

# School of Mathematics and Statistics

## Training Program for Academic Master's Degree

(Implemented Since 2018)

### 1. Training objectives

1. Enable students to gain a good understanding of Marxist-Leninist Doctrine, Mao Zedong Thought, Deng Xiao-ping Theory, the important thought of Three Represents, Scientific Outlook on Development, and Xi Jinping's "The Thought on Socialism with Chinese Characteristics for a New Era", to support the Party's Basic Guideline and establish correct outlooks on the world, life and values, to have good ideological and political qualities and moral character, good humanistic literacy and academic accomplishment, and a strong sense of enterprise and responsibility, to observe law and discipline, to keep physically and mentally healthy, to be willing to serve the people, serve the CCP's governance and administration, serve the consolidation and development of the socialist system with Chinese characteristics, and serve the Reform and Opening-up and the construction of socialist modernization.

2. Have a solid command of the basic theory of mathematics and systematic professional knowledge. Be familiar with the emerging trends of this profession. Know how to use modern technologies such as computers and the Internet. Accept the lessons of independent scientific research. Be capable of independently engaging in scientific research, teaching, or other practical work for this subject.

3. Master a foreign language. Be able to use this foreign language to efficiently read the scientific and technological literature of this subject.

### 2. Research fields (see appendix)

### 3. Period of schooling

1. The schooling period of an academic master's degree in our institute is normally 3-4 years, including 1-1.5 years for course study.
2. Standards for early graduation (at least 2 years' study at school): The academic masters who apply for early graduation shall have studied all courses prescribed by training program and completed the examinations of other trainings. Applicants shall have excellent results and strong innovative ability. These students must publish one paper related to their subject in the SCI or EI journals, or publish two papers (or more) in the designated learned periodicals. These include papers that have received official letters of acceptance. The first author of a published paper must be from the School of Mathematics and Statistics of Wuhan University. If the paper is published together with others in Chinese, the student is required to be the first author. If the paper is published with others in a foreign language, the author can be arranged in alphabetical order by name according to the international general rules for mathematical papers. In addition, for papers in which a teacher is listed as the first author and a student is listed as the second author, the student can be assumed as the first author. If there are objections on the qualification of dissertations, the final arbitration may be made by the Academy Degree Committee.

### 4. Courses (see appendix) and credits

#### 1. Classification of courses

Academic master's courses are classified as degree courses and elective courses

#### I. Degree courses

(1) Public required course for the whole school: ideological and political theory courses and the 1st foreign language (72 class hours, 2 credits). Ideological and political theory courses include one required course "Research on the Theory and Practice of Socialism with Chinese Characteristics" (36 class hours, 2 credits), and one elective course the "Dialectics of Nature" (18 class hours, 1 credit).

(2) Core curriculum courses: This refers to courses which all academic masters of the same first-class discipline should learn together, including the methodology of scientific research in this discipline and the common professional courses.

(3) Research oriented required courses: This refers to required courses of certain research field for academic masters.

## II. Elective courses

Elective courses include public elective courses and professional elective courses. Public elective courses include courses in computer science, management, liberal arts, PE, career guidance etc. Academic master students should elect no more than 2 credits. Professional elective courses include courses within a specific discipline which can broaden students' scope of knowledge and deepen their specialized knowledge, as well as other courses designated by a teacher according to research fields.

### 2. Credits

Requires a total of 42 credits: Course credits 30, practical credits 2, paper credits 10.

Detailed course credits are provided below: Ideological and political theory course, 3 credits; First foreign language, 2 credits; Core curriculum courses, no less than 12 credits; Research oriented required courses, no less than 9 credits; the rest are credits for elective courses.

Choosing extra core curriculum courses as research oriented required courses is allowed. Choosing extra research oriented required courses as elective courses is allowed.

## 5. Required programs

### 1. Practice program

(1) Academic masters shall carry out social practice, professional practice or academic exchanges in school. The practice program includes campus practical teaching (such as computer operation and programming, case analysis, and simulation training) and off-campus practice (such as social survey, field research, and base practice). Off-campus professional practice normally starts in the 4th or 5th semester. Students shall submit a practice summary report after completing their professional practice, and receive 2 credits following approval.

(2) The experiences of taking part in practice and academic exchanges shall be recorded in the Examination Form for Practice of Academic Masters. Students can't take part in graduation defense until the practice and academic exchanges have been approved and recorded by the school and master school training department.

