# Foundation Algebra for Physical Sciences and Engineering
# CELEN036

# Module Handbook

**Credits:** 10

This handbook contains important information about the module. Read it in full at the beginning of the semester and re-read it whenever you have a question. If you do not find an answer to your question here, contact the module convenor or your tutor.

University of Nottingham
UK | CHINA | MALAYSIA

**Module convenor**: Dr Chenyang Xue

chenyang.xue@nottingham.edu.cn

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## 1. Who is teaching on this module?

List of tutors teaching in this module are given in the table below:

| Name | Role | Email | Room |
|------|------|-------|------|
| Dr Sannia Mareta | Senior Tutor (Lecturer) | sannia.mareta2@nottingham.edu.cn | Trent 380 |
| Dr Chenyang Xue | Module Convenor (Lecturer) | chenyang.xue@nottingham.edu.cn | Trent 341 |
| Dr Chenfei Zhang | Module Co-Convenor | chenfei.zhang@nottingham.edu.cn | Trent 341 |
| Dr Collins Ezeh | Tutor | collins.ezeh@nottingham.edu.cn | Trent 365 |
| Mr Shen Wang | Tutor | shen.wang@nottingham.edu.cn | Trent 341 |
| Mr Lucien Lu | Tutor | lucien.lu@nottingham.edu.cn | Trent 365 |

The updated office hours for all tutors will be given on Moodle.

## 2. What is this module about?

The Preliminary Year Mathematics Course for consists of two modules:

(i)  **CELEN036 (Foundation Algebra for Physical Sciences and Engineering)** in the Autumn Semester;

(ii)  CELEN037 (Foundation Calculus & Mathematical Techniques) in the Spring Semester.

These modules, which form part of a compulsory core Preliminary Year Course, are designed to ensure that you have the mathematical skills and standard vocabulary which you will require when you embark on your full degree course next year. We hope to fill in any gaps in your knowledge and to introduce you to some of the features that you are likely to meet in degree programmes for engineering, science or computing.

The **CELEN036 (Foundation Algebra for Physical Sciences and Engineering)** module is intended to provide students with the mathematical knowledge and fluency in algebraic techniques essential for analysing basic problems in engineering or sciences. Key elements are the development of basic mathematical skills in algebra and trigonometry, and algebraic mathematical techniques and their application to problem solving

## 3. What will I learn on this module?

A student who completes this module successfully should be able to

- Manipulate standard algebraic expressions and perform polynomial factorisations
- Manipulate simple rational functions and calculate partial fractions
- Use numerical methods to solve simple problems
- Manipulate mathematical formulae and algebraic equations
- Apply fundamental mathematical concepts to problems of a routine nature in engineering or science
- Construct and present mathematical arguments with accuracy and clarity
- Communicate mathematical arguments using standard terminology
- Reason logically and work analytically
- Perform with high levels of accuracy
- Use e-learning and self-study skills.

This module consists of following topics:

Functions; Inverse functions; Polynomials; Algebraic and Transcendental functions; Trigonometry; Remainder and Factor Theorems; Bisection and Iteration Numerical Methods; Binomial Theorem and its applications in error estimation; Matrices and their application in solving a system of equations; Complex numbers; Partial fractions, and Sequences and Series.

## 4. What are the learning activities on this module?

**The Weekly Teaching Scheme for this module involves:** 1 Lecture, 1 Seminar, Self-Study.

**Lectures**: There will be a I hour lecture every week of teaching which will be delivered in the DH Lawrence Auditorium (please check your timetable). Lecture slides will be uploaded to Moodle after the lecture.

**Seminars**: During every teaching week (except for the first), there will be a seminar of 1 hour. The topics covered in the seminars are based on the lectures done in the previous week. Seminar Tutors will conduct the class in small groups providing help and encouraging discussions about questions in the seminar slides, these problems reinforce the concepts that have been treated in the lectures. Seminar slides will be uploaded to Moodle on Friday every week.

**Problem Sheets**: These are a set of exercises on the topic that will be learnt on that week. These will be uploaded on Moodle after the lecture.

**Self-study**: At UNNC we emphasise self-study. It has been calculated that this module will take up to 100 hours of your time including approximately 20 hours of lectures and

seminars. As such, for every 1 hour of lecture or seminar we expect that you will contribute around 4 hours towards reading and trying to understand the topics covered during the lecture session. You are encouraged to try and solve as many questions as you can on the Problem Sheet during self-study.

