

# 数学类创新班（本硕、本博连读）

## Mathematics and Applied Mathematics (Innovation Class)

专业代码：0701

学 制：4 年

Program Code:0701

Duration: 4years

### 培养目标：

培养德才兼备，数学及应用数学领域拔尖的创新型人才。毕业生具有扎实的数学基础和宽广的数学理论知识，得到严格的数学思维训练，掌握数学和应用数学的基本理论与基本方法，了解数学科学发展的趋势，有很强的运用数学理论分析和解决理论和实际问题的潜在能力。

数学与应用数学本-硕连读创新班的毕业生大部分要攻读数学专业的研究生，也可以攻读与数学相关专业的研究生，如：经济、金融、管理等。使之具备进一步从事数学及应用数学各个领域的高水平科学研究的能力。

### Educational Objectives:

The Innovating Class is designed to cultivate innovative talents with both ability and political integrity in the field of mathematics and applied mathematics. The program prepares students for a good mathematical basis and broad theoretical knowledge of mathematics, strict training of mathematical thinking, mastering basic theories and basic methods of mathematics and applied mathematics, understanding the development trend of the mathematical sciences, using a strong ability to analyze and solve problems in mathematical theory and practice.

Most graduate students will pursue their future careers in research and teaching in research institutes. It also paves way for further study in a mathematical-related professional. It has further engaged in high level scientific research in all areas of mathematics and applied mathematics.

### 毕业要求：

№1.职业道德与规范：具有良好的法律意识、职业道德和社会责任感。具有正确的人生观、价值观和道德观。

№2.自然科学与人文素养：具备良好的科学文化素养，了解自然科学和社会科学学科的基础知识和前沿知识。

№3.专业知识与素养：掌握扎实的数学基础知识和专业领域知识，具有良好的数学思维和数学素养。

№4.分析与解决问题：运用数学与专业知识以及计算机技术分析、解决实际问题。

№5. 研究：熟悉高级专业知识，能够基于科学原理并采用科学方法对理论及应用问题进行研究。

№6.沟通：能够与同行及社会公众进行有效的沟通和交流，具备一定的国际视野，能够在跨文化背景下进行沟通和交流。

No.7.团队合作: 具有较强的团队意识, 能够承担团队成员及负责人的角色。

No.8.终身学习: 具有自主学习和终身学习的意识, 有不断学习和适应发展的能力。

### **Student Outcomes:**

No.1 Professional ethics and standards: Having a good law consciousness, professional ethics and social responsibility. Having correct outlook on life, values and ethics.

No.2 Accomplishments in natural science and humanities: Having good accomplishments in science and cultural literacy. Understand the basic and cutting-edge knowledge of natural science and social science disciplines.

No.3 Professional knowledge and accomplishment: Mastering the solid knowledge of mathematics and professional knowledge. Having good mathematical thought and mathematical literacy.

No.4 Analysis and problem-solving: An ability to analyze and solve practical problems by using mathematics and professional knowledge and computer technology.

No.5 Research: Familiar with the advanced professional knowledge. An ability to conduct investigations of theory and application problems based on scientific theories and adopting scientific methods.

No.6 Communication: An ability to communicate effectively with the peers and with society at large, and communicate in cross-cultural contexts with international perspective.

No.7 Teamwork: Sense of teamwork and ability to function effectively as a member or leader.

No.8 Lifelong Learning: Awareness in independent learning and lifelong learning. Ability to learn and adapt to the development.

