

Liverpool John Moores University

Title: General Mathematics
Status: Definitive
Code: **3503YAUZOO** (127976)
Version Start Date: 01-08-2021

Owning School/Faculty: Biological and Environmental Sciences
Teaching School/Faculty: Yunnan Agricultural University

| Team | Leader |
|-----------------|--------|
| Rachael Symonds | Y |

Academic Level: FHEQ3 **Credit Value:** 20 **Total Delivered Hours:** 50
Total Learning Hours: 200 **Private Study:** 150

Delivery Options

Course typically offered: Semester 2

| Component | Contact Hours |
|-----------|---------------|
| Lecture | 38 |
| Practical | 10 |

Grading Basis: 40 %

Assessment Details

| Category | Short Description | Description | Weighting (%) | Exam Duration |
|----------|-------------------|---|---------------|---------------|
| Exam | Exam | Written exam covering all taught material | 60 | 2 |
| Test | Test | Coursework test | 32 | |

Aims

This course is a common basic mathematics undergraduate course for all students. Through the study of this course, students should obtain the basic concepts, basic theories, and basic operation methods of univariate function limits and continuity, univariate function differentials, and univariate function integrals, etc., and lay a necessary foundation for follow-up courses and further acquired mathematical knowledge. The object of study in this course is function (quantity dependence in the

process of change). Contents include functions, limits, continuous, one-variable function calculus, differential equations, etc. Through the teaching of this course, students will have a general understanding of the basic theory of calculus, and fully understand the background and mathematical ideas of calculus, master the basic methods and skills of calculus, and have certain ability in analysis and demonstration of computing. And also students can apply the methods of calculus to solve application problems.

Learning Outcomes

After completing the module the student should be able to:

- 1 Describe and recall functions, basic concepts of limits, proficient in calculations of limits, images of functions, properties of limits.
- 2 Understand basic concepts of derivatives, proficient in the calculation of derivatives, and the application of derivatives.
- 3 Understand basic concepts of indefinite integral and definite integral, proficient in calculation of indefinite integral and definite integral, application of integral.
- 4 Understand and describe basic concepts of first-order and second-order differential equations, proficient in the calculation of first-order equations and second-order constant coefficient equations.

Learning Outcomes of Assessments

The assessment item list is assessed via the learning outcomes listed:

| | | | | |
|-----------------|---|---|---|---|
| Written exam | 1 | 2 | 3 | 4 |
| Coursework Test | 1 | 2 | 3 | 4 |

Outline Syllabus

Section 1: Limits and continuity of functions

This chapter requires students to learn the limits of series, the limits of functions, and the basic concepts and methods and applications of continuity of functions.

Knowledge points include: real numbers; limits of sequences; properties of convergent sequences; criteria for convergence of sequences; monotonic bounded sequences; Cauchy convergence criteria; mappings and functions; limits of functions and their relationship with sequence limits; properties of function limits and operations The criteria for the existence of function limits; two important function limits; infinitesimal quantities, infinitesimal quantities, and comparisons; the concept and properties of function continuity; the discontinuities of functions; the properties of continuous functions on closed intervals; the uniform continuity of functions.

Section 2: Differential Functions of Unary Functions and Their Applications

This chapter requires students to learn basic concepts and basic methods and applications of functions such as derivatives, differentials and their basic theorems, and behavior of functions.

The basic knowledge points include: the concept of derivative; the meaning of

derivative; the geometric meaning of derivative; the derivative of simple function; the algorithm of derivative; the derivative of inverse function, compound function and implicit function; the derivative of function determined by parametric equation; the relevant change rate Problems; Concepts of Differentiation; Differential Formulas and Algorithms; Simple Applications of Differentiation; Concepts of Higher Order Derivatives; Algorithms of Higher Order Derivatives; Extreme Values and Fermat's Theorem; Mean Value Theorem of Differentials; Lobeda's Law; Taylor Formula And its applications; monotonicity of functions; extreme values of functions; maximum and minimum values of functions; bumps of functions; inflection points of curves; asymptotic lines of functions; analytical methods of function mapping; Calculation; approximate solution of equation.

Section 3: Unary Function Integrology and Its Applications

This chapter requires students to learn the concepts and properties of indefinite integrals, definite integrals, and generalized integrals, and to master related calculations and applications.

The knowledge points include: (1) the concept and nature of indefinite integrals; the basic formulas of indefinite integrals; the first type of integration integration method (miniature differential method); the second type of integration integration method; segment integration method; integration of rational functions; Integration of simple irrational functions; rational integration of trigonometric functions. (2) The concept of definite integral; the definition and geometric meaning of definite integral; the nature of definite integral. (3) Basic principles of calculus; partial integration method of definite integral; conversion integral method of definite integral; approximate calculation of definite integral. (4) Micro-element method; the problem of the area of the plane figure: the arc length of the plane curve; the parallel cross-sectional area is the volume of the known solid; the volume of the rotating body; the side area of the rotating body; the average value of the function; , Liquid side pressure. (5) Integral on infinite interval; Generalized integral of unbounded function; Examination and convergence method of integral on infinite interval; Examination and convergence criterion of integral of unbounded function; Γ function.

Section 4: Differential Equations

The knowledge in this chapter is mainly calculation, and students are required to master the solving problems of various differential equations in this chapter.

Basic knowledge points: basic concepts of differential equations, differential equations with separable variables, homogeneous equations, first-order linear differential equations, Bernoulli equations, lower-order higher-order differential equations, general theory of second-order linear differential equations Second-order constant coefficient homogeneous linear differential equation, second-order constant coefficient non-homogeneous linear differential equation.

Learning Activities

This course mainly focuses on classroom teaching, supplemented by some practical activities, in which students are randomly sampled on the podium to recall and describe course content. In extracurricular classes, teachers organize students to answer questions about self-study and course content.

Notes

This course is a foundation level general mathematics course that requires students to understand the concepts and properties of functions, limits, derivatives, differentials, indefinite integrals, definite integrals, and applications of definite integrals, master the corresponding basic calculation methods and skills, and be able to solve simple practical problems.