### 2. Opening report and mid-term examination

Mid-term examination and distribution are required at the end of the latter semester of the second academic year. Those with exceptional grades can directly pursue a doctoral degree, while

those who are not qualified will be dropped out. The rest who are qualified will continue studying for a Master's Degree.

At the end of the 3rd semester or the beginning of the 4th semester, students put forward the title and writing plan of their dissertation under their teachers' guidance, and make an opening report to a graduate steering group. Students can start research and paper writing after approval.

## 6. Dissertation

1. Academic masters must take part in at least one research program under the guidance of tutors and at least eight academic exchange activities (attending academic conferences and listening to academic reports at home and abroad), and publish at least one dissertation in the designated periodicals (papers receiving an official letter of acceptance shall be deemed to be published). Signature requirements are the same as those in the standard of early graduation.

2. According to the characteristics of their research fields, students can start collecting data and selecting a topic under the guidance of tutors starting from the 4th semester, and propose the title and writing plan of the dissertation, and have the opening report at the end of the 4th semester. Make a progress report in a related research group at the proper time during the 5th semester. Organize and print the dissertation in the 5th semester or at the beginning of the 6th semester. The dissertation requires a standardized format, correct proposition, careful reasoning, accurate data, fluent text, and must be defended strictly according to related regulations. Thesis defense must be organized at the end of the semester. Dissertation level should be good or above.

## 7. Training method

1. Tutors play a major role in the training of masters, together with guidance groups. Fully-utilize the tutor responsibility system, which is guided by scientific research and practical innovation. Pay full attention to every postgraduate's political thoughts, moral character, professional learning, physical and mental health, and scientific research ability. Teach students in accordance with their aptitude. Give them serious training and strict requirements. Emphasize the initiative and consciousness of postgraduates in the process of training. Apply more heuristic and seminar teaching methods. Focus on the cultivation of research and innovation abilities of postgraduates.

2. In the process of teaching, focus on academic training links such as subject research, special topic discussion and academic reports, and strengthen practical teaching links.

3. Strengthen the training of the literature reading and information retrieval abilities of

academic postgraduates. Make a list of the main classical works, frontier works, major learned periodicals and other catalogues that must be read and that can be selectively read by postgraduates of this major (discipline). Literature reading should be included in the scope of examination or checked in the form of reading reports, opening reports, etc.

4. The tutor (or postgraduate guidance group) should develop a reasonable individual training plan according to training methods and personalized principle within the first month of the first semester, and the plan needs to make specific arrangements for curriculum learning, practical activities, academic activities, scientific research and dissertation work, etc.

# Appendix 1: Research Areas and Curriculum in pure math

## Research Areas in pure math.

- 01 partial differential equations and its applications in physics, biology and medicine
- 02 Degenerate partial differential equations
- 03 Partial differential equations in fluid dynamics
- 04 Complex and hyper-complex boundary behaviour
- 05 Algebra and representation theory, number theory and algebraic geometry
- 06 functional analysis and its applications
- 07 several complex variables and complex geometry
- 08 differential geometry
- 09 geometric analysis
- 10 fractal geometry and dynamic systems

# Pure Math (Code 070101) Curriculum for the Master Program

Categories	Course Codes	Courses	credits	hours	Semester	Remarks		
Degree courses	Public required course	Theory and Practice of Scientific Socialism		2	36	1		
		Dialectics of Nature		1	18	1		
		First Foreign Language	Master English		2	72		1
			Doctor (Master) French					
			Doctor (Master) German					
			Doctor (Master) Japanese					
	Doctor (Master) Russian							
	Core curriculum courses	Remarks: This refers to courses which all academic masters of the same first-class discipline should learn together, including the methodology of scientific research in this discipline and the common professional courses.						
		Functional Analysis		4	72	1	Closed book exam. Select at least 3 courses, among which Functional analysis is mandatory	
		Differentiable Manifolds and Topology		4	72	1		
		Modern Algebra		4	72	1		
		Theory of Function Spaces		4	72	1		
		Measure Theory		4	72	1		
		Mathematical Statistics		4	72	1		
		Advanced Numerical Analysis		4	72	1		
Research oriented required courses	Remarks: This refers to required courses of certain research field for academic masters.							
	General Theory of Partial Differential Equations		4	72	2	Select at least 3 courses.		
	Elliptic and Parabolic Differential Equations		3	54	2 or 3			
	Quasilinear Hyperbolic Systems of Conservation Laws		3	54	2 or 3			
	Operator Theory		3	54	2 or 3			