### **专业简介:**

数学与数学专业是国家级特色专业, 广东省名牌专业。本创新班于2009年设置并开始招生, 培养德才兼备, 数学及应用数学领域拔尖的创新型人才。毕业生具有扎实的数学基础和宽广的数学理论知识, 得到严格的数学思维训练, 掌握数学和应用数学的基本理论与基本方法, 了解数学科学发展的趋势, 有很强的运用数学理论分析和解决理论和实际问题的潜在能力。数学与应用数学本-硕连读创新班的毕业生大部分要攻读数学专业的研究生, 也可以攻读与数学相关专业的研究生, 如: 经济、金融、管理等。使之具备进一步从事数学及应用数学各个领域的高水平科学研究的能力。

本专业办学条件良好、师资力量雄厚。本专业有教授19人, 副教授11人。拥有105平方米的图书资料室, 共有图书6667册、英文黄皮书1838册。丰富的藏书和网络资源极大地满足了师生的学习工作需要。近年, 多次举办国际、国内学术研讨会以及邀请国内外专家50人次来访问讲学, 包括菲尔兹奖获得者2人、院士14人。加强国际化交流与合作, 推进与加拿大西安大略大学、英国伯明翰大学、英国爱丁堡大学、法国南特大学等大学开展本硕联合培养项目。

### **Program Profile:**

This specialty is the National characteristic one and the Guangdong provincial key one. The Innovating

Class is set up and begin enrollment in 2009. The Innovating Class is designed to cultivate innovative talents with both ability and political integrity in the field of mathematics and applied mathematics. The program prepares students for a good mathematical basis and broad theoretical knowledge of mathematics, strict training of mathematical thinking, mastering basic theories and basic methods of mathematics and applied mathematics, understanding the development trend of the mathematical sciences, using a strong ability to analyze and solve problems in mathematical theory and practice. Most graduate students will pursue their future careers in research and teaching in research institutes. It also paves way for further study in a mathematical-related professional. It has further engaged in high level scientific research in all areas of mathematics and applied mathematics.

The professional school conditions in this specialty are good, strong teachers. There are 19 professors and 11 associate professors. It has a library that owns 105 square meters and 6667 books, including 1834 copies of English Yellow Book. Rich collection of books and network resources greatly meet the needs of teachers and students to study and work. In the past a few years, we have held many international or domestic academic seminars. We also have invited more than 50 domestic and foreign experts to visit our school, including two Fields prize winners and 14 academicians. We also strengthen the international exchanges and cooperation, including carrying out the joint training program

### **专业特色：**

本专业强调数学和应用数学基本理论、基本方法的训练，进行数学建模、计算机和数学软件方面的基本训练，使学生具有科学研究的初步能力；具有很好的空间想象力、逻辑推理力、抽象思维力等基本能力以及理论分析能力；具有很强的数学应用意识和计算机技术解决实际问题的能力，具备较广泛的适应社会需要的可塑性和很强的发展潜力。

### **Program Features:**

This specialty emphasizes methods of basic theory, basic training, mathematical modeling, computer and software training on mathematics and applied mathematics. The program prepares students with initial capacity of scientific research, good spatial imagination, logical reasoning ability, abstract thinking ability of the basic theory of analysis, a strong sense of mathematics and computer application technology to solve practical problems, with the broader needs of society and strong development potential.

**授予学位：**理学学士学位

**Degree Conferred:** Bachelor of Natural Sciences

### **主干课程：**

数学分析、高等代数、解析几何、常微分方程、复变函数、实变函数、泛函分析、概率论、近世代数、点集拓扑学、数学物理方程、C++程序设计。

### **Core Courses:**

Mathematical Analysis、Advanced Algebra、Analytic Geometry、Ordinary Differential Equations、Complex Analysis、Real Analysis、Functional analysis、Probability Theory、Abstract Algebra、Set Topology、Equations of Mathematical Physics、C++ Program Design

### **特色课程:**

全英语教学课程: 微分方程定性方法与数值模拟、现代分析基础

研究型课程: 微分方程定性方法与数值模拟、Sobolev 空间

新生研讨课: 走进现代代数学和几何学、动力系统中的某些分支问题

本研贯通课: 现代分析基础、Sobolev 空间

创新实践课程: 数学模型、数学软件与数学实验

### **Featured Courses:**

Courses Taught in English: The Qualitative Methods and Numerical Simulation for Differential Equations, Foundations of Modern Analysis

Research Courses: The Qualitative Methods and Numerical Simulation for Differential Equations, Foundations of Modern Analysis, Sobolev Spaces

