

信息与计算科学

一、培养目标

本专业旨在培养具有扎实的数理基础和计算机基础，系统掌握信息与计算科学的基本理论和方法，受到良好的数据分析、数值计算和计算机应用以及程序设计等技能的训练，具有较强的定量分析、数学建模、算法应用和程序设计以及分析和解决实际问题的能力，在信息处理、科学与工程计算以及计算机领域从事理论和应用研究、软件设计和开发的高级专门人才。可在本学科或相近、相关学科进一步攻读硕士、博士学位，能胜任政府机关、公司企业、金融机构、科研院所的信息、情报、统计、教育等部门的设计、研究、计算、管理和教学等工作。

二、基本规格要求

（一）品德修养方面：

热爱祖国，拥护党的路线、方针、政策，积极上进，具有良好的思想品德、社会公德和良好的心理素质，遵纪守法，在德、智、体等各方面全面发展。

（二）专业知识结构：

掌握数学科学的基本原理和与计算机应用相关的基础知识以及信息分析处理和数值计算等方面的核心知识（通过开设学门类基础课程和专业核心课程来实现）；了解信息与计算科学在专业领域的专门知识，拓展计算数学和计算机应用的知识面（通过在分模块的专业任选课程中选修一定的学分来实现）。

（三）素质能力要求：

获得数学的抽象推理和归纳综合、数值算法的设计和实现、软件的使用和编程等方面的专门训练，具有较强的数学素质和运用所学知识分析问题和解决问题的能力，具有较强的计算机操作能力和较强的工作协调能力，具有一定的创新意识和不断获取知识、发挥自身潜能的能力。

三、培养特色

依照学校建设高水平研究型大学的定位，遵循厚基础、宽口径、强能力、重创新的办学理念，通过普通招生和自主招生等多种形式，按数学类大类招生，后期向“数学与应用数学”和“信息与计算科学”两个专业分流，培养研究型 and 复合应用型的专门人才。

四、学制、毕业基本要求及学位授予

1. 本科基本学制4年，弹性学习年限3—6年，按照学分制度管理。

2. 信息与计算科学专业学生毕业最低学分数为170学分，其中各类别课程及环节要求的学分数如下表：

课程类别	通识必修	学门核心	学类核心	专业核心	专业选修	通识选修	集中实践	合计
学分数	27	32	36	25	21	8	21	170

3. 学生修完培养方案规定的所有必修课、选修课及完成有关环节，达到规定的最低毕业学分数，并修完规定必须但不记学分的所有课程和环节，德、智、体合格，即可毕业。满足学位授予相关文件要求的，授予理学学士学位。

五、课程设置及学分分布

(一) 通识教育课程〔必修 27+ (6) 学分+选修 8 学分〕

通识教育课程包括必修和选修两部分。通识选修课程按《湖南大学通识选修（文化素质教育）课程方案》实施，通识必修课程如下：

编码	课程名称	学分	备注
GE01101	毛泽东思想和中国特色社会主义理论体系概论	3+ (3)	
GE01039	思想道德修养与法律基础	1.5+ (1.5)	
GE01100	形势与政策	0.5+ (1.5)	
GE01102	中国近现代史纲要	2	
GE01103	马克思主义基本原理 (上)	2	
GE01104	马克思主义基本原理 (下)	2	
GE01012 (-15)	大学英语	8	
GE01088	计算机基本能力测试	0.5	
GE01093	计算机导论与程序设计	2.5	
GE01107 (-13)	心理素质与生涯发展	1	
GE01089 (-92)	体育	4	

(二) 学门核心 (32 学分)

课程编码	课程名称	学分	备注
MA03001	数学分析 (1)	6	
MA03002	数学分析 (2)	6	
MA03003	数学分析 (3)	6	
MA03012	普通物理 (1)	4	
MA03013	普通物理 (2)	4	
GE03007	普通物理实验 A (1)	1	
GE03008	普通物理实验 A (2)	1	
ME04020	理论力学	4	
合计		32	

(三) 学类核心 (36 学分)

课程编码	课程名称	学分	备注
MA03004	高等代数 (1)	6	
MA03005	高等代数 (2)	6	
MA03006	空间解析几何	4	
MA04001	常微分方程	4	
MA04004	复变函数	4	
MA05003	实变函数	4	
MA05005	泛函分析	4	
MA04002	概率论	4	
合计		36	

(四) 专业核心 (25 学分)

