

生物技术专业培养方案

Curriculum for Undergraduate of Biotechnology Major

一、培养目标

本专业培养适应现代生物技术发展需要，德、智、体、美、劳全面发展，具有良好的人文和科学素养、扎实的生命科学理论基础、系统的生物技术专业知识和技能、较强的实践能力，具备一定的创新意识和国际化视野，融知识和能力全面协调发展的高素质应用型人才。毕业生能够在教育、科研、生物技术产业及其相关领域从事教学、科学研究、生产、技术开发及管理等方面工作。期待毕业生五年左右达到以下目标：

1. 具有良好的思想品德修养、职业道德和高度的社会责任感，具备良好的人文和科学素养；
2. 掌握扎实的数学、物理、化学、计算机等方面的学科基础知识；
3. 系统掌握生物技术专业的基础理论、基本知识和专业技能，能够综合应用所掌握的理论知识和相关技术，解决生物技术研究 and 产业中的复杂问题，具备在相关机构中从事教学、科研、新技术与新产品研发、生产管理和人事管理等工作的能力；
4. 具有强烈的创新意识、较强的文献检索和资料查询的能力，能及时了解生物技术的理论前沿、发展动态和应用前景，熟悉生物技术及其产业的相关政策和法规；
5. 具有终身学习的意识，具有适应社会发展需求、继续深造的潜能，具有健康的身心素质、坚强的意志力和应对危机与突发事件的能力；
6. 具有宽广的国际化视野和熟练应用外语的能力，具备良好的语言表达、团队协作和组织管理能力。

I. Training objectives

This major trains undergraduate student to be highly-competent practical talents adapt to the modern biological technology development needs. Graduates are expected to be comprehensive development of moral, intellectual, physical; have good humanistic quality and scientific literacy, solid theoretical basis, systematic of biotechnology professional knowledge; have strong practical ability and certain innovation consciousness and international vision. Graduates can work in education, scientific research, biotechnology industry and related fields in teaching, research, production, technology development and management. Graduates are expected to reach the following goals within 5 years or so.

1. Having good ideological and moral cultivation, professional ethics and high sense of social responsibility; Good humanistic and scientific literacy.

2. To master solid knowledge of mathematics, physics, chemistry, computer and other disciplines.
3. To master professional biotechnology theory, knowledge and skills; able to solve complex problems in biological technology research and industry using integrated application of theoretical knowledge and related technologies; capable of teaching, scientific research, new technology and new product research and development, production management and personnel management in relevant institutions.
4. Having a strong sense of innovation, proficient literature retrieval and data query skills, timely understanding the frontier trends and development of biotechnology and application prospect of theory, familiar with biological technology and its industry policies and regulations.
5. Having the consciousness of lifelong learning and the potential to adapt to the needs of social development; having healthy physical and mental quality, strong willpower and the ability to deal with crisis and emergencies.
6. Having a broad international vision and the ability to skillfully use foreign languages; having good language skills, teamwork and organization management.

二、毕业要求

1. 思想政治和德育：具有良好的思想品德修养，树立正确的世界观、人生观和价值观，具备健康的心理行为能力。
2. 职业道德与规范：了解并遵守生物技术领域中所涉及的职业要求和规范，包括生物安全、有毒有害物的管理规范、人体和动物实验的伦理要求等，能在生物技术实践中理解并遵守职业道德、行为规范和法律法规，履行责任。
3. 自然科学基础知识：能够掌握数学、物理、化学、生物学等基础知识，并将其用于解决生物技术中的问题。
4. 现代工具：掌握本专业文献检索、资料查询及运用网络搜索工具获取相关信息的基本方法，能合理有效地应用于生物技术研究 and 实践。
5. 生物技术基本知识：掌握生物学、生物化学及分子生物学、细胞生物学、遗传学、微生物学等现代生物技术相关学科的理论框架及技术体系；能够运用现代生物技术分离、纯化和检测生物分子，并进行定量分析、结构分析和分子（基因）操作。
6. 生物技术专业技能：基本掌握基因工程、蛋白工程、抗体工程和组织工程等生物工程技术，并能够理解其适用范围，对复杂的生物技术工程问题进行理论与模拟分析，并通过信息综合得到有效的结论。