Freshmen Seminars: Introduction to Modern Algebra and Geometry, Some Problems in Dynamical Systems

Baccalaureate-Master's Integrated Courses: Foundations of Modern Analysis, Sobolev Spaces

Innovation Practice: Mathematical Models, Mathematical software and mathematical experiment

## 一、教学计划总体安排表 (General Teaching Schedule)

学 年	学 期	教 学 进 度 安 排 (周)																			理 论 教 学	考 试	入 学 教 育	军 训	课 程 设 计	大 作 业	工 程 训 练	电 子 实 习	综 合 实 验	社 会 实 践	生 产 实 习	毕 业 实 习	其 它 实 习	中 外 合 作 项 目	毕 业 设 计	就 业 安 排	机 动	假 期	小 计	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	
		一	1		C	A	A	A	A	A	A	A	A	A	A	A	A	A	B	D	D	D	14	1	1	3														
2	A		A	A	A	A	A	A	A	A	A	A	A	A	A	A	E	E	B	B	16	2			2													20		
二	3	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	E	E	B	B	16	2			2													20		
	4	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	E	E	B	B	16	2			2														20	
三	5	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	E	O	B	B	16	2			1											1		20		
	6	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	E	E	B	B	16	2			2														20	
四	7	研究生阶段学习, 并完成本科毕业设计 (论文)																			16	2																		20
	8																																			3		15	2	19
合 计 (周)																					110	13	1	3	9										3		15	3		158

## 二、各类课程学分登记表 (Registration Form of Curriculum Credits)

### 1. 学分统计表 (Credits Registration Form)

课程类别 Course Category	课程要求 Requirement	学分 Credits	学时 Academic Hours	备注 Remarks
公共基础课 General Basic Courses	必修 Compulsory	72.5	1132	
	通识 General Education	10.0	160	
	选修 Elective	2.0	32	
学科基础课 Disciplinary Basic Courses	必修 Compulsory	46.5	744	
	选修 Elective	0	0	
专业领域课 Specialty- related Courses	必修 Compulsory	0	0	
	选修 Elective	10.0	160	
合 计 Total		141.0	2228	
集中实践教学环节 (周) Practice Training (Weeks)	必修 Compulsory	31.0	31 周	
	选修 Elective	5.0	5 周	
毕业学分要求 Credits Required for Graduation	141.0+36.0=177.0			

注: 硕士、博士阶段课程修读要求及毕业资格按照学生修读的研究生专业培养方案执行; 学生本科阶段在取得专业教学计划规定学分的同时, 还必须第二课堂取得 2 个人文素质教育学分和 4 个创新能力培养学分。

## 2.类别统计表 (Category Registration Form)

学时 Academic Hours					学分 Credits						
总学时数 Total	其中 Include		其中 Include		总学分数 Total	其中 Include		其中 Include			其中 Include
	必修学时 Compulsory	选修学时 Elective	理论教学学时 Theory Course	实验教学学时 Lab		必修学分 Compulsory	选修学分 Elective	集中实践教学环节学分 Practice-concentrated Training	理论教学学分 Theory Course Credits	实验教学学分 Lab	创新创业教育学分 Innovation and Entrepreneurship Education
2228	1876	352	1956	272	177	150	27	36	132.5	8.5	7

