetic circuit is made up of one or more closed loop paths containing a magnetic flux. The flux is usually generated by permanent magnets or electromagnets and confined to the path by magnetic cores consisting of ferromagnetic materials like iron, although there may be air gaps or other materials in the path. Magnetic circuits are employed to efficiently channel magnetic fields in many devices such as electric motors, generators, transformers, relays, lifting electromagnets, SQUIDs, galvanometers and magnetic recording heads.

The concept of a "magnetic circuit" exploits a one-to-one correspondence between the equations of the magnetic field in an unsaturated ferromagnetic material to that of an electrical circuit. Using this concept the magnetic fields of complex devices such as transformers can be quickly solved using the methods and techniques developed for electrical circuits.

Some examples of magnetic circuits are:

- Horseshoe magnet with iron keeper (low-reluctance circuit)

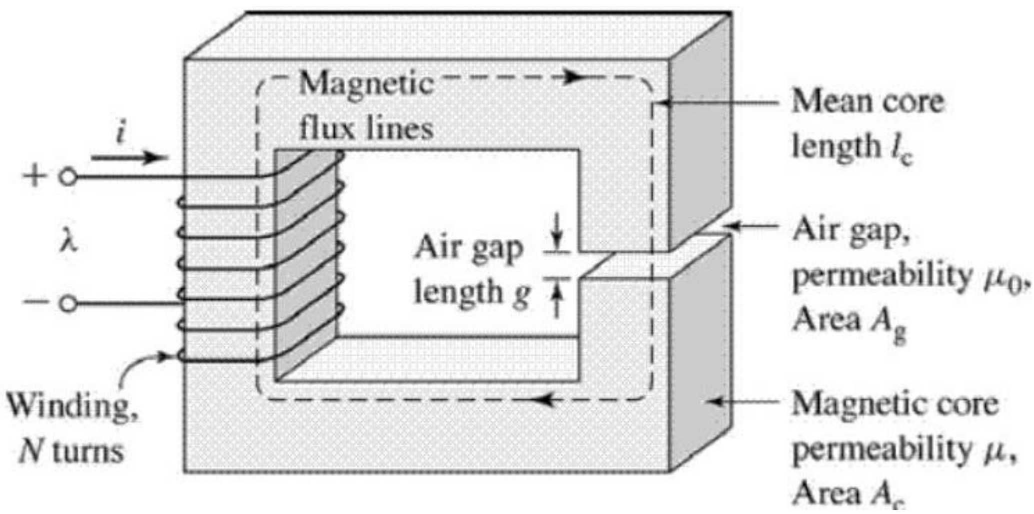
- Horseshoe magnet with no keeper (high-reluctance circuit)

- Electric motor (variable-reluctance circuit)

- Some types of pickup cartridge (variable-reluctance circuits)

Working of Circuit

The magnetic circuit closed path to which a magnetic field, represented as lines of magnetic flux, is confined. In contrast to an electric circuit through which electric charge flows, nothing actually flows in a magnetic circuit.



In a ring-shaped electromagnet with a small air gap, the magnetic field or flux is almost entirely confined to the metal core and the air gap, which together form the magnetic circuit. In an electric motor, the magnetic field is largely confined to the magnetic pole pieces, the rotor, the air gaps between the rotor and the pole pieces, and the metal frame. Each magnetic field line makes a complete unbroken loop. All the lines together constitute the total flux. If the flux is divided, so that part of it is confined to a portion of the device and part to another, the magnetic circuit is called parallel. If all the flux is confined to a single closed loop, as in a ring-shaped electromagnet, the circuit is called a series magnetic circuit.

Related Terms

- **Flux**: Flux describes any effect that appears to pass or travel (whether it actually moves or not) through a surface or substance flux is a vector quantity, describing the magnitude and direction of the flow of a substance or property.

- **Magnetic Flux**: Magnetic flux is a measurement of the total magnetic field which passes through a given area. It is a useful tool for helping describe the effects of the magnetic force on something occupying a given area. The measurement of magnetic flux is tied to the particular area chosen.

