Topic	Description
Module	Electrodynamics
Module Code	MECH-M-1-EDY-EDY-VO
Semester	WS 2025
Lecturer	Daniel T. McGuiness, Ph.D
ECTS	3
SWS	2
Lecture Type	ILV
Coursework Name	Individual Assignment
Work	Individual
Suggested Private Study	10 hours
Submission Format	Submission via SAKAI
Submission Deadline	01.02.26 23:59
Late Submission	Not accepted
Resubmitting Opportunity	No re submission opportunity

> No lecture time is exclusively devoted to the aforementioned assignment.

A portion of the mark for every assignment will be, where applicable, based on style. Style, in this context, refers to organisation, flow, sentence and paragraph structure, typographical accuracy, grammar, spelling, clarity of expression and use of correct IEEE style for citations and references. Students will find *The Elements of Style (3rd ed.)* (1979) by Strunk & White, published by Macmillan, useful with an alternative recommendation being *Economist Style Guide (12th ed.)* by Ann Wroe.

Submission Format and Requirements with LaTeX

Before submitting your work for assessment please follow the following requirements.

1. **The work must be done using LaTeX and no other format will be accepted.** You are allowed to use whatever software you wish to write (i.e., Overleaf, TeXStudio, LyX, ...). The work must also conform to the **MCI** Documentation guidelines (which is in SAKAI). A template is provided to you here which was written by the author of this document.

   > If you are to use **mcidoc** template, set the `document-state` as `Report`.

   > To learn LaTeX, the author has tutorials which can be accessed here.

   Please treat this assignment as a great practice to learn LaTeX as you will need it when you are writing your thesis.

2. The report (and all its content) **must** be submitted as a `.pdf` along with all the necessary files (`.tex`, `.sty`) to compile it. Submit one (1) `.zip` file containing everything with the following name pattern.

   `[STUDENT-ID]_[STUDENT-NAME]_[STUDENT-SURNAME].zip`

   For example, a student named **Jason Brigham** with a student ID **2710704051** would send their submission as:

   `2710704051_Jason_Brigham.zip`

   and their submission would be in arranged as the following directory:

```
2710704051_Jason_Brigham/
├─ tex/
│  ├─ 2710704051_Jason_Brigham.tex, *.pdf, mcidoc.cls, custom.sty, ...
│  └─ figures/
│     └─ .jpg, .png, ...
└─ HW_Content/
   └─ src/, include/, .cpp, .bash, .py, ...
```

   where `...` are any additional requirement (i.e., `.bib`, `.glo`) you may need for TeX and the `HW_Content` is any content which is relevant to the Homework (i.e., if your HW is about python, this is where all the python scripts would be kept, or where your ROS 2 source files would be, or where your C++ codes would be for a project.)

3. The work must be submitted to SAKAI and **no link to personal repo will be accepted.**

> To make sure your submission conform to given requirements, please test out zipping/unzipping and running any code before submission. Any deviations from the requirements will incur penalties to the final grade.

Question	Maximum Point	Received Point
Electric Potential Between Plates	30	
The Inductance of a Co-Axial Cable	30	
Rotating a Coil in a Changing Magnetic Field	40	
Sum	100	

[Q1] Electric Potential Between Plates — 30

Two grounded, semi-infinite, parallel-plane electrodes are separated by a distance of h. A third electrode perpendicular to both is maintained at a constant potential V_0.