### 三、专业教学计划表 (Teaching Schedule)

类别 Course Category	课程 代码 Course No.	课程名称 Course Title	是否 必修 C/E	学时数 Total Curriculum Hours				学分 数 Credits	开课 学期 Semester	毕业 要求 Student Outcomes	
				总学 时 Class Hours	上机 Computer-ai ded Class Hours	实验 Lab Hours	实践 Practice Hours				
公共基础课 General Basic Courses	143093	思想道德修养与法律基础 Cultivation of Thought and Morals & Fundamental of Law	必修 课 C	(40) (36)				2.5	2	No1	
	143091	中国近现代史纲要 Skeleton of Chinese Modern History		(32) 24				2.0	1	No2	
	143106	毛泽东思想和中国特色社会主义理论体系概论 Thought of Mao ZeDong and Theory of Socialism with Chinese Characteristics		(80) 48				5.0	4	No1	
	143090	马克思主义基本原理 Fundamentals of Marxism Principle		(40) 36				2.5	3	No1	
	143094	形势与政策 Analysis of the Situation & Policy		(128)				2.0	1-8	No1	
	144001	大学英语 (一) College English(1)		64				4.0	1	No6	
	144002	大学英语 (二) College English(2)		64				4.0	2	No6	
	152001	体育 (一) Physical Education (1)		32			32	1.0	1	No1	
	152002	体育 (二) Physical Education (2)		32			32	1.0	2	No1	
	152003	体育 (三) Physical Education (3)		32			32	1.0	3	No1	
	152004	体育 (四) Physical Education (4)		32			32	1.0	4	No1	
	106001	军事理论 Military Principle		(16)				1.0	2	No1	
	141001	大学物理 I (一) General Physics (1)		48				3.0	2	No2	
	141002	大学物理 I (二) General Physics (2)		48				3.0	3	No2	
	141007	大学物理实验 (一) Physics Experiment(1)		32		32		1.0	2	No2	
	141008	大学物理实验 (二) Physics Experiment(2)		32		32		1.0	3	No2	
	140042	数学分析 (一) Mathematical Analysis(1)		80				5.0	1	No3	
	140043	数学分析 (二) Mathematical Analysis(2)		96				6.0	2	No3	
	140044	数学分析 (三) Mathematical Analysis(3)		96				6.0	3	No3	
	140033	高等代数 (上) Advanced Algebra		64				4.0	1	No3	
	140034	高等代数 (下) Advanced Algebra		80				5.0	2	No3	
	140036	解析几何 Analytic Geometry		48				3.0	1	No3	
	140030	常微分方程 Ordinary Differential Equations		64				4.0	3	No3	
	140088	C++程序设计 C++ Programming		80	16			4.5	2	No3,4	
	140215	数学分析习题课 (一) Mathematical Analysis Exercises Course (I)		26	选修				1.5	1	No3

	140216	数学分析习题课(二) Mathematical Analysis Exercises Course (II)	课 E	32				2.0	2	№3	
	140217	数学分析习题课(三) Mathematical Analysis Exercises Course (III)		32				2.0	3	№3	
	140218	高等代数习题课(一) Advanced Algebra Exercises Course (I)		26				1.5	1	№3	
	140219	高等代数习题课(二) Advanced Algebra Exercises Course (II)		32				2.0	2	№3	
	145223	大学计算机基础 Foundations of Computer		32				2.0	1	№4	
		人文科学领域 Humanities	通 识 课 E	96				6.0		№2	
		社会科学领域 Social Science	64				4.0		№2		
	<b>合 计</b> <b>Total</b>			必 C	1132	16	64	128	72.5		
				选 E	选修课修读最低要求 12.0 学分 (含通识 10.0 学分) minimum elective course credits required 12						

### 三、专业教学计划表(续)(Teaching Schedule)

类别 Course Category	课程 代码 Course No.	课程名称 Course Title	是否 必修 C/E	学时数 Total Curriculum Hours				学分 数 Credits	开课 学期 Semester	毕业 要求 Student Outcomes
				总学时 Class Hours	上机 Computer-ai ded Class Hours	实验 Lab Hours	实践 Practice			
学科基础课 Disciplinary Basic Courses	140076	数据结构 Data Structure	必 C	64				4.0	3	№3,4
	140186	走进现代代数学和几何学 Introduction to Modern Algebra and Geometry	必 C	32				2.0	1	№2,3
	140230	动力系统中的某些分支问题 Some Problems in Dynamical Systems	必 C	32	4			2.0	2	№2,3
	140032	复变函数 Complex Analysis	必 C	64				4.0	4	№3
	140037	近世代数 Abstract Algebra	必 C	72				4.5	3	№3
	140125	数值分析 Numerical Analysis	必 C	64				4.0	4	№3,4,5
	140040	实变函数 Real Variable Function	必 C	64				4.0	4	№3
	140172	实变函数习题 Real Variable Function Exercises Course	必 C	16				1.0	4	№3
	140072	概率论 Probability Theory	必 C	64				4.0	4	№3
	140154	点集拓扑学 General Topology	必 C	72				4.5	6	№3
	140091	微分几何 Differential Geometry	必 C	72				4.5	5	№3
	140041	泛函分析 Functional analysis	必 C	64				4.0	5	№3