课程编码	课程名称	学分	
MA05017	数据结构与算法分析	4	
MA05015	数理统计	4	
MA05016	数值分析 (双语)	5	
MA05018	最优化理论与方法	4	
MA04006	数学模型	4	
MA04007	偏微分方程	4	
合计		25	

(五) 专业选修课 (21 学分)

专业选修课设置三个模块:

第一模块

编码	课程名称	学分	备注
MA06010	近世代数 (双语)	5	
MA05004	微分几何	4	
MA06003	代数拓扑	4	
MA06013	流形上的微积分	4	
MA06022	微分流形	4	
MA06023	多复变函数	3	
MA06024	数论基础 (双语)	3	
MA06012	Lie 群基础	3	
MA06025	Riemann 几何初步	3	
MA06026	动力系统	3	
MA06027	测度论	3	
MA06028	组合数学 (双语)	3	
MA06029	图论及其应用	3	
MA05007	拓扑学基础	3	

第二模块

编码	课程名称	学分	备注
MA06021	微分方程数值解	4	
MA06049	反问题	4	
MA06034	并行计算	3	
MA06035	多尺度分析	3	
MA06036	运筹学	3	
MA06033	数值代数	3	
MA05009	信息论	3	
MA06038	数据库原理	4	
MA05013	面向对象程序设计	4	
MA06014	软件工程	4	
MA06039	数字图像处理	4	
MA06050	数值逼近	3	
MA05008	离散数学	4	
MA06051	数据挖掘	3	
MA06052	数学物理反问题的数值解	3	
MA06053	计算机组成原理	4	
MA06054	人工智能计算	3	
MA06055	自动控制原理	3	

第三模块

编码	课程名称	学分	备注
MA06040	随机微分方程	4	
MA06004	多元统计分析	4	
MA06041	应用随机过程	3	
MA06001	Bayes 统计	3	
MA06042	应用回归分析	3	
MA06043	宏观经济学	3	
MA06044	微观经济学	3	
MA06006	计量经济学	3	
MA06045	金融市场学	3	
MA06046	金融工程学	3	
MA06047	国际金融	3	
MA06048	金融风险管埋	3	

注意：每位学生须至少选修 21 学分，建议按照模块选修，也可跨专业选修，但跨专业选修课程不超过 11 学分；申请参加免试推荐攻读研究生学位的同学至少有 12 学分集中在某一个模块中选修。

(六) 集中实践 (21 学分)

编码	课程名称	学分	备注
GE01040	军事训练	0	军训、军事与国防（含军事理论）
GE09030	中文写作实训	1	
GE09027	英文应用写作实训	1	
MA10011	应用数学软件	2	
MA10012	学科创新训练	2	学分要求：在读期间成功参加全国大学生数学竞赛、全国大学生数学建模竞赛、美国国际大学生数学建模竞赛、丘成桐大学生数学竞赛、ACM 国际大学生程序设计竞赛、“挑战杯”全国大学生课外学术科技作品竞赛等学科竞赛一次，或参加各级大学生创新训练计划项目（SIT）等业余科技研究项目一项并结题，或按照课程要求撰写相关课程论文 1 篇成绩合格。
MA10013	新生讨论课（1）	0.5	
MA10014	新生讨论课（2）	0.5	
MA10006	毕业实习	2	
MA10007	毕业论文	12	
总计		21	

六、课程责任教师一览表

序号	姓名	职称	学历学位	专业特长	课程（专业核心、专业选修、通识选修）
1	白敏茹	副教授	博士	优化及其应用	最优化理论与方法、数值分析、运筹学、数值逼近
2	蔡明杰	助理教授	硕士	粗糙集与数据挖掘、软件编程与软件开发	数据结构与算法分析、面向对象程序设计、软件工程、离散数学
3	陈高洁	助理教授	博士	偏微分方程数值解	数值分析、运筹学、微分方程数值解、最优化理论与方法
4	陈仪朝	副教授	博士	离散数学、组合图论	近世代数、图论及其应用、组合数学
5	顾广泽	副教授	博士	非光滑优化、非线性分析	数学分析、数值分析
6	李亚琼	教授	博士	金融数学、贝叶斯统计	概率论、数理统计、Bayes 统计
7	刘陶文	副教授	博士	非线性规划问题的理论与方法、半定规划	数值代数、最优化理论与方法、数学模型、运筹学
8	姚 兰	助理教授	博士	数据挖掘、网络优化	数据结构与算法分析、数据库原理、应用数学软件、并行计算、数据挖掘
9	杨海建	副教授	博士	高性能并行计算	数学模型、应用数学软件、并行计算
10	彭岳建	教授	博士	组合数学与图论	组合数学、泛函分析、图论及其应用
11	雷 渊	副教授	博士	数值代数	高等代数
12	宋怀玲	副教授	博士	微分方程数值解	数学分析、微分方程数值解、数值分析
13	郑光辉	助理教授	博士	数学物理方程反问题	数值分析、数学物理反问题的数值解、微分几何、应用数学软件
14	姜立建	教授	博士	多尺度方法、偏微分方程数值解	数值分析、微分方程数值解、多尺度分析
15	夏汉民	助理教授	硕士	信息与控制	信息论、数字图像处理、计算机组成原理、自动控制原理、人工智能计算
16	于红香	助理教授	硕士	概率统计、金融工程	概率论、多元统计分析、数理统计
17	王岁杰	助理教授	博士	组合数学	图论及其应用、组合数学
18	黄泽军	助理教授	博士	组合矩阵论	高等代数、高等几何（双语）