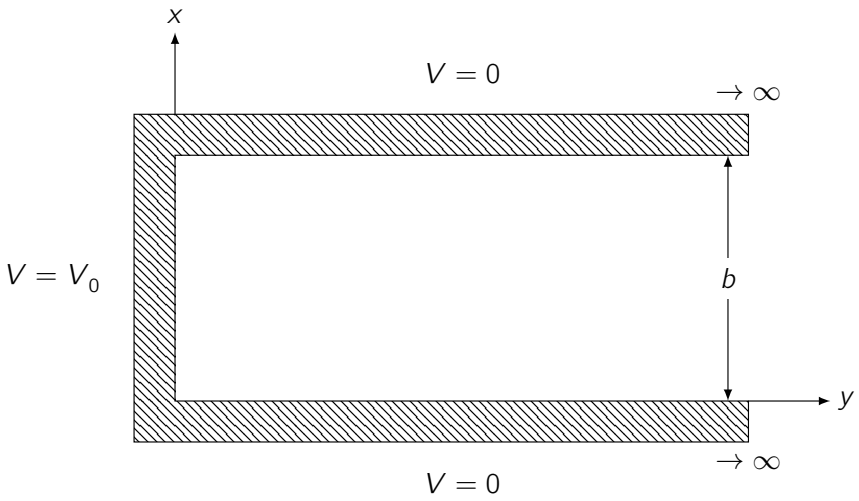

Figure 1: The cross-sectional figure for "Electric Potential Between Plates". The plate electrodes are infinite in z direction.

Based on this information, please determine the potential distribution in the region enclosed by the electrodes.

[Q2] The Inductance of a Co-Axial Cable — 30

An air co-axial transmission line has a solid inner conductor of radius a and a very thin outer conductor of radius b.

Using this information, please determine the inductance per unit length of the line.

[Q3] Rotating a Coil in a Changing Magnetic Field — 40

An h by w rectangular conducting loop is situated in a changing magnetic field:

$$\boldsymbol{B} = \boldsymbol{a}_y B_0 \sin \omega t$$

The normal of the loop initially makes an angle α with $\boldsymbol{a}_y$, as shown below. Based on this information, please find the induced emf in the loop:

i. When loop is at rest (20)

ii. When the loop rotates with an angular velocity ω about the x-axis. (20)

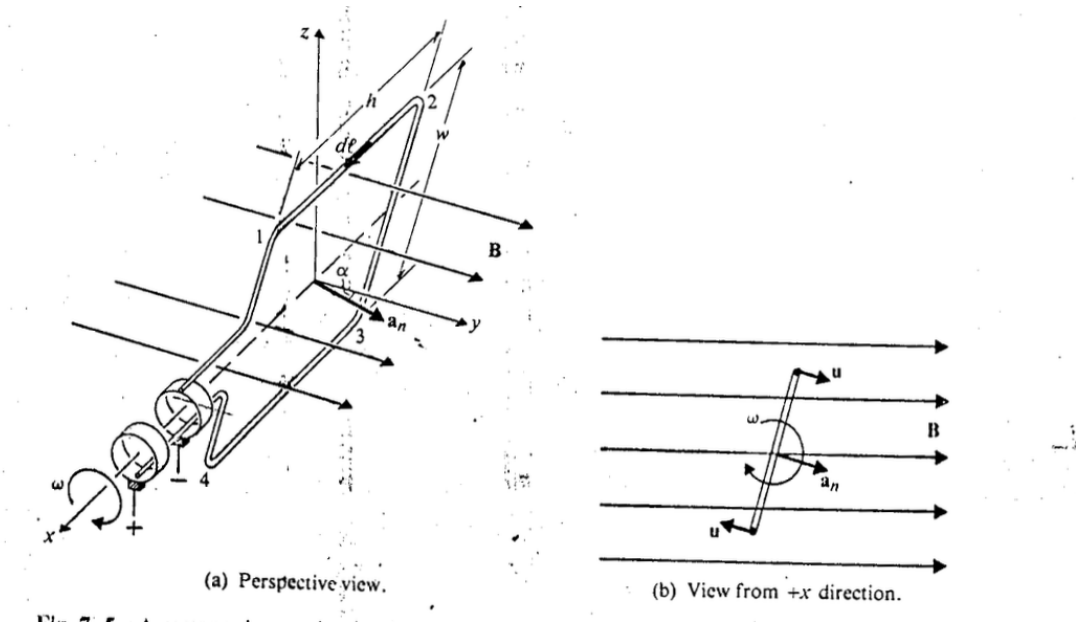

Figure 2: A rectangular conducting loop rotating in a changing magnetic field.