**Office Hours**: You are encouraged to take advantage of Office hours offered by teaching staff, to get help on difficulties you may have with regard to lecture/seminar sessions or Problem Sheets. Information on the Office Hours will be made available on Moodle.

**The schedule for the Lectures** is given in the table below. Note that the seminars start one week after the lecture which is in timetable week 2, and the topics treated in seminars are the topics which have been covered in the preceding lecture. Hence you are advised to attend all lectures and seminars as they are both complementary!

| Timetable Week | Lecture | Topic |
|---|---|---|
| 2 (w/c 23/09/24) | 1 | **Functions:** Basics of functions, Types of functions, Graphing functions, Composition of functions, Inverse functions, Inequalities. |
| 4 (w/c 07/10/24) | 2 | **Quadratic Equations:** Solving quadratic equations, Method of completing the square, Graphing Quadratic functions, Nature of roots, Formation of quadratic equations. **Exponential and Logarithmic functions:** Rules of exponents (indices), Bases of logarithms, Relation between logarithmic and exponential functions, Rules of logarithms. |
| 5 (w/c 14/10/24) | 3 | **Polynomial Factorisation:** Remainder and Factor Theorems, Methods of long division and Synthetic Division, Complete factorisation of cubic polynomials.   **Partial Fractions:** Partial fractions for non-repeated linear factors, Non-repeated Quadratic factors, Repeated linear factors. |
| 6 (w/c 21/10/24) | 4 | **Trigonometry I:** Basics of Trigonometry, Trigonometric Identities, Range and period of trigonometric functions, Sets of zeros, Solving Trigonometric equations. |
| 7 (w/c 28/10/24) | 5 | **Trigonometry II:** Addition and Factor formulae, Multi-angle formulae, Inverse Trigonometric functions. Expressing $a \cos(x) + b \sin(x)$ as $r \cos(x- \theta)$ |
| 8 (w/c 04/11/24) | 6 | **Complex Numbers:** Introduction to Complex Numbers, Algebra of complex numbers, Argand diagram, Polar form of a Complex Number, Representation of algebraic operations on Argand diagram. |
| 9 (w/c 11/11/24) | | **Mid-term Exam / Independent Learning Week** |
| 10 (w/c 18/11/24) | 7 | **Numerical Methods:** Introduction to Numerical methods, Finding roots using Bisection Method, Explanation of Iteration method and finding roots using iteration. |
| 11 (w/c 25/11/24) | 8 | **Binomial Theorem:** Binomial Theorem, Polynomial expansions, Application of Binomial theorem in error estimation. |
| 12 (w/c 02/12/24) | 9 | **Matrices:** Introduction to Matrices, Matrix algebra, Inverse matrix, solving systems of linear equations using Matrix method. |
| 13 (w/c 09/12/24) | 10 | **Sequence:** Sequences (AP, GP, Harmonic and Fibonacci). **Series:** Arithmetic, Geometric and Harmonic series, Infinite Geometric Series, Power series, Method of differences. **Limits.** |
| 14 (w/c 16/12/24) | 11 | Revision lecture |

## 5. How is the module assessed?

| Mid-semester Exam | |
|---|---|
| **Weighting** | 30 % of overall module |
| **Date and Time** | Week 9 (w.c. Nov./13/2024) (60 minutes written examination) timetable would be released by CPSO and you would also be informed on Moodle. |
| **Duration** | 60 minutes |
| **Topics** | Topics covered in Lectures 1 to 5. |
| **Type of assessment** | 20 questions |
| **Feedback** | A complete working to all questions showing sample methods, and a statement of common errors made would be published on Moodle |
| **Notes** | <ul><li>Students are expected to write their answers and show all workings to all questions in the space provided in the examination booklet which also contains all the questions. This would be collected after the examination.</li><li>Only CELE permissible calculators are allowed in this examination.</li><li>No electronic devices capable of storing and retrieving text, including electronic dictionaries, may be used.</li><li>Dictionaries are not allowed with one exception. Those whose first language is not English may use a standard translation dictionary to translate between that language and English provided that neither language is the subject of this examination. Subject specific translation dictionaries are not permitted.</li></ul> |

