SUSTech Doctoral Program

(Research Degree)

Name of the First-level Discipline	Mathematics
Code of the First-level Discipline	0701

This PhD Program applies to students admitted in 2019

Graduate School of SUSTech
July 22nd, 2019

I. Program Objectives

Cultivating professional talents with integrity, ambition, sense of innovation and patriotic spirit: 1. Have solid mathematical foundation and research competence, receive systematic professional training. 2. Be able to engage in research independently and produce innovative fruits. 3. Be competent in writing and communicating, particularly the article writing on mathematics.

II. Major Research Focus

NO.	Discipline Direction	Major Research Focus
1	Fundamental Mathematics	1. PDEs and Their Applications 2. Dynamical Systems 3. Algebraic Combinatorial Mathematics 4. Algebraic Number Theory, Algebraic Geometry 5. Geometry and Topology
2	Computational Mathematics	1. PDEs Numerical Solution 2. Mathematical Physics Inverse Problems
3	Applied Mathematics	1. Applied Mathematics in Natural Science and Engineering 2. Financial Mathematics
4	Probability and Mathematical Statistics	1. Applied Probability 2. Limit Theory 3. Stochastic Process and Its Application 4. Statistics

III. Program Duration

Type of Students	Normal Program Duration
PhD students with a master's degree	4 years
students enrolled in bachelor-master-doctor program or master-doctor program	5 years

IV. Required Credits

Category	Required Credits	
	PhD students with a master's degree	students enrolled in bachelor-master-doctor program or master-doctor program
Ideological and Political Theory	2	2
English Course	2	2
English Writing and Communication on Mathematics	3	3
Discipline-based Courses	18	33
Seminar	4	4
Total	29	44

V. PhD Qualifying Examination

Contents: Examine the fundamental theories, professional knowledge, and discipline frontier knowledge that the PhD student has mastered.

Time: The PhD student with a master' s degree shall pass the Qualifying Examination before the end of the third semester; students enrolled in bachelor-master-doctor program or master-doctor program shall pass the Qualifying Examination before the end of the fifth semester.

Mode: two written examinations, 180 minutes each.

Committee: consist of at least 5 doctoral advisors in the related disciplines, who shall include at least 1 related expert from outside the same department; the total number of committee members shall be an odd number, and the student's advisor may be included;

Result: The result of the Examination shall be PASS or FAIL.The PhD student having passed the written examinations may start the stage of doctoral dissertation. Those having failed shall apply for the second examination within three months; if still failing, they shall discontinue the schooling or learn as a master's student.

Examination Subjects:

Fundamental Mathematics: two subjects selected from "Analysis, Dynamical Systems, PDEs, Algebra, Combinatorial Mathematics, Group Theory and Application"

Computational Mathematics: two subjects selected from "Applied Mathematics, Computing Methods, Analysis, PDEs"

Applied Mathematics: two subjects selected from "Applied Mathematics, Computing Methods, Optimization Methods, Analysis, PDEs, Probability and Stochastic Calculus, Financial Mathematics"

Probability and Mathematical Statistics: two subjects selected from "Probability, Probability and Stochastic Calculus, Stochastic Process and Application, Game Theory and Application, Statistics, Financial Mathematics"

Note: the two selected subjects shall be approved by one's advisor with his signature; the addition of oral defense shall be accredited by advisors' committee and determined by vice director of Department of Mathematics who are in charge of graduate students' affairs.

VI. Dissertation Proposal Assessment

Contents: assess students' familiarity with the history and academic development of the discipline, the proposal of research issues of theoretic or pragmatic significance and the innovation, reasonableness behind it.
Time: The PhD students shall finish the Proposal Assessment within 1 year after passing PhD qualifying examination.
Mode: submit a written report to attend the oral defense
Organizing: The duration of oral defense for PhD Dissertation Proposal Assessment shall be no shorter than 1 hour. The Dissertation Proposal Assessment Committee shall consist of at least 5 doctoral advisors in the related disciplines, who shall include at least 1 related expert from outside the same department; the total number of committee members shall be an odd number, and the student's advisor may be included;
Result: The resolution for the Assessment shall be made through secret ballot, and a PASS requires approval from at least two thirds of all the committee members. The PhD student having passed the Assessment shall modify his/her dissertation proposal according to the assessment opinions. Those PhD students having failed shall attend the second examination within six months; if still failing, he/she shall obey related rules.

VII. Annual-Midterm Assessment

Contents: Assess the student's dissertation progress, scientific research input and achieved results, etc.;
Organizing: At least 3 doctoral advisors in the related disciplines shall be included, and the student's advisor may be included;
Mode: submit an annual research progress report, which shall be assessed by advisors and returned with feedback. PhD students with a master's degree shall finish one assessment before the end of the second academic year and third academic year, respectively; students enrolled in bachelor-master-doctor program or master-doctor program shall finish one assessment before the end of the third academic year and fourth academic year, respectively. For each extended schooling year, the student shall receive one additional assessment; any extension of half a year or longer but less than one year shall be deemed as one year for this purpose;
Result: The resolution for the Assessment shall be made through secret ballot, and a PASS requires approval from at least two thirds of all the committee members. Any

student failing in the second or later assessment shall obey related rules.