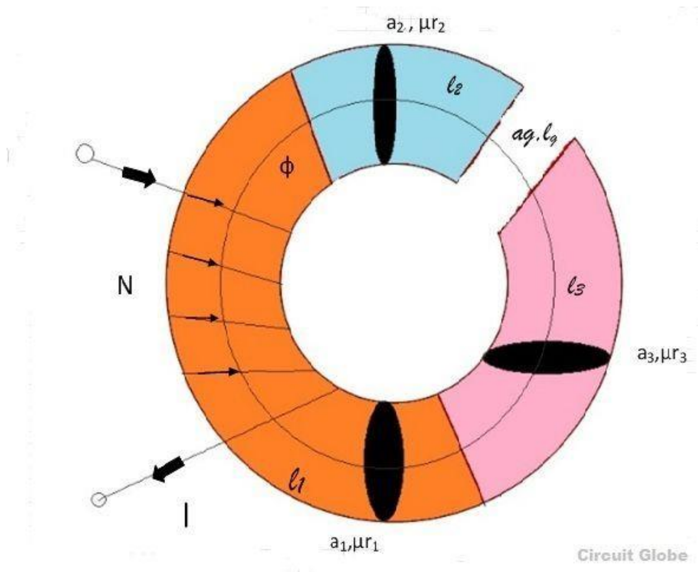
- **Magnetic Field**: A magnetic field is the area around a magnet, magnetic object, or an electric charge in which magnetic force is exerted. The invisible area around a magnetic object that can pull another magnetic object toward it or push another magnetic object away from it is called a magnetic field.

- **Magnetic Force**: Magnetic force, attraction or repulsion that arises between electrically charged particles because of their motion. The magnetic force between two moving charges may be described as the effect exerted upon either charge by a magnetic field created by the other.

Related Terms

- **Magnetic Flux Density**: Any Magnetic flux density(B) is defined as the force acting per unit current per unit length on a wire placed at right angles to the magnetic field. Units of B is Tesla (T). B is a vector quantity.
- **Reluctance:** Magnetic reluctance, or magnetic resistance, is a concept used in the analysis of magnetic circuits. It is defined as the ratio of magnetomotive force (mmf) to magnetic flux. It represents the opposition to magnetic flux, and depends on the geometry and composition of an object.
- **Magnetomotive Force:** The strength of the MMF is equivalent to the product of the current around the turns and the number of turns of the coil. As per work law, the MMF is defined as the work done in moving the unit magnetic pole (1weber) once around the magnetic circuit.
- **Faraday's Law of Electromagnetic Induction:** Faraday's law of induction is a basic law of electromagnetism predicting how a magnetic field will interact with an electric circuit to produce an electromotive force (EMF)—a phenomenon known as electromagnetic induction. It is the fundamental operating principle of transformers, inductors, and many types of electrical motors, generators and solenoids

Series Circuit



The Series Magnetic Circuit is defined as the magnetic circuit having a number of parts of different dimensions and materials carrying the same magnetic field.

When number of magnetic materials of different cross-sectional area, length and permeability are connected in a chain they are said to be in series.

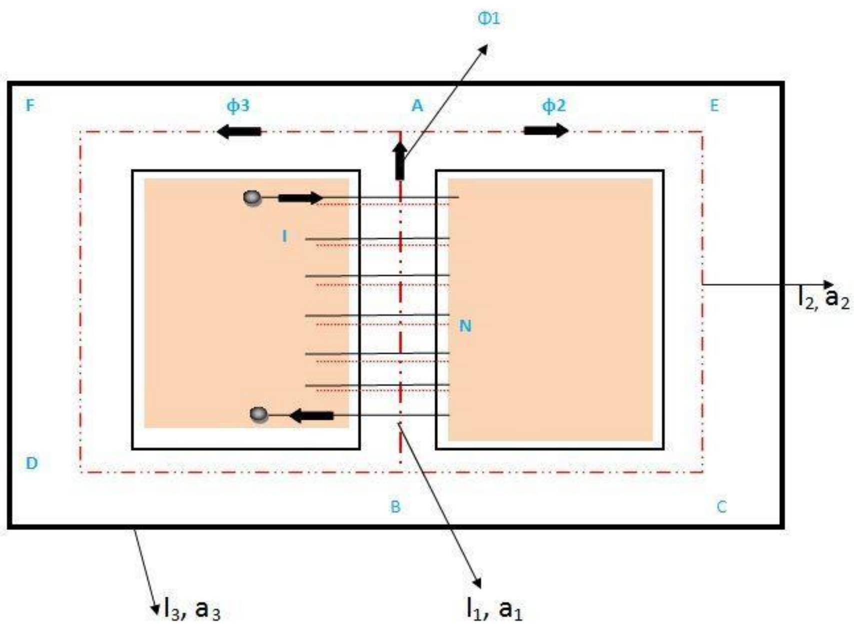
The magnetic flux flowing through each magnetic material of different cross-sectional area, length and permeability remains constant.

