

## Basic details

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                 |                      |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|----------------------|
| UID                                                 | <input type="text"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Cohorts covered | <input type="text"/> |
| Long title                                          | <input type="text" value="Electromagnetism"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                 |                      |
| New code                                            | <input type="text" value="ELEC50007"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | New short title | <input type="text"/> |
| Brief description of module<br>(approx. 600 chars.) | <input type="text" value="Electromagnetic systems are ubiquitous in electrical engineering. Electromagnetism forms the foundation of understanding and designing systems as diverse as electrical motors, transformers, sensors, and RF to optical communication systems. The Maxwell equations are the basics of EM. Using vector calculus, we will solve these equations and apply them in low frequency and high frequency applications. Low frequency applications forms strong links with analogue and power electronics whilst high frequency application covers communications and sensing."/> |                 |                      |
| Available as a standalone module/ short course?     | <input type="text" value="N"/>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                 |                      |

## Statutory details

|              |                                      |                                 |                                |             |
|--------------|--------------------------------------|---------------------------------|--------------------------------|-------------|
|              | ECTS                                 | CATS                            | Non-credit                     |             |
| Credit value | <input type="text" value="10"/>      | <input type="text" value="20"/> | <input type="text" value="N"/> | HECOS codes |
| FHEQ level   | <input type="text" value="Level 5"/> |                                 |                                |             |

## Allocation of study hours

|                   | Hours                              |                                                                            |
|-------------------|------------------------------------|----------------------------------------------------------------------------|
| Lectures          | <input type="text" value="30"/>    | <i>16 hrs autumn term + 14 hrs spring term</i>                             |
| Group teaching    | <input type="text" value="14"/>    | <i>8 hrs autumn term + 6 hrs spring term</i>                               |
| Lab/ practical    | <input type="text" value="18"/>    | <i>4 hrs autumn term + 14 hrs spring term</i>                              |
| Other scheduled   |                                    | <i>Incl. project supervision, fieldwork, external visits.</i>              |
| Independent study | <input type="text" value="188"/>   | <i>Incl. wider reading/ practice, follow-up work, completion of assess</i> |
| Placement         |                                    | <i>Incl. work-based learning and study that occurs overseas.</i>           |
| Total hours       | <input type="text" value="250"/>   |                                                                            |
| ECTS ratio        | <input type="text" value="25.00"/> |                                                                            |

## Project/placement activity

|                                |                                 |
|--------------------------------|---------------------------------|
| Is placement activity allowed? | <input type="text" value="No"/> |
|--------------------------------|---------------------------------|

## Module delivery

|               |                                             |       |                                                  |
|---------------|---------------------------------------------|-------|--------------------------------------------------|
| Delivery mode | <input type="text" value="Taught/ Campus"/> | Other | <input type="text"/>                             |
| Delivery term | <input type="text"/>                        | Other | <input type="text" value="Autumn &amp; Spring"/> |

## Ownership

|                                 |                                                                   |
|---------------------------------|-------------------------------------------------------------------|
| Primary department              | <input type="text" value="Electical and Electronic Engineering"/> |
| Additional teaching departments | <input type="text"/>                                              |
|                                 | <input type="text"/>                                              |

Delivery campus **South Kensington**

## Collaborative delivery

Collaborative delivery? **N**

External institution **N/A**  
External department **N/A**  
External campus **N/A**

## Associated staff

| Role          | CID | Given name | Surname |
|---------------|-----|------------|---------|
| Module Leader |     | Oleksiy    | Sydoruk |
|               |     |            |         |
|               |     |            |         |
|               |     |            |         |
|               |     |            |         |
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|               |     |            |         |
|               |     |            |         |

## Learning and teaching

### Module description

|                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Learning outcomes              | <p>Upon successful completion of this module, you will be able to:</p> <ol style="list-style-type: none"><li>1. Apply the techniques of Vector Calculus to obtain analytical solutions to problems involving differential operators, line and surface integrals, as well as Green's, Divergence and Stokes' theorems.</li><li>2. Use Maxwell's equations to explain basic electromagnetic phenomena</li><li>3. Calculate electric and magnetic field vectors</li><li>4. Calculate capacitance and inductance</li><li>5. Analyse transmission-line devices</li><li>6. Explain the principles of radio-communication and radar systems</li><li>7. Measure parameters of electromagnetic devices</li><li>8. Assemble and evaluate performance of simple radar systems</li></ol> |
| Module content                 | <p>Fields; Differential operators; Line Integrals; Surface Integrals; Volume Integrals, Gauss', Stokes', and Green's theorems; Coordinate systems; Maxwell's equations; Static electric fields; Capacitance; Static magnetic fields; Inductance; Transmission lines; Electromagnetic waves; Electromagnetic waveguides; Scattering parameters; Antennas, Radio communication and radar</p>                                                                                                                                                                                                                                                                                                                                                                                   |
| Learning and Teaching Approach | <p>The lectures and will be delivered in-person and be and recorded. Lecture notes and lecture slides will be shared. Classes will be delivered in-person and be time tabled, but not recorded. The classes will cover problems including those not covered in the lecture notes. Apart from lectures and classes, questions can be submitted online.</p> <p>Labs and coursework are an integral part of this module. In the Autumn term, the coursework will be theory based and start after the midterm. In the Spring term, the labs are hardware based.</p>                                                                                                                                                                                                              |
| Assessment Strategy            | <p>There will be one computer-based test in the Autumn term</p> <p>There will further be a theoretical coursework assignment in the Autumn term. It will be assessed by a written report.</p> <p>The Spring-term hardware laboratory will be assessed by a written report.</p> <p>The final exam will cover all the topics in the module</p>                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Feedback                     | <p>Feedback will be given in the exercise classes.</p> <p>The computer-based tests will generate automatic feedback.</p> <p>Feedback will be given on written reports</p> <p>Feedback on the exams will be giving in after the Supplementary Qualifying Tests have been given. This feedback will come in the form of annotated example answers. The annotations will highlight where the student cohort did well and where general problems in understanding were observed.</p> |
| Reading list                 | J. D. Kraus and D. A. Fleisch 'Electromagnetics (with Applications)'                                                                                                                                                                                                                                                                                                                                                                                                             |
| Required equipment/ software | laptop with Matlab                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## Quality assurance

|                        |               |
|------------------------|---------------|
| Date of first approval |               |
| Date of last revision  | December 2024 |
| Date of this approval  |               |

## Office use only

|                    |  |
|--------------------|--|
| QA Lead            |  |
| Department staff   |  |
| Date of collection |  |

Module leader Oleksiy Sydoruk

|               |  |
|---------------|--|
| Date exported |  |
| Date imported |  |

Notes/ comments

## Assessment details

### Grading method

Numeric

Pass mark

40%

## Assessments

[illegible]

100%