VIII. General Requirements of PhD Dissertation

PhD Dissertation: all PhD students shall finish research and dissertation writing independently under the instruction of his/her advisor.
Academic Level: As for the PhD dissertation, it is required that the author propose innovative solutions to the research topic, the dissertation meet the standard of PhD dissertation in world first-class universities, and the research achievements hit international level.
Dissertation Writing: the PhD dissertation shall clearly introduce one's innovation achievements with sound readability, give a comprehensive review of the discipline history and development trend.
Plagiarism Check: in principle, together with signature of his/her advisor, the "similarity rate with the author's own published literature deducted" shall be lower than 5%, which shall be deemed PASS in the check; if the similarity rate is between 5% and 10%, an explanation description must be submitted, and, subject to the signature of the advisor and the dean of department (or the vice dean of department in charge of postgraduates) for approval, it shall then be deemed PASS.

IX. PhD Dissertation Examination

Time: The student may apply for PhD Dissertation Examination after passing the formal examination and plagiarism check of PhD dissertation.
Mode: Examination by peer experts
Organizing: the examination shall be conducted by at least 3 doctoral advisors in related disciplines (at least 2 experts from outside of the university)
Result: After the examination, the PhD student shall modify his/her dissertation according to the experts' opinions. If 1 expert does not approve of oral defense during this examination, the examinee may, after modifying the dissertation within one month, submit it to that expert or hire another expert for re-examination; if 2 experts do not approve of oral defense, this examination application shall be cancelled. The interval for a PhD student to apply for two PhD Dissertation Examinations shall be at least six months; any student failing in the second examination shall obey related rules.

X. Oral Defense of PhD Dissertation

Time: After passing the PhD Dissertation Examination, the PhD student may apply for the Oral Defense of PhD Dissertation;
Organizing: The Committee for Oral Defense of PhD Dissertation shall consist of at least 5 experts in the related disciplines (including at least 1 paper examination expert); the total number of committee members shall be an odd number, including at least 2 experts from outside the university. The committee chair shall be a professor or an expert with equivalent professional title. All the committee members shall have the qualification of doctoral advisor and the professional title of associate professor or equivalent or higher, and at least half of those members shall be experts with the professional title of professor or equivalent. The student' s advisor could present but not as a member of the Committee for Oral Defense.
Result: The resolution for the Oral Defense shall be made through secret ballot, and a PASS requires approval from at least two thirds of all the committee members. The student having failed in the Oral Defense of PhD Dissertation may modify the dissertation within two years (within the maximum program duration for the PhD student) and attend one more oral defense, in which case dissertation assessment shall be re-triggered ahead of time; for any student failing again in the second oral defense, the university will no longer accept his/her application for Oral Defense of PhD Dissertation.

XI. Requirements of Scholarly Achievement

Quality: At least one paper published on or accepted by high quality journals on the discipline (SCI-indexed journals recognized by Degree Assessment Sub-committee of the Discipline)
Authorship: the author's unit shall be Southern University of Science and Technology; in case of authors' ordering not in accordance with the initial letter of the names, the student shall be the first author or the second author (his/her tutor is the first the author).

XII. Others

Comments from the Degree Assessment Sub-committee of the Discipline: Signature of the Committee Chair： （Stamp） Date:
Comments from the Degree Assessment Committee of the University Signature of the Committee Chair： （Stamp） Date:

Appendices to the Doctoral Program in Mathematics

Appendix I：Courses

Category	Course Code	Course Name	Credits
Ideological and Political Theory	GGC5021	Chinese Marxism and Contemporary	2
English Courses	GGC5016	English for PhD Studies	2
	GGC5041	Professional English Writing and Communication	3
Compulsory Courses	MAT8020	Abstract Algebra II	3
	MAT8021	Algebraic Topology	3
	MAT8022	Combinatorics	3
	MAT8023	Group Theory and Its Application	3
	MAT8024	Differential Manifolds	3
	MAT8025	An Introduction to Dynamical Systems	3
	MAT8026	Advanced Functional Analysis	3
	MAT8027	Measure Theory	3
	MAT8028	Scientific Computing	3
	MAT8029	Applied Mathematical Solution	3
	MAT8030	Modern Probability	3
	MAT8031	Advanced Statistics	3
	MAT8032	Game Theory and Application	3
	MAT8033	Big Data Analysis and Application	3
	MAT7060	Symplectic Geometry and Hamiltonian System	3
	MAT7061	Smooth Ergodic Theory	3
	MAT7062	Dynamical Systems Feature	3
	MAT7063	Differential Topology	3
	MAT7064	Differential Geometry and Topology Feature	3
	MAT7065	Complex Geometry	3
	MAT7066	PDEs in Physics	3
	MAT7067	Nonlinear Functional Analysis	3
	MAT7068	Partial Differential Equation (volume 1)	3
	MAT7069	Partial Differential Equation (volume 2)	3
	MAT7070	Partial Differential Equation Features	3
	MAT7071	Biomathematics	3
	MAT7072	Biomathematics Feature	3
	MAT7073	Lie Group and Lie Algebras	3