7. 实验设计与信息处理：能够基于生物学原理，选择与使用恰当的生物技术工具、仪器设备和信息技术工具，对生物技术领域问题进行研究，包括设计实验、分析数据、撰写论文和信息处理。
8. 环境和可持续发展：在利用生物技术工具解决人类健康和社会安全问题的过程中，理解生物技术发展和应用对人类健康、生态环境、社会安全以及法律和文化的影响，坚持可持续发展。
9. 团队合作和沟通：能够在多学科背景下的团队中承担个体、团队成员以及负责人的角色，并能够就现代生物技术领域生产与研发中的问题与业界同行及社会公众进行有效的沟通和交流，包括设计实验方案和操作具体过程、清晰表达和陈述发言。
10. 创新：具有一定的创新意识和创造性思维能力，始终坚持批判性思考和创造性工作。
11. 国际视野：掌握和熟练运用一门外语，始终关注和了解学科前沿动态和发展趋势，具备一定的国际视野及跨文化交流能力。
12. 终身学习：掌握自我学习的方法，具备自主学习和终身学习的意识与能力，能持续更新核心知识以适应专业或职业发展。

II. Requirements

1. Ideological and political and moral education: having good ideological and moral cultivation, setting up correct outlook on world, life and values, and having healthy mental and behavioral ability.
2. Professional ethics and norms: understanding and abiding by the professional requirements and norms involved in the field of biotechnology, including biosafety, toxic and hazardous substance management norms, human and animal experiment ethical requirements, etc., able to abide by the professional ethics and codes of conduct in biotechnology practice, and fulfilling responsibilities.
3. Basic knowledge of natural science: able to master basic knowledge of mathematics, physics, chemistry and biology, and using them to solve problems in biotechnology.
4. Modern tools: mastering the basic methods of literature retrieval, data query and the use of Internet search tools to obtain relevant information, which can be reasonably and effectively applied to the research and practice of biotechnology.
5. Basic knowledge of biotechnology: mastering the theoretical framework and technical system of biology, biochemistry, molecular biology, cell biology, genetics, microbiology and other disciplines related to modern biotechnology; Capable of using modern biotechnology to isolate, purify and detect biomolecules and perform quantitative analysis, structural analysis and molecular (gene) manipulation.
6. Biotechnology professional skills: basically master genetic engineering, protein engineering, antibody engineering and biological engineering technology such as tissue

engineering, and be able to understand their scopes of application, conduct theoretical and simulation analysis on complex biotechnological engineering problems, and obtain effective conclusions through information synthesis.

7. Experimental design and information processing: be able to select and use appropriate biotechnology tools, instruments and information technology based on biological principles to solve the problems in the field of biotechnology, including experimental design, data analysis, thesis writing and information processing.

8. Environment and sustainable development: understanding the impact of the development and application of biotechnology on human health, ecological environment, social security, law and culture in the process of using biotechnology tools to solve human health and social security problems and adhere to sustainable development.

9. Team cooperation and communication: able to organize, manage, and work with people, able to take on roles of individuals, team members, and leaders in a multidisciplinary team;

Able to communicate and exchange with industry peers and the public, in the cross cultural background, including the experimental design and the concrete operation process, with clear expression and statement.

10. Innovation: with a certain sense of innovation and creative thinking ability, always adhering to critical thinking and creative work.

11. International vision: mastering and skillfully using a foreign language, always paying attention to and understanding the frontier trends and development trends of the discipline, and having certain international vision and cross-cultural communication ability.

12. Lifelong learning: mastering the method of self-learning, having the awareness and ability of self-learning and lifelong learning, and continuously updating core knowledge to adapt to professional or career development.

附：培养目标实现矩阵

	培养目标 1	培养目标 2	培养目标 3	培养目标 4	培养目标 5	培养目标 6
毕业要求 1	√				√	
毕业要求 2	√			√		
毕业要求 3		√	√			
毕业要求 4		√		√	√	
毕业要求 5			√			
毕业要求 6			√	√		
毕业要求 7			√	√	√	
毕业要求 8	√		√		√	

毕业要求 9						√
毕业要求 10				√		
毕业要求 11						√
毕业要求 12					√	

三、专业主干课程

生物化学、分子生物学、微生物学、遗传学、细胞生物学、动物学、免疫学基础、生理学、发育生物学、生物统计学

III. Core courses

Biological Chemistry、Molecular Biology、Microbiology、Genetics、Animal Sciences、Cell Biology、Immunology、Physiology、Developmental Biology、Biostatistics

四、基本学制：四年

IV. Recommended length of the program: 4 years

五、授予学位：理学学士

V. Degree: Bachelor of Biotechnology

学生修满所规定的最低毕业学分，符合武汉科技大学授予学士学位规定，授予理学学士学位。

六、毕业学分要求：176 学分

毕业额定学分：176 学分

课程类型	学分要求	课程类型	学分要求
1、通识教育平台课程	46	3、专业课程模块	64.5
必修课程	42	必修课程	50
选修课程	4	选修课程	14.5 (23)
2、学科基础平台课程	40.5		
必修课程	32.5	4、实践教学模块	18
选修课程	8 (15)	5、素质拓展模块	7

