

## COURSE SPECIFICATION

The course information as follows may be subject to change, either during the session because of unforeseen circumstances, or following review of the course at the end of the session. Queries about the course should be directed to the course instructor.

1.	<b>Course Title</b>	<b>A Ordinary Differential Equations A</b>				
2.	<b>Originating Department</b>	Mathematics				
3.	<b>Course Code</b>	MA201a				
4.	<b>Credit Value</b>	4				
5.	<b>Course Type</b>	Major Core Courses				
6.	<b>Semester</b>	Spring				
7.	<b>Teaching Language</b>	English / English & Chinese				
8.	<b>Instructor(s), Affiliation &amp; Contact</b> <b>For team teaching, please list all instructors</b>	sull@sustech.edu.cn , HERTZ Jana(rhertz@sustech.edu.cn) (wangxf@sustech.edu.cn) wangy66@sustech.edu.cn , Linlin Su(sull@sustech.edu.cn), HERTZ Jana(rhertz@sustech.edu.cn) Xuefeng Wang(wangxf@sustech.edu.cn), Yong Wang wangy66@sustech.edu.cn , Department of Mathematics				
9.	<b>Tutor/TA(s), Contact</b>	To be announced				
10.	<b>Maximum Enrolment</b> <b>Optional</b>					
11.	<b>Delivery Method</b>	Lectures	/ Tutorials	/ Lab/Practical	( Other Please specify )	Total
	<b>Credit Hours</b>	48	32	0	0	80

12. <b>Pre-requisites or Other Academic Requirements</b>	I&II&III & ; I&II Mathematical Analysis I&II&III (or Calculus I&II and Real Analysis), Linear Algebra I&II
13. <b>Courses for which this course is a pre-requisite</b>	MA303 Partial Differential Equations (MA303)
14. <b>Cross-listing Dept.</b>	None

### SYLLABUS

15. **Course Objectives**

This course mixes theory with applications, and uses softwares to aid the understanding on theoretical results and to help to solve application problems. The course aims to nurture the ability of the student to use ODE to solve problems arising in applications and other branches of mathematics.

16. **Learning Outcomes**

Students have a good grasp of the basic knowledge of ordinary differential equations, and can use the knowledge to deal with practical problems.

17. **Course Contents (in Parts/Chapters/Sections/Weeks. Please notify name of instructor for course section(s), if this is a team teaching or module course.)**

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6.	8
6.1.	
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6.4.	
1. Introduction(2 Credit Hours)	
1.1. Some Basic Mathematical Models; Direction Fields	
1.2. Solutions of Some Differential Equations	
1.3. Classification of Differential Equations	
2. First Order Differential Equations(20 Credit Hours)	
2.1. Linear Equations; Method of Integrating Factors	
2.2. Separable Equations in Variables	
2.3. Modeling with First Order Equations	
2.4. Exact Equations and Integrating Factors	
2.5. Elementary Transformation Method	
2.6. The Existence and Uniqueness Theorem	
2.7. Proof of the Existence and Uniqueness Theorem	

2.8. Peano's Existence Theorem
2.9. Extensions of Solutions
2.10. Comparison Theorems
3. Second Order Linear Equations(8 Credit Hours)
3.1. Homogeneous Equations with Constant Coefficients
3.2. Solutions of Linear Homogeneous Equations; the Wronskian
3.3. Complex Roots of the Characteristic Equation
3.4. Repeated Roots; Reduction of Order(1 Credit Hours)
3.5. Nonhomogeneous Equations; Method of Undetermined Coefficients
3.6. Variation of Parameters
3.7. Mechanical and Electrical Vibrations
4. High Order Linear Equations(2 Credit Hours)
4.1. General Theory of nth Order Linear Equations
4.2. Homogeneous Equations with Constant Coefficients
4.3. The Method of Undetermined Coefficients
4.4. The Method of Variation of Parameters
5. Systems of First Order Linear Equations (8 Credit Hours)
5.1. Introduction
5.2. Review of Matrices
5.3. Basic Theory of Systems of First Order Linear Equations
5.4. Homogeneous Linear Systems with Constant Coefficients
5.5. Complex Eigenvalues
5.6. Fundamental Matrices
5.7. Repeated Eigenvalues
5.8. Nonhomogeneous Linear Systems
6. Nonlinear Differential Equations and Stability(8 Credit Hours)
6.1. The Phase Plane: Linear Systems
6.2. Autonomous Systems and Stability
6.3. Locally Linear Systems
6.4. Liapunov's Second Method

## 18. Textbook and Supplementary Readings

<b>Textbook:</b>
1. Elementary Differential Equations and Boundary Value Problems, 11th edition, William E. Boyce, Richard C. DiPrima and Douglas C. Meade, Wiley, 2017.
2. Differential Equations With Boundary Value Problems , second edition, John Polking, Albert Boggess and David Arnold, Pearson, 2005.
<b>Reference:</b>
, , , , , 2004 .

## ASSESSMENT

19.

Type of Assessment	Time	% of final score	Penalty	Notes
Attendance				
Class Performance				
Quiz		20		
Projects				
Assignments		20		
Mid-Term Test		25		

<b>Final Exam</b>		35		
<b>Final Presentation</b>				
<b>Others (The above may be modified as necessary)</b>				

20. **GRADING SYSTEM**

A.	<b>Letter Grading</b>
B.	<b>/ Pass/Fail Grading</b>

**REVIEW AND APPROVAL**

21. /  
This Course has been approved by the following person or committee of authority

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