| End of Semester Exam | |
|---|---|
| **Weighting** | 70% of overall module |
| **Date and Time** | Scheduled during University Exam Weeks |
| **Duration** | 90 minutes |
| **Topics** | The exam contains 7 problems , and the examination will cover the following topics:<br><br>Functions, Quadratic Equations, Exponential and Logarithmic Functions, Trigonometry I & II, Polynomial Factorisation, Numerical Methods, Binomial Theorem, Matrices, Complex Numbers, Partial Fractions, Sequence, Series. |
| **Type of assessment** | <ul><li>Onsite</li></ul> |

| | |
|---|---|
| **Feedback** | Solutions to all the questions showing sample methods, and a statement of common errors made |
| **Notes** | • Only CELE permissible calculators are allowed in this examination.<br>• No electronic devices capable of storing and retrieving text, including electronic dictionaries, may be used.<br>• Dictionaries are not allowed with one exception. Those whose first language is not English may use a standard translation dictionary to translate between that language and English provided that neither language is the subject of this examination. Subject specific translation dictionaries are not permitted. |

## 6. What are the assessment criteria?

You would be expected to show all workings to all the questions, and the marks awarded are based on your workings. Check the Moodle page few weeks before the mid-semester examination and final examinations to see sample questions and answers which would be made available to aid your preparation.

## 7. What do I need to know about feedback?

For the mid-semester examination, a complete working showing sample solutions to the questions would be on Moodle after the examination. This would aid your preparation for the final examination. Also, after the final examination, a statement of the common errors made would be published on Moodle.

Please, make use of the office hours to further discuss general feedbacks with tutors.

Also, note that feedback in CELE is a two-way process and takes many forms. Depending on the learning task, you will receive written or oral feedback to help you improve. Sometimes the feedback will be offered to the whole class of students: this general feedback is no less important for your learning. Sometimes people become defensive when receive feedback meant to help them improve. Try to fight against negative emotions and make the most of any comment meant to help you improve. It is your responsibility to reflect on your tutor's comments and set goals. Feedback is not always negative! Tutors will also highlight what is good and must continue. You will also have plenty of opportunities to give feedback to your tutors through Early Module Feedback and the SET/SEM surveys at the end of the semester and students' participation in CELE's Learning Community Forum (you can read the Student Handbook for more information on these processes). Equally important, you are always welcomed to speak with your tutor during office hours to share your feedback.

## 8. Where can I find the module readings and materials?

All information and materials for this module are available on its Moodle Page.

The Moodle page contains constantly updated information relating to this module, and all the relevant Learning Materials.

The **Learning Materials** on Moodle are: Lecture Slides, Seminar Slides, Problem Sheets, MathTutor resources, HELM resources, and Vocabulary materials.

**Lecture Slides:** These are the slides used to deliver the weekly lectures. The complete version of the lecture slide would be uploaded on Moodle after every lecture.

**Seminar Slides:** These are the slides used to deliver the weekly seminars. A copy of these slides will be made available by the end of Friday on every seminar week.

**Problem Sheets:** This is a collection of problems relating to the topics treated in that week. The answers to the exercises are provided, and it is expected that you use this resource for additional practice.

**Self-study Resources:** This is a provision for web-based interactive materials to enable students to revise and practice basic mathematical skills. It comprises summary text and exercises. The learning material is produced by a group of teachers and mathematicians from some UK Universities: Mathcentre, HELM

**Vocabulary Materials:** These are a collection of resources to help you with some important vocabulary for this module.

**Additional Reading for this Module**

**Reference textbook:** College Algebra by J. W. Coburn & J. P. Coffelt (3rd edition). Publisher: McGraw Hill. You may access this textbook on NUSearch. Note that there are limited access to this e-book at any given time, as such you may have to wait for a while to gain access.

**Other reference textbooks:** There are few quantities of physical copies or limited electronic access to the digital copies of some of these textbooks in the University Library.

College Algebra by M. Dugopolski. Publisher: Addison-Wesley.

Engineering Mathematics by K. A. Stroud & D. J. Booth. Publisher: Palgrave Macmillan.

Foundation Mathematics by D. J. Booth. Publisher: Addison-Wesley Longman.

Foundation Algebra by P. Gajjar. Publisher: Red Globe Press.

Foundations of Mathematics by P. Brown. Publisher: Mercury Learning & Information.

## 9. What happens if I fail?

Resits for the module comprises a written examination (with 100% weighting) taken within the University period of resit examinations, provisionally scheduled for August 2025.