*通识教育选修课 4 学分包括：人文社科类 1 学分、艺术体育类 1 学分、自然科学类 0 学分、经济管理类 2 学分 **VI. Credits required for graduation: 176 credits**

Type of courses	Academic credits	Type of courses	Academic credits
1. Courses of general education	46	3. Specialized Courses	64.5
Required courses	42	Core specialized courses	50
Elective courses	4	Elective courses	14.5 (23)
2. General disciplinary courses	40.5		
Required Courses	32.5	4. Practicum and Internship Courses	18
Elective Courses	8 (15)	5. Quality Development Courses	7

七、学分比例

VII、Ratio of Credits

1. 必修选修学分比例

The proportion of compulsory elective credits

类别	学分	占总学分比例
必修	0	0%
选修	0	0%

2. 实践教学环节学分比例

The proportion of credits in practice teaching

类别	学分	占总学分比例
实践教学环节	实验教学学时	28.5
	实践教学模块	
	素质拓展模块	0
		2850.0%

十、教学环节设置及学分分布表

课程类型	课程性质	课程编码	课程名称	学分	合计	课内学时			实践学时	学期	是否辅修/ 双学位课程	先修课程/ 备注		
						讲课	实验	上机						
平台	公共课程平台课程	通识教育平台课程	必修	1306001	大学计算机基础 A Computer Foundation A	3	48	30	0	18	0	1		
				1401840	大学英语(一) College English (I)	3	48	48	0	0	0	1		
				1501882	体育(一) Physical Education(I)	1	26	26	0	0	0	1		
				2502001	大学生心理健康教育 Mental Health Education	1	16	16	0	0	0	1		
				5105001	思想道德修养与法律基础 Moral Cultivation and Basics of Law	3	48	42	0	0	6	1		
				2504003	军事课 Military Course	4	148	36	0	0	112	1, 2		
				5106001	形势与政策 World Affairs and State Policy	2	64	64	0	0	0	1, 2, 3, 4, 5, 6, 7, 8		
				1401841	大学英语(二) College English (II)	3	48	48	0	0	0	2		
				1501883	体育(二) Physical Education(II)	1	34	34	0	0	0	2		
				2503002	职业生涯规划与就业创业指导 Career Planning and Employment Entrepreneurial Guidance	1	16	16	0	0	0	2		
5103001	中国近现代史纲要 An Outline of Modern and Contemporary History of China	3	48	42	0	0	6	2						

				1401842	大学英语(三) College English (III)	3	48	48	0	0	0	3		
				1501884	体育(三) Physical Education(III)	1	34	34	0	0	0	3		
				5102001	马克思主义基本原理 Fundamentals of Marxism	3	48	44	0	0	4	3		
				1401843	大学英语(四) College English (IV)	3	48	48	0	0	0	4		
				1501885	体育(四) Physical Education(IV)	1	34	34	0	0	0	4		
				2501002	公益劳动 Community Service	1	16	0	0	0	16	4		
				5101001	毛泽东思想与中国特色社会主义理论体系概论 Theoretical System of Socialism with Chinese Characteristics	5	80	64	0	0	16	4		
模块	素质拓展模块	创新创业教育	必修	创新创业实践 3 学分 Innovation Practices 3 Academic Credits										
		第二课堂	必修	第二课堂 3 学分 Second Classroom 3 Academic Credits										
		学科基础平台课程	必修	0702603	高等数学 B(一) Advanced Mathematics B(I)	4	64	64	0	0	0	1		
	2206006			普通化学 General Chemistry	2	32	32	0	0	0	1			
	2253017			普通化学实验 Experiments in General Chemistry	1	16	0	16	0	0	1			
	0702604			高等数学 B(二) Advanced Mathematics B(II)	5	80	80	0	0	0	2			
	0703605			大学物理 B(一) College Physics B(I)	2.5	40	40	0	0	0	2			

