Program	Level	Second cycle		
	Name of the program	Pure Mathematics		
COURSE				
Course title	**Analytic Number Theory**			
Course code	Semester	Course status	ECTS	Contact hours (L+AE+LE)
PMAT 490	II	Mandatory course	8	3+2+0
Lecturer				
Course Goals	The main objects studied in the course are the Riemann zeta and the Dirichlet L function. Different ways of constructing these functions and their properties are discussed. Special attention is devoted to their relation to some distribution results. The relation between the Reimann zeta function and the distribution of prime numbers, i.e. the prime number theorem is discussed, as well as the relation between the Dirichlet L function and the distribution of primes in arithmetic progressions. The content may serve as a basis for constructing and analyzing zeta and L functions in different general contexts.			
Learning Outcomes	After completing this course, students should demonstrate competency in the following skills: - Understand the essence of the analytical methods in number theory; - Be aware of the importance of the Riemann zeta function and the Riemann hypothesis; - Understand fundamental principles of the construction of a zeta or L function associated to different arithmetic or algebraic objects.			

COURSE CONTENT

- Dirichlet series and Riemann zeta function, Möbius function, von Mangoldt function, and Möbius inversion formula.
- Some important Dirichlet series and arithmetic functions related to the Riemann zeta function.
- Meromorphic continuation and functional equation for the Riemann zeta function.
- Entire function, the order of an entire and meromorphic function, Hadamard factorization theorem.
- Zeros of the Riemann zeta function, factorization formulas, Hamburgers inversion theorem.
- Hadamard and de la Vallée Poussin theorems.
- The Prime number theorem.
- Zero-free region for the Riemann zeta function.
- The Riemann hypothesis and some consequences.
- Finite Abelian groups and associated characters.
- Gaussian sums associated to Dirichlet characters.
- Dirichlet L function, its meromorphic continuation, and functional equation.
- Dirichlet theorem about prime numbers in arithmetic progressions.
- Distribution of prime numbers in arithmetic progressions.

LITERATURE

[1] T. M. Apostol: Introduction to analytic number theory, UTM Springer, 1998.
[2] E. C. Titchmarsh: The theory of the Riemann zeta-function, 2nd ed., Oxford University Press, 1986.
[3] M. R. Murty: Problems in analytic number theory, GTM Springer, 2001.
[4] G. J. O. Jameson, The prime number theorem, LMS Student texts 53, Oxford University Press, 2003.

STUDENT WORKLOAD (hours in a semester)

Lectures	45	Exercises	30	Individual work	90	T o t a l	165

GRADING			**REMARKS**
Criterion	Maximum	Minimum	

	points	points	
Midterm exams			
Project			
Final exam			
T o t a l	100	55	