七、专业责任教授

序号	姓名	职称	学历学位	专业特长	承担授课课程
1	彭岳建	教授	博士	组合数学与图论	组合数学、泛函分析、图论及其应用

Information and Computing Science

I . Objectives

This program will enable students to build a solid foundation in mathematics and computer science, to master the basic theory and methods of information and computing science, to undertake a good training in data analysis, numerical computing, application of computers and program design, to obtain strong ability in quantitative analysis, mathematical modeling, algorithm application, program design, and to obtain a strong ability in analyzing and solving problems. This program will enable students to become advanced specialized experts in theoretical and applied research, software design and development. Graduates will be prepared for a wide range of career paths such as researchers, teachers and managers in governmental institutions, business corporations, financial institutions and research institutions, etc. Graduates can also undertake Master or PhD studies in information and computing science or related subjects.

II . Basic Specifications

1. Moral cultivation;

Love the motherland; Support CPP's policies; Have good morality, social ethics and psychological diathesis; Observe the laws and rules; Have comprehensive development in moral, intelligence and sports.

2. Knowledge

Gain the fundamental principles in mathematical science, basic knowledge related to the application of computers, and core knowledge in information processing and numerical computing (achieved via studying the fundamental courses and core courses of the major); Grasp professional knowledge in information and computer science, broaden the knowledge in computing science and the application of computers (achieved via choosing certain selective courses of the major).

3. Quality and Ability

Have the professional training in abstract reasoning, induction and synthesis, design and realization of numerical algorithms, usage of software and computer programming; Gain a strong mathematical diathesis, and a strong ability in applying mathematics and computing sciences to analyze and solve problems from the real world; Gain the ability of operating computers and collaboration. Have a sense to absorb knowledge ceaselessly and to realize one's potential.

III . Characteristics

Acting according to the object of building a high level research oriented university, following the idea of providing solid foundational, wide ranged, ability and innovation emphasized education, the Mathematics program recruits students via the normal channel and autonomy enrollment. To educate research oriented and application oriented graduates, the program is further specialized into two orientations—Mathematics and applied mathematics, Information and computing science.

IV. Length of Schooling, Basic Requirements for Graduation and Degree Conferment

1. The length of schooling for undergraduate studies is four years, with a flexible length lasting from 3 to 6 years, based on the regulation of credit system.

2. Students of Mathematics and Applied Mathematics majors are expected to complete a minimum of 170 credits upon graduation, and the required credits for different courses are illustrated in the following table:

Course Category	Required General Education Courses	Introductory Major Courses	Major Survey Courses	Required Core Courses	Restricted Electives	General Education Electives	Intensive Practice	Total
Credits	27	32	36	25	21	8	21	170

3. students, who are qualified enough to meet all the requirements of this program, will thus be awarded the Bachelor's Degree of Science.

V. Curriculum and Credits

1. General Education Courses [required $27 + (6) +$ elective 8 credits]

The general education courses consist of required courses and elective courses. General education electives are designed according to the *Curriculum Design of General Education Electives of Hunan University*. Required general education courses are illustrated in the following table.