			0703607	大学物理实验 B Experiments of College Physics B	1.5	24	0	24	0	0	2		
			1306004	计算机程序设计基础(C) Basics of Computer Programming(C)	4	64	40	0	24	0	2		
			2206679	有机化学 B Organic Chemistry B	2.5	40	40	0	0	0	2		
			2206681	分析化学 B Analytical Chemistry B	2	32	32	0	0	0	2		
			2253027	有机化学实验 B Organic Chemical Experiment B	1.5	24	0	24	0	0	2		
			2253028	分析化学实验 B Analytical Chemical Experiment B	1.5	24	0	24	0	0	2		
			0702026	线性代数 Linear Algebra	2	32	32	0	0	0	3		
			0703606	大学物理 B(二) College Physics B(II)	2	32	32	0	0	0	3		
			1601006	医学文献检索 Medical Literature Retrieval	1	18	18	0	0	0	4		
		选修	0101088	技术经济与投资分析 Technical Economy and Investment Analysis	2	32	32	0	0	0	3		
			0702303	概率论与数理统计 A Probability and Mathematical Statistics(A)	3	48	48	0	0	0	3		
			0502004	管理学原理 Principles of Management	3	48	48	0	0	0	4		
			1401043	中级英语听力与写作 Intermediate English Listening & Writing	3	48	48	0	0	0	4		
			0602032	知识产权法 Intellectual Property Law	2	32	32	0	0	0	5		
			1306005	数据库技术及应用 Database Technology and Applications	3	48	24	0	24	0	5		

专业 核心 课程	必修	1801016	生物技术导论 Introduction to Biotechnology	2	32	32	0	0	0	1		
		1801001	动物学 Animal Sciences	3	48	48	0	0	0	3		
		1801024	生物化学（一） Biological chemistry（一）	4.5	72	72	0	0	0	3		
		1801026	细胞生物学 Cell Biology	3	48	48	0	0	0	3		
		1850001	动物学实验 Experiments in Animal Sciences	1.5	24	0	24	0	0	3		
		1850007	生物化学实验 Experiments in Biological Chemistry	3	48	0	48	0	0	3		
		1850008	细胞生物学实验 Experiments in Cell Biology	1.5	24	0	24	0	0	3		
		1801003	分子生物学 Molecular Biology	4	64	64	0	0	0	4		
		1801009	遗传学 Genetics	3	48	48	0	0	0	4		
		1801011	生理学 Physiology	3	48	48	0	0	0	4		
		1801037	生物化学（二） Biological chemistry（二）	3	48	48	0	0	0	4		
		1850002	分子生物学实验 Experiments in Molecular Biology	1.5	24	0	24	0	0	4		
		1850005	遗传学实验 Experiments in Genetics	1	16	0	16	0	0	4		
		1850006	生理学实验 Experiments in Physiology	1	16	0	16	0	0	4		
		1801005	免疫学基础 Immunology	3	48	48	0	0	0	5		
		1801007	微生物学 Microbiology	3	48	48	0	0	0	5		

			1801019	基因组学技术 Genomics Technology	1.5	24	24	0	0	0	5		
			1850003	免疫学基础实验 Experiments in Immunology	1	16	0	16	0	0	5		
			1850004	微生物学实验 Experiments in Microbiology	1.5	24	0	24	0	0	5		
			1801014	生物统计学 Biostatistics	3	48	32	16	0	0	6		
			1801015	发育生物学 Developmental Biology	2	32	32	0	0	0	6		
	专业 任 选 课 程	选修	1801029	系统生物学 Systems Biology	2	32	32	0	0	0	3		
			1801021	生物材料与组织工程 Biomaterials and tissue engineering	2	32	32	0	0	0	4		
			1801023	生物信息学 Bioinformatics	2	32	32	0	0	0	4		
			1801030	食品化学 Food chemistry	1.5	24	24	0	0	0	4		
			1801031	植物学 Phytology	2	32	32	0	0	0	4		
			1801013	现代生物仪器分析 Modern Biological Instrument Analysis	2	32	32	0	0	0	5		
			1801017	酶工程 Enzyme engineering	2	32	32	0	0	0	5		
			1801018	发酵工程 Fermentation Engineering	2	32	32	0	0	0	6		
			1801020	蛋白质组学技术 Proteomics Technology	1.5	24	24	0	0	0	6		
			1801028	神经生物学 Neurobiology	2	32	32	0	0	0	6		
			1801033	抗体工程 Antibody engineering	2	32	32	0	0	0	6		
			1801041	生物制品 Biological products	2	32	32	0	0	0	6		

		实践教学模块	必修	1801070	认识实习 Introductory Practice	2	2(周)	0	0	0	2(周)	3		
				1850009	生物技术开放实验设计 Open Experiment Design for Biotechnology	2	2(周)	0	0	0	2(周)	7		
				1850010	分子生物学实验设计与实践 Design and Practice for Molecular Biology Experiment	1	1(周)	0	0	0	1(周)	7		
				1850011	细胞生物学实验设计与实践 Design and Practice for for Cell Biology Experiment	1	1(周)	0	0	0	1(周)	7		
				1801097	毕业实习 Pre-graduation Practice Experience	4	4(周)	0	0	0	4(周)	8		
				1801099	毕业设计(论文) Pre-graduation Internship	8	12	0	0	0	12(周)	8		