		Harmonic Analysis	3	54	2 or 3	
		Several Complex Variables	3	54	2 or 3	
		Complex Geometry	3	54	2 or 3	
		Riemannian Geometry	3	54	2	
		Geometry of Submanifolds	3	54	3	
		Algebra and Representation Theory	3	54	2 or 3	
		Boundary Value Problems for Analytic Functions	3	54	2 or 3	
		Fractal Geometry	3	54	2	
Elective courses	Public elective courses	Notes: Public elective courses include courses in computer science, management, liberal arts, PE, career guidance etc. Academic master students should elect no more than 2 credits.				
		Second Foreign Language	Doctor (Master) English	2	72	1
			Master French			
			Master German			
			Master Japanese			
			P.E.	1	36	
		Instruction of Career	1	36		
	Professional elective courses	Professional elective courses include courses within a specific discipline which can broaden students' scope of knowledge and deepen their specialized knowledge, as well as other courses designated by a teacher according to research fields.				
			Algebraic Topology	3	54	3
			Variational Method, Geometric Variational Problems	2	54	3
		Microlocal Analysis	2	54	2 or 3	
		Mathematical Theory on Fluid Mechanics	2	54	2 or 3	
		Noncommutative Analysis	3	54	2 or 3	
		Modern Complex Analysis	2	54	2 or 3	
		Complex Equations and Its Applications	2	54	2 or 3	



			Geometric Structures on Spaces	2	54	2 or 3 or 4	
			Geometric Analysis	2	54	3 or 4	
			Algebraic Geometry	2	54	2 or 3	
			Clifford Analysis	2	54	2 or 3	
			Dynamical System	2	54	2 or 3	

## Appendix 2: Research Areas and Curriculum in computational math

### Research Areas in computational math

- 01 Numerical Methods on Partial Differential Equations
- 02 Numerical Algebra
- 03 Multiscale Modeling and Simulation
- 04 Computational Materials
- 05 Partial Differential Equations and Optimal Control
- 06 Inverse Problems and Computation
- 07 Scientific and Industrial Computational Softwares
- 08 Computational Intelligence
- 09 Quantum Computation
- 10 Computational Fluid Dynamics
- 11 Computational Biology
- 12 Computer Sciences and Its Applications

## Computational Math (Code 070102) Curriculum for the Master Program

Categories		Course Codes	Courses	credits	hours	Semester	Remarks	
Degree Courses	Public required courses		Theory and Practice of Scientific Socialism	2	36	1		
			Dialectics of Nature	1	18	1		
		First Foreign Language	Master English		2	72		1
			Doctor (Master) French					
			Doctor (Master) German					
			Doctor (Master) Japanese					
	Doctor (Master) Russian							
	Core Curriculum Courses	Remarks: This refers to courses which all academic masters of the same first-class discipline should learn together, including the methodology of scientific research in this discipline and the common professional courses.						Closed book exam. Select at least 3 courses, among which Functional analysis is mandatory
			Functional Analysis	4	72	1		
			Differentiable Manifolds and Topology	4	72	1		
			Modern Algebra	4	72	1		
			Theory of Function Spaces	4	72	1		
			Measure Theory	4	72	1		
			Mathematical Statistics	4	72	1		
			Advanced Numerical Analysis	4	72	1		
Research Oriented Required Courses	Remarks: This refers to required courses of certain research field for academic masters.							
		Modern Numerical Methods on PDEs	3	54	2 or 3			
		Advanced Numerical Algebra	3	54	2 or 3			
		Scientific and Engineering Computing	3	54	2 or 3			

			Finite Element Methods	3	54	2 or 3	
Elective courses	Public elective courses	Notes: Public elective courses include courses in computer science, management, liberal arts, PE, career guidance etc. Academic master students should elect no more than 2 credits.					
			Second Foreign Language	Doctor (Master) English	2	72	1
				Master French			
				Master German			
				Master Japanese			
		P.E		1	36		
		Instruction of Career		1	36		
	Professional elective courses	Professional elective courses include courses within a specific discipline which can broaden students' scope of knowledge and deepen their specialized knowledge, as well as other courses designated by a teacher according to research fields.					
			Multiscale modeling and simulation		2	54	2 or 3
			Introduction to Computational Materials		2	54	2 or 3
			Inverse Problems: Theory and Computation		2	54	2 or 3
			Computational Systems Biology		2	54	2 or 3
			Computational Fluid Dynamics		2	54	2 or 3
		Computational Intelligence		2	54	2 or 3	
		Soft Computing		2	54	2 or 3	
	Quantum Information and Quantum Computation		2	54	2 or 3		
Make-up courses	Notes: Required course for academic master students from interdisciplinary background or equal academic capacity. Take least 2 courses. No credits are awarded, but a passing score is required.						
		Real Analysis					
		Complex Analysis					
		Differential Equations on Mathematical Physics					
		Numerical Analysis					