Code	Course Title	Credit(s)	Remarks
GE01101	Introduction to Maoism and Theoretical System of Socialism with Chinese Characteristics	3+ (3)	
GE01039	Moral Cultivation and Law Basics	1.5+ (1.5)	
GE01100	Current Situation and Policies	0.5+ (1.5)	
GE01102	Outline of Modern Chinese History	2	
GE01103	Fundamentals of Marxism I	2	
GE01104	Fundamentals of Marxism II	2	
GE01012(-15)	College English	8	
GE01088	Computer Proficiency Test	0.5	
GE01093	Introduction to Computer Science and Programming	2.5	
GE01107(-13)	Psychological Health & Career Planning	1	
GE01089(-92)	Physical Education	4	

2. Introductory Major Courses(32 credits)

Code	Course Title	Credit(s)	Remarks
MA03001	Mathematical Analysis I	6	
MA03002	Mathematical Analysis II	6	
MA03003	Mathematical Analysis III	6	
MA03012	College Physics I	4	
MA03013	College Physics II	4	
GE03007	Physical Experiments A(I)	1	
GE03008	Physical Experiments A(II)	1	
ME04020	Theoretical Mechanics	4	
Total		32	

3. Major Survey Courses (36 credits)

Code	Course Title	Credit(s)	Remarks
MA03004	Advanced Algebra I	6	
MA03005	Advanced Algebra II	6	
MA03006	Analytical Geometry	4	
MA04001	Ordinary Differential Equations	4	
MA04004	Complex Variable Functions	4	
MA05003	Real Variable Functions	4	
MA05005	Functional Analysis	4	
MA04002	Probability Theory	4	
Total		36	

4. Required Core Courses (25 credits)

Code	Course Title	Credit(s)	Remarks
MA05017	Data Structure and Algorithm Analysis	4	
MA05015	Mathematical Statistics	4	
MA05016	Numerical Analysis (bilingual)	5	
MA05018	Optimization Theory and Methods	4	
MA04006	Mathematical Modeling	4	
MA04007	Partial Differential Equations	4	
Total		25	

5. Restricted Electives (21 credits)

There are three orientations in restricted electives.

Orientation I

Code	Course Title	Credit(s)	Remarks
MA06010	Abstract Algebra (bilingual)	5	
MA05004	Differential Geometry	4	
MA06003	Algebraic Topology	4	
MA06013	Calculus on Manifolds	4	
MA06022	Differentiable Manifolds	4	
MA06023	Function of Several Complex Variables	3	
MA06024	Number Theory (bilingual)	3	
MA06012	Introduction to Lie Groups	3	
MA06025	Introduction to Riemannian Geometry	3	
MA06026	Dynamical Systems	3	
MA06027	Measure Theory	3	
MA06028	Combinatorics (Two Languages)	3	
MA06029	Graph Theory and It's Applications	3	
MA05007	Elements of Topology	3	

Orientation II

Code	Course Title	Credit(s)	Remarks
MA06021	Numerical Solution of Differential Equations	4	
MA06049	Inverse Problems	4	
MA06034	Parallel Computing	3	
MA06035	Multiscale Analysis	3	
MA06036	Operations Research	3	

Cont

Code	Course Title	Credit(s)	Remarks
MA06033	Numerical Algebra	3	
MA05009	Information Theory	3	
MA06038	Database Principles	4	
MA05013	Object Oriented Programming	4	
MA06014	Software Engineering	4	
MA06039	Digital Image Processing	4	
MA06050	Numerical Approximation	3	
MA05008	Discrete Mathematics	4	
MA06051	Data Mining	3	
MA06052	Numerical Solution for Inverse Problem of Mathematical Physics	3	
MA06053	Principles of Computer	4	
MA06054	Artificial Intelligence Calculation	3	
MA06055	Automatic Control Theory	3	

Orientation III

Code	Course Title	Credit(s)	Remarks
MA06040	Stochastic Differential Equations	4	
MA06004	Multivariate Statistical Analysis	4	
MA06041	Applied Stochastic Processes	3	
MA06001	Bayesian Statistics	3	
MA06042	Applied Regression Analysis	3	
MA06043	Macroeconomics	3	
MA06044	Microeconomics	3	
MA06006	Econometrics	3	
MA06045	Financial Markets	3	
MA06046	Financial Engineering	3	
MA06047	International Finance	3	
MA06048	Financial Risk Management	3	

Note: Students are required to take at least 21 credits, and are suggested to take courses in one orientation according to their majors. Students can also take courses from different orientations, but the credits outside their majors should be less than 11 credits. Students who are recommended to pursue graduate study should take at least 12 credits in one orientation.