Elective Courses	MAT7074	Commutative Algebra	3
	MAT7075	Algebraic Geometry	3
	MAT7076	Algebraic Curves	3
	MAT7077	Algebra Feature	3
	MAT7078	Permutation Group	3
	MAT7079	Algebraic Graph Theory	3
	MAT7080	Combinatorial Mathematics Feature	3
	MAT7081	Matrix Computations	3
	MAT7082	Numerical Optimization	3
	MAT7083	Convex Optimization Algorithms	3
	MAT7084	Finite Element Methods	3
	MAT7085	Finite Element Methods: Theory and Practice	3
	MAT7086	Inverse Problem: Theory and Methods	3
	MAT7087	Computational Fluid Dynamics Methods	3
	MAT7088	Numerical Solution of Partial Differential Equations	3
	MAT7089	Optimization Theory and Methods	3
	MAT7090	Computational Mathematics Feature	3
	MAT7091	Applied Mathematics Feature	3
	MAT7092	Continuous-time Markov Chain	3
	MAT7093	Stochastic Calculus	3
	MAT7094	Stochastic Calculus and Its Application in Finance	3
	MAT7095	Financial Risk Management	3
	MAT7096	Financial Derivatives Pricing Model and Calculus	3
	MAT7097	Dynamics of Economy and Finance	3
	MAT7098	Stochastic Control and Portfolio Theory	3
	MAT7099	Financial Mathematics Feature	3
	MAT7100	Deep-learning of Statistics	3
	MAT101	Generalized Linear Model	3
	MAT102	Probability and Statistics Feature	3
	MAT103	Time Series Analysis	3
	MAT104	Bayesian Statistics	3
	MAT105	Computational Statistics	3
	MAT106	Non-parametric Statistics	3
	MAT107	Financial Statistics	3
Seminar	ACA6001	Seminar	4

1. Professional English Writing and Communication is a common compulsory course

2. Compulsory Course for Mathematics Major: for PhD students with a master's degree, 6 credits are required from MAT8020 to MAT8033; for students enrolled in the bachelor-master-doctor program or the master-doctor program, 9 credits are required from MAT8020 to MAT8033. All PhD students are required to select a course from MAT8022 to MAT8031.

Fundamental Mathematics: MAT8020-MAT8027

Computational Mathematics: MAT8026-MAT8029

Applied Mathematics: MAT8026-MAT8033

Probability and Mathematical Statistics: MAT8026-MAT8033

3. Elective Courses: for PhD students with a master's degree, 12 credits are required from outside of the Compulsory Course for Mathematics Major; for students enrolled in the bachelor-master-doctor program or the master-doctor program, 24 credits are required from outside of the Compulsory Course for Mathematics Major.

4. In each semester, selected courses shall be accredited by advisors' committee with the signature of one's own advisor, and put on record at the Sub-committee for Graduate Degree in Department of Mathematics.

5. Assessment standard for Compulsory Course for Mathematics Major and Elective Course for Mathematics Major shall be in line with SUSTech Rules on the Management of Graduate Courses. For major course failing, restudy is required but only once. The number of restudy course shall be no more than two.

6. All the courses shall be finished one semester before the oral defense.

7. Seminar: PhD students are required to participate a minimum of 40 academic lectures and 8 Graduate Colloquium organized by the department before graduation assessment, in which the student shall be the reporter at least twice.

8. Students passing certain subjects in PhD Qualifying Examination can be exempted from studying related courses:

Passing "Analysis" to be exempted from studying "Measure Theory" and "Advanced Functional Analysis"

Passing "Algebra" to be exempted from studying "Abstract Algebra II" and "Group Theory and Its Application"

Passing "Combinatorial Mathematics" to be exempted from studying "Combinatorial Mathematics"

Passing "Topology and Geometry" to be exempted from studying "Algebraic Topology" and "Differential Manifolds"

Passing "Computational Mathematics" to be exempted from studying "Scientific Computing"

Passing "Applied Mathematics" to be exempted from studying "Applied Mathematics Solution"

Passing "Optimization Methods" to be exempted from studying "Optimization Theory and Methods" and "Numerical Optimization"

Passing "Probability and Stochastic Calculus" to be exempted from studying "Modern Probability" and "Stochastic Calculus"

Passing "Probability" to be exempted from studying "Modern Probability"

Passing “Statistics” to be exempted from studying “Advanced Statistics”

Appendix II：Recommended Courses in Related Fields

Course code	Course Name	Credit
EBA5001	Data-driven Service Operation	3
EBA5002	Management Frontier and Research Methods	3
FIN5011	Quantitative Investment Analysis	3
FIN5013	Social Network Model and Application	3
FIN5014	Financial Data Mining	3
FIN5015	Advanced Financial Risk Management	3
FIN5016	Financial Econometrics and Application	3
FIN5017	Financial Time Series Analysis	3
FIN5018	Mathematical Finance	3
STA5001	High-dimensional Statistical Analysis	3

Note:

1. Credits of courses listed above can be counted as credits of discipline-based electives.

Appendices revised on December 18th, 2019