## Appendix 3: Research Areas and Curriculum in Probability and statistics

### Research Areas in Probability and Statistics

- 01 Stochastic Analysis
- 02 Stochastic Processes
- 03 Stochastic Matrices
- 04 Applied Probability
- 05 Insurances and Mathematical Finance
- 06 Mathematical Statistics
- 07 Survival Analysis
- 08 High Dimensional Data Analysis

## Probability and Statistics (Code 070103) Curriculum for the Master Program

Categories	Course Codes	Courses	credits	hours	Semester	Remarks		
Degree Courses	Public required courses	Theory and Practice of Scientific Socialism	2	36	1			
		Dialectics of Nature	1	18	1			
		First Foreign Language	Master English	2	72		1	
			Doctor (Master) French					
			Doctor (Master) German					
	Doctor (Master) Japanese							
	Doctor (Master) Russian							
	Core Curriculum Courses	Remarks: This refers to courses which all academic masters of the same first-class discipline should learn together, including the methodology of scientific research in this discipline and the common professional courses.					Closed book exam. Select at least 3 courses, among which Functional analysis and measure theory are mandatory	
		Functional Analysis	4	72	1			
		Differentiable Manifolds and Topology	4	72	1			
		Modern Algebra	4	72	1			
		Theory of Function Spaces	4	72	1			
		Measure Theory	4	72	1			
		Mathematical Statistics	4	72	1			
	Advanced Numerical Analysis	4	72	1				
Research Oriented required Courses	Remarks: This refers to required courses of certain research field for academic masters.					At least 9 credits required.		
	Advanced Probability Theory	3	72	2				
	Stochastic Processes	3	54	2				
	Stochastic Analysis	3	54	3				
	Linear Model	3	54	2				

			Time Series Analysis	3	54	3		
			Multivariate Statistical Analysis	3	54	2		
Elective Courses	Public elective courses	Notes: Public elective courses include courses in computer science, management, liberal arts, PE, career guidance etc. Academic master students should elect no more than 2 credits.						
		Second Foreign Language	Doctor (Master) English		2	72	1	
			Master French					
			Master German					
			Master Japanese					
			P.E		1	36		
		Instruction of Career		1	36			
	Professional elective courses	Professional elective courses include courses within a specific discipline which can broaden students' scope of knowledge and deepen their specialized knowledge, as well as other courses designated by a teacher according to research fields.						
			Large Deviations		2	54	3	At least 4 credits required.
			Mathematical Finance		2	54	3	
			Non-parameter Estimation		2	54	3	
			Survival Analysis		2	54	3	
			Sampling Techniques and Applications		2	54	3	
			Statistics Computing		2	54	2	
		Stochastic Partial Differential Equations		2	54	2		
	Infinite Dimensional System of Particles		2	54	2			
Make-up Courses	Required courses for academic master students from Interdisciplinary background or equal academic capacity. Take at least 2 courses. No credits are awarded, but a passing score is required.							
		Real Analysis		4	72	1		
		Probability and Statistics		4	72	1		

## Appendix 4: Research Areas and Curriculum in Applied Math

### Research Areas in Applied Math

- 01 Wavelet Analysis and Its Applications
- 02 Control theory of differential equations
- 03 Long Time Behavior, Controllability, Observability
- 04 Coding Theory and Information Security
- 05 Optimization Theory and Its Applications
- 06 Ill-posed Problems and Generalized Inverses Theory
- 07 Applied Nonlinear Analysis
- 08 Complex Networks: Theory and Applications
- 09 Nonlinear Dynamics



# Applied Math (Code 070104) Curriculum for the Master Program

Categories	Course Codes	Courses	credits	hours	Semester	Remarks	
Degree Courses	Public required courses	Theory and Practice of Scientific Socialism	2	36	1		
		Dialectics of Nature	1	18	1		
		First Foreign Language	Master English	2	72		1
			Doctor (Master) French				
			Doctor (Master) German				
	Doctor (Master) Japanese						
	Doctor (Master) Russian						
	Core Curriculum Courses	Remarks: This refers to courses which all academic masters of the same first-class discipline should learn together, including the methodology of scientific research in this discipline and the common professional courses.					Closed book exam. Select at least 3 courses, among which Functional analysis is mandatory
			Functional Analysis	4	72	1	
			Differentiable Manifolds and Topology	4	72	1	
			Modern Algebra	4	72	1	
			Theory of Function Spaces	4	72	1	
			Measure Theory	4	72	1	
			Mathematical Statistics	4	72	1	
		Advanced Numerical Analysis	4	72	1		
Research Oriented Required Courses	Remarks: This refers to required courses of certain research field for academic masters. Required courses from other research areas of the school are allowed.					At least 6 credits required.	
		Theory and Algorithm of Optimization	3	54	1 or 2		
		Concise Course on Optimal Control Theory	3	54	2		
		Wavelet Analysis and Its Applications	3	54	2		
		Graph theory and Applications	3	54	2		

