

Tamkang University Academic Year 113, 2nd Semester Course Syllabus

Course Title	NUMBER THEORY	Instructor	YAO CHENG
Course Class	TSNXB3A DEPARTMENT OF APPLIED MATHEMATICS AND DATA SCIENCE, 3A	Details	◆ General Course ◆ Selective ◆ 2nd Semester ◆ 3 Credits
Relevance to SDGs	SDG4 Quality education		
D e p a r t m e n t a l A i m o f E d u c a t i o n			
I . To teach knowledge in mathematics. II. To train teaching professionals in mathematics. III. To develop independent and creative thinking. IV. To establish ability to present oneself. V . To promote cooperative working spirit. VI. To prepare self learning ability in multiple areas.			
Subject Departmental core competences			
A. To learn the fundamentals of mathematics.(ratio:25.00) B. To develop independent and logical thinking ability.(ratio:25.00) C. To learn basics of probability and statistic.(ratio:5.00) D. To use the aid of computer in solving mathematical and statistical problems.(ratio:15.00) E. To obtain the ability to collect and analyze data.(ratio:5.00) F. To establish ability to pursue knowledge in advanced mathematics.(ratio:25.00)			
Subject Schoolwide essential virtues			
1. A global perspective. (ratio:5.00) 2. Information literacy. (ratio:30.00) 3. A vision for the future. (ratio:10.00) 4. Moral integrity. (ratio:5.00) 5. Independent thinking. (ratio:30.00) 6. A cheerful attitude and healthy lifestyle. (ratio:5.00)			

7. A spirit of teamwork and dedication. (ratio:10.00)

8. A sense of aesthetic appreciation. (ratio:5.00)

**Course
Introduction**

Number theory is one of the most ancient subject in the mathematics. Despite of this, number theory is still one of the most active research area in nowadays mathematics. Usually, the questions from number theory are easy to understand, but to solve the questions need to take lots of effort. In the first semester of this course, we will introduce elementary number theory. Our focus will be on quadratic reciprocity law and continued fraction. In the second semester, we will enter to more advanced topics. We will introduce to the algebraic number theory, basic on examples.

The correspondences between the course's instructional objectives and the cognitive, affective, and psychomotor objectives.

Differentiate the various objective methods among the cognitive, affective and psychomotor domains of the course's instructional objectives.

I. Cognitive : Emphasis upon the study of various kinds of knowledge in the cognition of the course's veracity, conception, procedures, outcomes, etc.

II. Affective : Emphasis upon the study of various kinds of knowledge in the course's appeal, morals, attitude, conviction, values, etc.

III. Psychomotor: Emphasis upon the study of the course's physical activity and technical manipulation.

No.	Teaching Objectives	objective methods
1	The aim of this course is to introduce both elementary and more advanced number theory	Cognitive

The correspondences of teaching objectives : core competences, essential virtues, teaching methods, and assessment

No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABCDEF	12345678	Lecture	Testing, Study Assignments, Report(including oral and written)

Course Schedule

Week	Date	Course Contents	Note
1	114/02/17 ~ 114/02/23	7.2 Euler's phi-function 7.3 Euler's theorem	
2	114/02/24 ~ 114/03/02	7.4 Some properties of phi-function 8.1 The order of an integer modulo n	

3	114/03/03 ~ 114/03/09	8.2 Primitive roots for primes 8.3 Composite numbers having primitive roots	
4	114/03/10 ~ 114/03/16	8.4 The theory of indices 9.1 Euler's criterion	
5	114/03/17 ~ 114/03/23	9.2 The Legendre symbol and its properties 9.3 Quadratic reciprocity	
6	114/03/24 ~ 114/03/30	9.4 Quadratic congruences with composite moduli 10.1 From Caesar cipher to public key cryptography	
7	114/03/31 ~ 114/04/06	10.2 The Knapsack cryptosystem 10.3 An application of primitive roots to cryptography	
8	114/04/07 ~ 114/04/13	12.1 The equation $x^2 + y^2 = z^2$	
9	114/04/14 ~ 114/04/20	Midterm Exam/Midterm Assessment Week (teachers can adjust the week as needed)	
10	114/04/21 ~ 114/04/27	12.2 Fermat's last theorem	
11	114/04/28 ~ 114/05/04	14.2 The Fibonacci sequence	
12	114/05/05 ~ 114/05/11	14.3 Certain identities involving Fibonacci numbers	
13	114/05/12 ~ 114/05/18	15.3 Finite continued fractions	
14	114/05/19 ~ 114/05/25	15.3 Infinite continued fractions	
15	114/05/26 ~ 114/06/01	16.2 Primitive testing and factorization	
16	114/06/02 ~ 114/06/08	16.3 An application to factoring: remote coin flipping	
17	114/06/09 ~ 114/06/15	Final Exam/Final Assessment Week (teachers can adjust the week as needed)	
18	114/06/16 ~ 114/06/22	Flexible Teaching Week: Generally, no in-person classes; teachers may arrange teaching activities or final assessments, among other options.	
Key capabilities			
Interdisciplinary			

Distinctive teaching	
Course Content	Logical Thinking AI application
Requirement	
Textbooks and Teaching Materials	Self-made teaching materials:Handouts
References	Elementary number theory by David Burton (7-th edition)
Grading Policy	<p>◆ Attendance : % ◆ Mark of Usual : 40.0 % ◆ Midterm Exam : 30.0 %</p> <p>◆ Final Exam : 30.0 %</p> <p>◆ Other () : %</p>
Note	<p>This syllabus may be uploaded at the website of Course Syllabus Management System at http://info.ais.tku.edu.tw/csp or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at http://www.acad.tku.edu.tw/CS/main.php.</p> <p>※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.</p>