类别 Course Category	课程 代码 Course No.	课程名称 Course Title	是否 必修 C/E	学时数 Total Curriculum Hours				学分 数 Credits	开课 学期 Semester	毕业 要求 Student Outcomes
				总学时 Class Hours	上机 Computer-ai ded Class Hours	实验 Lab Hours	实践 Practice			
				选修课修读最低要求 0 学分 minimum elective course credits required:0						
	140045	数学物理方程 Equations of Mathematical Physics	必 C	64				4.0	6	№3
	<b>合计 Total</b>		必 C	744				46.5		
			选 E	选修课修读最低要求 0 学分 minimum elective course credits required:0						
专业领域课 Specialty-related Courses	140220	数据库系统 Introduction to Database Systems	选 E	64				4.0	6	№3,4
	140178	数理逻辑 Principle of Logic	选 E	32				2.0	3	№3
	140059	运筹学 Operational Research	选 E	64				4.0	5	№3
	140177	面向对象程序设计 Object-oriented Programming	选 E	64	16			3.5	3	№3,4
	140134	数学软件与数学实验 Mathematics Software and Mathematics Experiments	选 E	48	32			2.0	4	№3,4
	140208	统计软件 Statistical Software	选 E	48	16			2.5	6	№4
	140174	初等数论 Elementary number theory	选 E	64				4.0	3	№3
	140062	数理统计 Mathematical Statistics	选 E	64				4.0	5	№3
	140060	数学模型 Mathematical Model	选 E	48				3.0	3	№4
	140333	数学分析选讲 Selected Topics in Mathematical Analysis	选	32				2.0	4	№3,4
	140334	高等代数与解析几何选讲 Selected Topics in Advanced Algebra and Analytic Geometry	选	32				2.0	4	№3,4
	140225	微分方程定性方法与数值模拟 The Qualitative Methods and Numerical Simulation for Differential Equations	选 E	64	8			4.0	6	№3,4
	140129	组合与图论 Combinatorics and Graph Theory	选 E	64				4.0	4	№3
	140115	代数学基础 Foundations of Algebra	选 E	64				4.0	5	№3
	140116	测度论 Measure theory	选 E	64				4.0	7	№3
	140161	随机过程 Stochastic Process	选 E	64				4.0	7	№3
	140083	微分方程数值解 Numerical Solutions of Differential Equations	选 E	48				3.0	5	№3,4,5
	140224	大数据应用 Big Data Application	选	32				2.0	5	№4
	140211	数据挖掘与统计决策 Data Mining and Statistics Decision	选 E	64				4.0	6	№4

类别 Course Category	课程 代码 Course No.	课程名称 Course Title	是否 必修 C/E	学时数 Total Curriculum Hours				学分 数 Credits	开课 学期 Semester	毕业 要求 Student Outcomes
				总学时 Class Hours	上机 Computer-ai ded Class Hours	实验 Lab Hours	实践 Practice			
	140118	计算智能 Computational intelligence	选 E	64				4.0	6	№4
	140065	计算机网络 Computer network	选 E	48				3.0	5	№4
	120003	创新研究训练 Train on creativity	选 E	32				2.0		№7
	120004	创新研究实践 I Innovation Research Practice 1	选 E	32				2.0		
	120005	创新研究实践 II Innovation Research Practice 2	选 E	32				2.0		
	120006	创业实践 Entrepreneurial Practice	选 E	32				2.0		
	<b>合 计 Total</b>		必 C							
			选 E	选修课修读最低要求 10.0 学分 minimum elective course credits required: 10						