6. Intensive Practices (21 credits)

Code	Course Title	Credit(s)	Remarks
GE01040	Military Training	0	Military training, affairs and national defense(military theories included)
GE09030	Chinese Practical Writing and Training	1	
GE09027	English Practical Writing and Training	1	
MA10011	Applied Mathematical Software	2	

Cont

Code	Course Title	Credit(s)	Remarks
MA10012	Mathematics Innovation Training	2	Credit Requirements: Student in this program will earn 2 credits upon he/she has: (a) successfully taken participation at least once in contests like Chinese Mathematics Competitions (CMC), China Undergraduate Mathematical Contest in Modeling (CUM-CM), Mathematics Contest in Modeling (MCM/ICM), S. T. Yau College Mathematics Contests, ACM International Collegiate Program Contest, The Challenge Cup, etc; or (b) taken participation in some amateur scientific and technological research projects like college student innovation and training program (SIT) and concluded with a report; or (c) written a curriculum related and qualified paper based on the course requirements.
MA10013	Freshman Seminar I	0.5	
MA10014	Freshman Seminar II	0.5	
MA10006	Graduation Internship	2	
MA10007	Graduation Thesis	12	
Total		21	

VI. Course Instructor List

No.	Name	Academic Title	Educational Background	Research Areas	Courses (Required Core, Restricted Electives, Major Survey)
1	Bai Minru	Associate Professor	Ph. D	Optimization and it's Application	Theories and Methods in Optimization, Numerical Analysis, Operations Research, Numerical Approximation
2	Cai Mingjie	Assistant Professor	M. A.	Rough Sets and Data Mining, Software Development and Programming	Data Structure and Algorithm Analysis, Objected-oriented Programming, Software Engineering, Discrete Mathematics
3	Chen Gaojie	Assistant Professor	Ph. D	Numerical Solution to Partial Differential Equations	Numerical Analysis, Operations Research, Numerical Solution to Differential Equations, Theories and Methods in Optimization
4	Chen Yizhao	Associate Professor	Ph. D	Discrete Mathematics, Combinatorics and Graph Theory	Modern Algebra, Graph Theory and it's Applications, Combinatorics
5	Gu Guangze	Associate Professor	Ph. D	Non-smooth Optimization, Nonlinear Analysis	Mathematical Analysis, Numerical Analysis
6	Li Yaqiong	Professor	Ph. D	Mathematical Finance, Bayesian Statistics	Probability Theory, Mathematical Statistics, Bayesian Statistics
7	Liu Taowen	Associate Professor	Ph. D	Theory and Method in Nonlinear Programming, Semidefinite Programming	Numerical Algebra, Theories and Methods in Optimization, Mathematical Models, Operations Research

Cont

No.	Name	Academic Title	Educational Background	Research Areas	Courses(Required core,restricted electives,major survey)
8	Yao Lan	Assistant Professor	Ph. D	Date Mining, Network Optimization	Data Structure and Algorithm Analysis,Database Principles,Applied Mathematical Software,Parallel Computing, Date Mining
9	Yang Haijian	Associate Professor	Ph. D	High-performance Parallel Computing	Mathematical Models, Applied Mathematical Software, Parallel Computing
10	Peng Yuejian	Professor	Ph. D	Combinatorics and Graph Theory	Combinatorics, Functional Analysis, Graph Theory and it's Applications
11	Lei Yuan	Associate Professor	Ph. D	Numerical Algebra	Advanced Algebra
12	Song Huailing	Associate Professor	Ph. D	Numerical Solution to Differential Equations	Numerical Solution to Differential Equations
13	Zheng Guanghui	Assistant Professor	Ph. D	Inverse Problems in Mathematical Physics	Mathematical Analysis, Numerical solution to Inverse Problems in Mathematical Physics,Differential Geometry, Applied Mathematical Software
14	Jiang Lijian	Professor	Ph. D	Multiscale Method, Numerical Solution to Partial Differential Equations	Numerical Analysis, Numerical Solution to Differential Equations, Multiscale Analysis
15	Xia Hanmin	Assistant Professor	M. A.	Information and Control Theory	Information Theory,Digital Image Processing,Principle of Computer Organization, Automatic Control Theory, Artificial Intelligence Computing
16	Yu Hongxiang	Assistant Professor	M. A.	Probability and Statistics, Financial Engineering	Probability Theory,Multivariate Statistics Analysis,Mathematical Statistics
17	Wang Suijie	Assistant Professor	Ph. D	Combinatorics	Graph Theory and it's Applications, Combinatorics
18	Huang Zejun	Assistant Professor	Ph. D	Combinatorics Matrix Theory	Advanced Algebra, Geometry (bilingual)

VII. Course Scheduler

No.	Name	Academic Title	Educational Background	Research Areas	Courses
1	Peng Yuejian	Professor	Ph. D	Combinatorics and Graph Theory	Combinatorics,Functional Analysis, Graph Theory and it's Applications

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