## 10. Independent Learning Week

CELE has named the week commencing on Monday 7th November as your Independent Learning Week. Independent learning is not limited to this week of course as it is a requirement throughout the semester. What makes Independent Learning Week special is that there are no scheduled classes and your tutors will encourage you to engage in learning activities that can be carried out both individually and in group. Some of you may also have mid-term exams falling into this week. Besides, you can set your own learning goals for the week. The goal is for you to use this week to reflect on what learning independently outside the classroom means to you, sharpen your study skills, and reinforce your preparation moving toward the end of the semester. To help you:

1) You will find recommended learning activities, to undertake individually or in group on the Moodle page of your module.

2) Classrooms will remain booked at the usual times in case you need a place where to meet with other students to work on the module's activities.

3) Tutors will remain available during office hours (check Moodle for their updated time slots).

## 11. Other important information about this module

**Formula Sheet:** The attached formula sheet (last two pages of this booklet) is standard for this course and will be provided during the written examination, and can always be used for reference during seminars or self-study.

**Calculator:** The university approved calculator is the CASIO fx-82 family of calculators (shown below), you are required to use this during any written examination for this module.
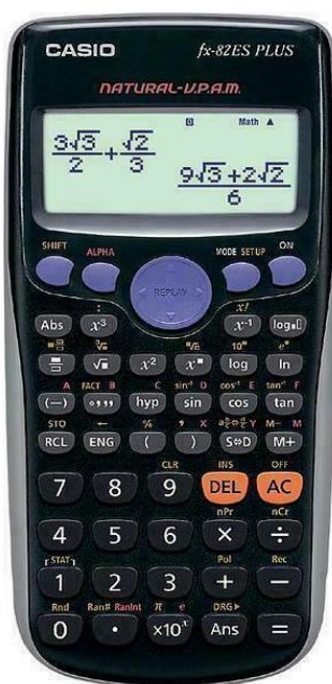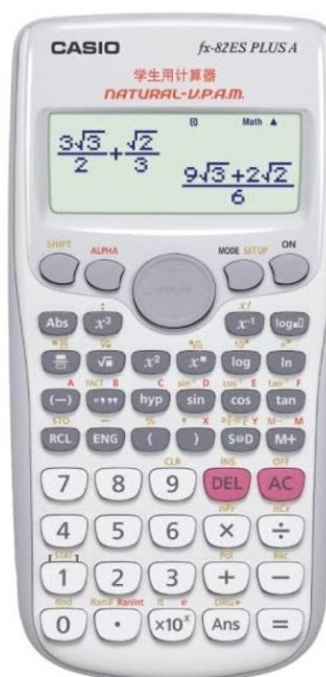


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# 12. Important policies to know

**Academic misconduct**

There is **zero tolerance** of Academic Misconduct for all students studying at UNNC. Once academic misconduct is confirmed, it will result in appropriate penalties. Misconduct is any inappropriate activity or behaviour by a student which may give that student, or another student, an unpermitted academic advantage in marked assessment. This includes (and is not limited to) plagiarism (appropriating someone else's texts or ideas without proper referencing), asking someone else to complete one's assessments, sharing your answers to individual quizzes with other students.

Misconduct Policy:
https://www.nottingham.ac.uk/qualitymanual/assessment-awards-and-deg-classification/pol-academic-misconduct.aspx

Misconduct Procedure (UNNC):
https://www.nottingham.edu.cn/en/academicservices/academic-misconduct/academic-misconduct.aspx

**Extenuating Circumstances (EC)**

If you **miss an exam or other form of assessment** on medical or acute personal grounds, please follow the procedures to apply for EC.

Extenuating Circumstances Procedure (UNNC):

https://www.nottingham.edu.cn/en/academicservices/unnc-extenuating-circumstances-procedure/unnc-extenuating-circumstances-procedure.aspx

**Attendance policy**

Please remember that **all classes are compulsory.** If you have to ask for leave you need to contact The Hub via TheHub@nottingham.edu.cn and provide evidence. Missing classes without authorized reasons will be recorded as **Absence** which may jeopardize your study.

A copy of the policy is posted on CELE Common Space under Policies and Regulations:

https://moodle.nottingham.ac.uk/course/view.php?id=39383

If any of these links results broken, you can contact CPSO for assistance:

cpso@nottingham.edu.cn.