The Equivalent Reluctance is the sum of individual reluctances in series magnetic circuit.

$$Total\ Reluctance\ (s) = s_1 + s_2 + s_3 + \ldots + s_n$$

$$Total\ mmf = H_1 l_1 + H_2 l_2 + H_3 l_3 + \cdots + H_n l_n$$

Parallel Circuit



A magnetic circuit having two or more than two paths for the magnetic flux is called a parallel magnetic circuit. Its behaviour can be compared to the parallel electric circuit.

The parallel magnetic circuit contains different dimensional areas and materials having various numbers of paths.

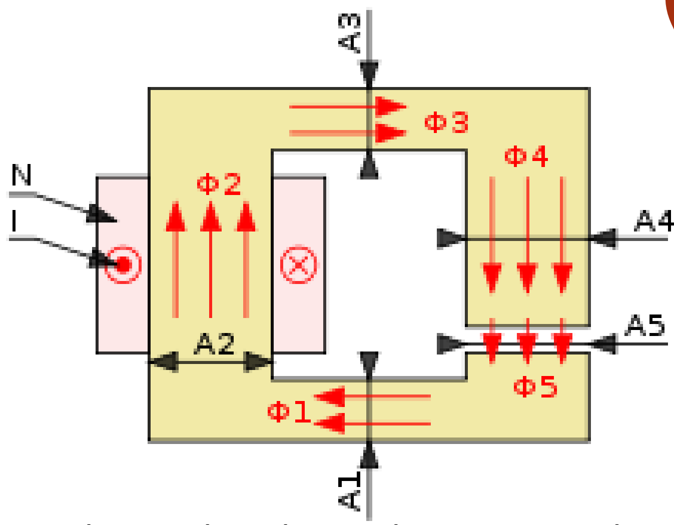
The Equivalent Flux is the sum of individual flux in parallel magnetic circuit.

The total MMF or the total Ampere turns required in the parallel magnetic circuit will be the sum of all the individual parallel paths.

$$Total\ Flux\ (\varphi) = \varphi_1 + \varphi_2 + \varphi_3$$

$$Total\ mmf\ = \ \varphi_1 S_1 + \varphi_2 S_2 + S + \varphi_3 S_3$$

Circuit Laws



Magnetic circuits obey other laws that are similar to electrical circuit laws. For example, the total reluctance **RT** of reluctances **R1, R2, ...** in series is: **RT = R1 + R2 + ...**

This also follows from **Ampère's law** and is analogous to **Kirchhoff's voltage law** for adding resistances in series. Also, the sum of magnetic fluxes **Φ 1 , Φ 2 , ...** into any node is always zero:

Φ 1 + Φ 2 + ... = 0

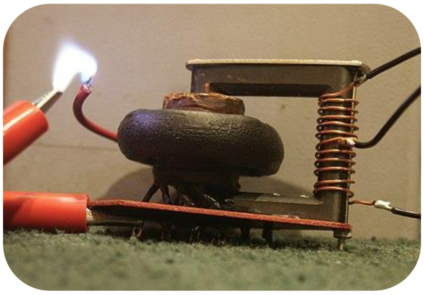
This follows from **Gauss's law** and is analogous to Kirchhoff's current law for analyzing electrical circuits.