		Ill-posed Problems and Generalized Inverses Theory	3	54	2		
		Number theory and Cryptography	3	54	2 or 3		
Elective courses	Public elective courses	Notes: Public elective courses include courses in computer science, management, liberal arts, PE, career guidance etc. Academic master students should elect no more than 2 credits.					
		Second Foreign Language	Doctor (Master) English	2	72	1	
			Master French				
			Master German				
			Master Japanese				
			P.E.	1	36		
		Instruction of Career	1	36			
	Professional elective courses	Professional elective courses include courses within a specific discipline which can broaden students' scope of knowledge and deepen their specialized knowledge, as well as other courses designated by a teacher according to research fields.					
			Applied Cryptography	3	54	2 or 3	
			Algebraic Coding Theory and Information Security	3	54	2 or 3	
		Complex Networks: Theory and Applications	3	54	2 or 3		
		Convex Analysis	3	54	2 or 3		
Make-up courses	Required courses for academic master students from Interdisciplinary background or equal academic capacity. Take at least 2 courses. No credits are awarded, but a passing score is required.						
		Mathematical Modelling	3	54	2	Research area dependent	
		Differential Equations on Mathematical Physics	4	72	1 or 3		
		Mathematical Experiments	3	54	2		
		Optimization Theory and Algorithms	4	72	1 or 3		

## Appendix 5: Research Areas and Curriculum in Statistical Science

### Research Areas in Statistical Science

1. Survival Analysis
2. Biostatistics
3. Regression analysis
4. Semiparametric and Nonparametric Statistics
5. Financial Statistics
6. Big data Analysis
7. Computational Statistics
8. Economic Statistics
9. Medical and Health Statistics
10. Comprehensive Evaluation of Health Performance

## Statistical Science (Code 071400) Curriculum for the Master Program

Categories		Course Codes	Courses	credits	hours	Semester	Remarks	
Degree courses	Public required course		Theory and Practice of Scientific Socialism	2	36	1	5 credits in total	
			Dialectics of Nature	1	18	1		
			First Foreign Language	2	72	1		
	Core curriculum Courses	Remarks: This refers to courses which all academic masters of the same first-class discipline should learn together, including the methodology of scientific research in this discipline and the common professional courses.						
			Measure theory	4	72	1	Closed book exam, drafted by the exam committee. At least 12 credits required.	
			Foundations of Modern Probability Theory	4	72	1		
			Mathematical Statistics	4	72	1		
			Statistical Computing	4	54	2		
	Research Oriented Required Courses	Remarks: This refers to required courses of certain research field for academic masters.						
			Sampling Techniques and Methods	3	54	2	At least 9 credits required.	
			Linear Models	3	54	2		
			Multivariate Statistical Analysis	3	54	2		
		Nonparametric Statistics	3	54	2			
		Time Series Analysis	3	54	3			
		Advanced Numerical Analysis	3	54	2			
Elective courses	Public elective	Notes: Public elective courses include courses in computer science, management, liberal arts, PE, career guidance etc. Academic master students should elect no more than 2 credits.						
			Second Foreign Language	2	72	1		

		P.E.	1	36			
		Instruction of Career	1	36			
Professional elective courses	Professional elective courses include courses within a specific discipline which can broaden students' scope of knowledge and deepen their specialized knowledge, as well as other courses designated by a teacher according to research fields.						At least 4 credits required.
		Case Study	2	54	3		
		Statistical Analysis of Qualitative Data	2	54	3		
		Bayesian Statistics	2	54	3		
		Data Mining	2	54	4		
		Financial Mathematics	2	54	3		
		Survival Analysis	2	54	3		
	Make-up courses	Notes: Required courses for academic master students from Interdisciplinary background or equal academic capacity. Take at least 2 courses. No credits are awarded, but a passing score is required.					
		Introduction to Probability		72	1		
		Introduction to Mathematical Statistics		72	1 or 2		