备注：学生根据自己开展科研训练项目、学科竞赛、发表论文、获得专利和自主创业等情况申请折算为一定的专业选修课学分（创新研究训练、创新研究实践 I、创新研究实践 II、创业实践等创新创业课程）。每个学生累计申请为专业选修课总学分不超过 4 个学分。经学校批准认定为选修课学分的项目、竞赛等不再获得对应第二课堂的创新学分。

#### 四、集中实践教学环节(Practice-concentrated Training)

课程 代码 Course No	课程名称 Course Title	是否 必修 C/E	学时数 Total Curriculum Hours		学分数 Credits	开课 学期 Semester	毕业要求 Student Outcomes
			实践 Practice weeks	授课 Lecture Hours			
106002	军训 Military Training	必 C	3 周		3.0	1	№1
143197	马克思主义理论与实践 Marxism Theory and Practice	必 C	2 周		2.0	假期	№1
140021	C++程序设计课程设计 C++ Programming (Course Project)	必 C	2 周		2.0	2	№3,4
140080	数据结构课程设计 Data Structures (Course Project)	必 C	2 周		2.0	3	№3,4
140089	数值分析课程设计 Numerical Analysis (Course Project)	必 C	2 周		2.0	4	№3,4,5
140179	面向对象程序设计课程设计 Object-oriented programming (Course Project)	选 E	2 周		2.0	3	№3,4
140331	数据库系统课程设计 Introduction to Database Systems (Course Project)	选 E	3 周		3.0	6	№3,4
140092	数学模型课程设计 Mathematical Models (Course Project)	选 E	2 周		2.0	3	№4
140212	数据挖掘与统计决策课程设计 Data Mining and Statistics Decision Project (Course Project)	选 E	2 周		2.0	6	№4

140228	统计学习与智能处理方法课程设计 Statistical Learning and Intelligent Processing (Course Project)	选 E	2 周		2.0	6	№4
140229	大数据应用课程设计 Big Data Application (Course Project)	选 E	2 周		2.0	5	№4
140123	微分方程数值解课程设计 Numerical of Differential Equation (Course Project)	选 E	2 周		2.0	5	№3,4
140123	毕业实习 Graduation intern	必 C	5 周		5.0	8	№4,6,7
140124	毕业设计(论文) Graduation project	必 C	15 周		15.0	8	№4,5,6
<b>合 计</b> <b>Total</b>		必 C	31 周		31.0		
		选 E	选修课修读最低要求 5.0 学分 minimum elective course credits required: 5.0				

## 五、第二课堂

第二课堂由人文素质教育和创新能力培养两部分组成。

### 1.人文素质教育基本要求

学生在取得专业教学计划规定学分的同时，还应结合自己的兴趣适当参加课外人文素质教育活动，参加活动的学分累计不少于 2 个学分。

### 2.创新能力培养基本要求

学生在取得本专业教学计划规定学分的同时，还必须参加国家创新创业训练计划或广东省创新创业训练计划或 SRP（学生研究计划）或百步梯攀登计划或一定时间的各类课外创新能力培养活动（如学科竞赛、学术讲座等），参加活动的学分累计不少于 4 个学分。

## 5. “Second Classroom” Activities

“Second Classroom” Activities are comprised of two parts, Humanities Quality Education and Innovative Ability Cultivation.

### 1)Basic Requirements of Humanities Quality Education

Besides gaining course credits listed in one’s subject teaching curriculum, a student is required to participate in extracurricular activities of Humanities Quality Education based on one’s interest, acquiring no less than two credits.

### 2)Basic Requirements of Innovative Ability Cultivation

Besides gaining course credits listed in one’s subject teaching curriculum, a student is required to participate in any one of the following activities: National Undergraduate Training Programs for Innovation and Entrepreneurship, Guangdong Undergraduate Training Programs for Innovation and Entrepreneurship, Student Research Program (SRP), One-hundred-steps Innovative Program, or any other extracurricular activities of Innovative Ability Cultivation that last a certain period of time (e.g. subject contests, academic lectures), acquiring no less than four credits.