Together, the three laws above form a complete system for analyzing magnetic circuits, in a manner similar to electric circuits. Comparing the two types of circuits shows that:

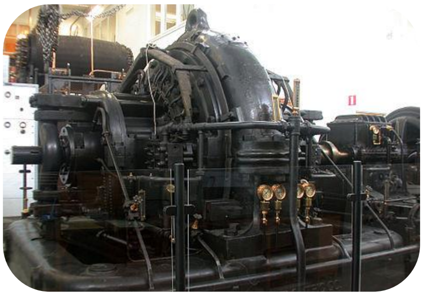
- The equivalent to resistance R is the **reluctance Rm**
- The equivalent to current I is the **magnetic flux Φ**
- The equivalent to voltage V is the **magneto motive Force F**

Applications

- Air gaps can be created in the cores of certain transformers to reduce the effects of saturation. This increases the reluctance of the magnetic circuit, and enables it to store more energy before core saturation. This effect is used in the flyback transformers of cathode-ray tube video displays and in some types of switch-mode power supply.
- Variation of reluctance is the principle behind the reluctance motor (or the variable reluctance generator) and the Alexanderson alternator.
- Multimedia loudspeakers are typically shielded magnetically, in order to reduce magnetic interference caused to televisions and other CRTs. The speaker magnet is covered with a material such as soft iron to minimize the stray magnetic field.
- Reluctance can also be applied to variable reluctance (magnetic pickups) .



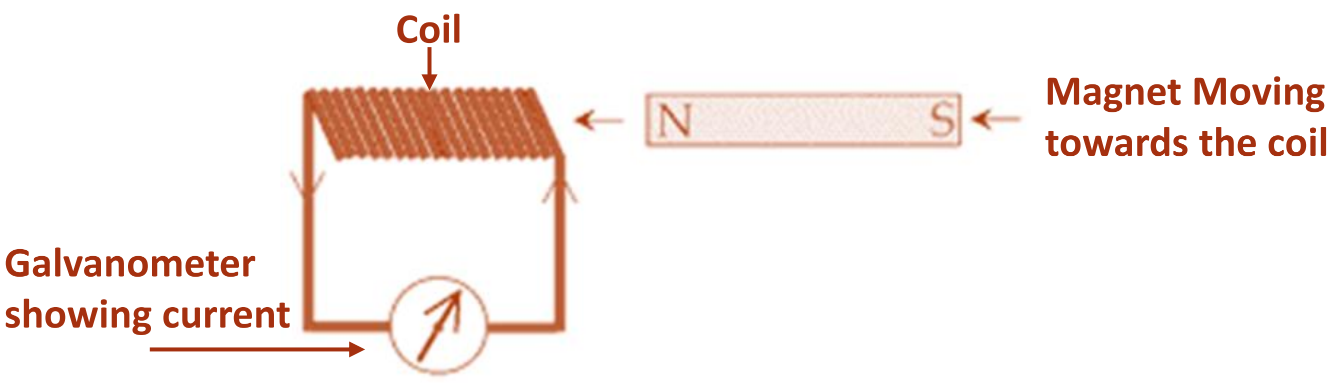
Flyback Transformers



Alexanderson Alternator

Loudspeakers

Model Report



- When a magnet is moved closer to the current carrying coil it will generate electricity as the coil moves through the magnetic field. As the magnet is moved, there will be an induced electro-motive force (EMF) which can cause a current in the coil. Once the magnet stops moving, the current will go to zero.
- Hence, when a galvanometer is connected to the circuit, there will be deflection due to the flow of electricity. As the magnet is moved toward the coil of wire, the needle of the galvanometer moves one direction. As the magnet is moved away from the coil of wire, the needle of the galvanometer moves the opposite direction. If the magnet is moved faster, the magnitude of the deflection increases.
- When the magnet is moved towards or away from the coil, the pointer or needle of the Galvanometer, which is basically a very sensitive centre zeroed moving-coil ammeter, will deflect away from its centre position in one direction only. When the magnet stops moving and is held stationary inside with regards to the coil the needle of the galvanometer returns back to zero as there is no physical movement of the magnetic field.