

## 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>	Real Analysis				
2.	<b>Originating Department</b>	Department of Mathematics				
3.	<b>Course Code</b>	MA213-16				
4.	<b>Credit Value</b>	5				
5.	<b>Course Type</b>	Major Core Courses				
6.	<b>Semester</b>	Fall				
7.	<b>Teaching Language</b>	English				
8.	<b>Instructor(s), Affiliation &amp; Contact</b> For team teaching, please list all instructors	Jana Hertz Department of Mathematics, Block 3, Wisdom Valley Jana Hertz, Room 427, <a href="mailto:rhertz@sustech.edu.cn">rhertz@sustech.edu.cn</a> , 0755-8801-8121				
9.	<b>Tutor/TA(s), Contact</b>	/				
10.	<b>Maximum Enrolment</b> ( ) Optional					
11.	<b>Delivery Method</b>	/ /	/	( )		
		<b>Lectures</b>	<b>Tutorials</b>	<b>Lab/Practical</b>	<b>Other Please specify</b>	<b>Total</b>
	<b>Credit Hours</b>	64	32	0		96

12. Pre-requisites or Other Academic Requirements	A Calculus A II
13. Courses for which this course is a pre-requisite	
14. Cross-listing Dept.	

## SYLLABUS

### 15. Course Objectives

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This course bridges Calculus and advanced math courses (such as Complex Analysis, Real Analysis, Functional Analysis and Probability). It covers basic theory of concepts of point set topology, using - language to describe concepts in Calculus, such as limit, continuity, differentiation, integration, convergence of series etc and to rigorously derive related properties and prove theorems. The course also introduces the continuity and differentiability of multivariate functions, inverse function theorem, implicit function theorem, multiple integrals, line integrals and surface integrals.

### 16. Learning Outcomes

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### 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.)**

1 (8 )

Chapter 1. Basic point set topology

2 (10 )

Chapter 2. Numerical sequences and series

3 (8 )

Chapter 3. Continuity

4 (6 )

Chapter 4. Differentiation

5 Riemann (6 )

Chapter 5. The Riemann integral

6 (8 )

Chapter 6. Sequences and series of functions

(8 )

Chapter 7. Multivariate functions

(10 )

Chapter 8. Line integrals and surface integrals

weekly schedule:

1 (1 ) (3 )

Week 1: Metric spaces (1 hours), open and closed sets (3 hours).

2 (2 ) (1 ) (1 )

Week 2: Compact sets (2 hours), perfect sets (1 hours), connected sets (1 hour).

3 (2 ) (1 ) (1 )

Week 3: Convergent sequences (2 hours), sub sequences (1 hour), Cauchy sequences (1 hour).

4 (1 ) (1 ) e (1 ) (1 )

Week 4: Upper and lower limits (1 hour), some special sequences, series (1 hour), series of nonnegative terms, the number e (1 hour), root and ratio test, power series (1 hour).

5	(1 )	(1 )	(1 )	(1 )
Week 5: Summation by parts, absolute convergence (1 hour), addition and multiplication of series, rearrangement (1 hour), limits of functions (1 hour), continuous functions (1 hour).				
6	(2 )	(1 )	(1 )	
Week 6: Continuity and compactness (2 hours), continuity and connectedness (1 hour), discontinuity (1 hour).				
7	(1 )	(1 )	(2 )	
Week 7: Monotonic functions (1 hour), infinite limits and limit at infinity (1 hour), the derivative of a real function (2 hours).				
8	(1 )	(1 )	(1 )	(1 )
Week 8: Mean value theorems (1 hour), the continuity of derivatives, L'Hospital's rule (1 hour), derivatives of higher order, Taylor's theorem (1 hour), differentiation of vector-valued functions (1 hour).				
9	(2 )	(2 )		
Week 9: Definition and existence of the integrals (2 hours), Properties of the integral (2 hours).				
10		(1 )	(1 )	(1 )
Week 10: Integration and differentiation, integration of vector-valued functions (1 hour), rectifiable curves (1 hour), discussion of main problem (1 hour), uniform convergence (1 hour).				
11	(2 )	(1 )	(1 )	
Week 11: Uniform convergence and continuity (2 hours), uniform convergence and integration (1 hour), uniform convergence and differentiation (1 hour).				
12	(2 )	(1 )	(1 )	
Week 12: Equicontinuous families of functions (2 hours), linear transformations (1 hour), differentiation (1 hour).				
13	(1 )	(1 )	(2 )	
Week 13: Differentiation, the contraction principle (1 hour), the inverse function theorem differentiation (1 hour), the implicit function theorem (2 hours).				
14	(2 )	(1 )	(1 )	
Week 14: The rank theorem (2 hours), multiple integrals (1 hour), primitive mappings (1 hour).				
15	(1 )	(3 )		
Week 15: Partition of unity, change of variables (1 hour), differential forms (3 hours).				
16	(2 )	Stokes	(1 )	(1 )
Week 16: Simplexes and chains (2 hours), Stokes's theorem (1 hour), review (1 hour).				

18. **Textbook and Supplementary Readings**

<p>Textbook</p> <p>Principles of Mathematical Analysis, W. Rudin, , 1 , 2004.</p> <p>Supplementary Readings</p> <p>Mathematical Analysis (I,II), Zorich, , 1 , 2010.</p>
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**ASSESSMENT**

19.

Type of Assessment	Time	% of final score	Penalty	Notes
Attendance		0		
Class Performance		0		
Quiz		0		
Projects		0		
Assignments		30		
Mid-Term Test		30		
Final Exam		40		
Final Presentation		0		
Others (The above may be modified as necessary)				

20.

**GRADING SYSTEM**

<p>A. Letter Grading</p> <p>B. / Pass/Fail Grading</p>
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**REVIEW AND APPROVAL**

21.

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

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