## Seed Science and Engineering

Major Code: 090105 Major Name: Seed Science and Engineering

## I. Objective System

1. Objectives

(1) General Objectives

Students are required to have physical and mental health with reasonable knowledge structure; to own decent personalities, humanity, and social responsibilities; to possess multiple capabilities including critical thinking, innovation, scientific inquiry, verbal dexterity, life-long learning, and organizational management; and to have the international perspective and teamwork spirit.

(2) Specific Objectives

Students are trained to be high quality innovative individuals qualified for research, teaching and management, technology extension and development of plant science and technology in modern agriculture and relevant fields in line with the requirement of national crop safety and modern seed industry. They are supposed to have good morality, humanistic pursuit and social responsibility, international perspectives and innovative ability, and master the basic theory, knowledge and skills in plant genetic improvement, seed production, processing, storage, quality inspection and management.

2. Basic Knowledge for Graduates Includes

(1) General Knowledge

A1. Arts and humanities, including history, philosophy, literature and art (to train students to understand different perspectives on history, the world, life, values, and aesthetics)

A2. Social science disciplines and their research methods (to equip students with basic research skills, a passion for humanistic pursuits, and an understanding of social responsibility)

A3. Mathematics, logic and physics (to train students to master basic knowledge in mathematics, logical analysis and college physics)

A4. Modern information technology (IT) (to enable students to use modern technologies relevant to the Internet, communications, and information processing)

A5. Ecological environmental studies, life sciences, and economic management (to provide students with a basic understanding of the natural world, economics, civilization, sociology, and more)

(2) Specific knowledge

A6. Fundamental knowledge of plant production discipline (the basic knowledge of plant physiology, basic biochemistry, genetics, modern biotechnology, agroecology, agricultural and forest meteorology, plant farming and cultivation, plant protection, microbiology, etc.);

A7. Fundamental knowledge of plant genetic improvement (the knowledge of conventional plant breeding, advanced breeding technology, test-related technology of new varieties, etc.);

A8. Fundamental knowledge of seed production, processing and quality inspection (the professional knowledge of plant seed production and quality control);

A9. Fundamental knowledge of information collection and processing (the basic knowledge of survey methods, analysis technology and report writing related to information collection and analysis);

A10. Fundamental knowledge of organization and management of seed company (the basic knowledge of seed-related policies and regulations, marketing and management of seed business);

A11. Fundamental knowledge of language utilization (to be proficient in native language and foreign language).

3. Graduate Requirements

(1) General Competencies

B1. To think clearly and express oneself well;

B2. To discover, analyze and solve problems;

B3. To think critically, innovate and pursue lifelong learning;

B4. To organize, manage, direct and cooperate;

B5. To appreciate literary and artistic works.

(2) Specific Competencies

B6. Field organization and management of crop production

B7. Practice capabilities of conventional crop breeding

B8. Capabilities of molecular-assisted crop breeding

B9. Capabilities of experiment design, data analysis, scientific report and thesis writing

B10. Practice capabilities of seed production, processing and quality control

B11. Practice capabilities of seed market investigation, analysis, and exploitation

B12. Capabilities of office software utilization and word processing

4. Required Graduate Qualities

(1) General Qualities

C1. Be ambitious and strong-willed (To take the unshaken responsibilities of succeeding civilization, exploring truth, revitalizing the Chinese nation, and benefiting human beings);

C2. Be hard-working and progressive (To be practical, regardless of fame, diligent, and pursuing excellence);

C3. Stay physically and mentally healthy and have open visions (To have well physical and mental qualities; to have a multicultural and tolerant attitude and be open with international visions);

C4. Think nimbly and enjoy innovations (To be good in thinking, investigating, innovating, exploring and desiring to be creative).

(2) Specific Qualities

C5. Be dedicated to agriculture and behave ethically (To learn and appreciate agriculture, and devote to agricultural career with a rigorous, hardworking and responsible altitude);

C6. Be healthy in mentality with an aggressive and self-motivated altitude;

C7. Be sound in health and be industrious.

### **II. General Requirements**

Graduates of this major are supposed to:

1. Master solid fundamental theories and scientific training, principles, professional knowledge, and basic skills in seed science, biology and related subjects;

2. Own multiple capabilities of investigation, decision-making, organization and management with a realistic and innovative altitude, and be competent to scientific research and other related works;

3. Know the current development of plant production disciplines and application vista of high technologies on seed production and seed science both domestically and internationally; be familiar with national seed policies and regulations, and international trade rules;

4. Master a foreign language and being competent in using computers, having basic capabilities of acquiring knowledge and processing information by means of modern information technology;

5. Possess profound humanistic spirit and good health.

#### **III. Primary and Relevant Subjects**

Primary subject: Plant Production

Relevant subject: Biology

## **IV. Core Courses**

Botany, Plant Physiology, Basic Biochemistry, Genetics, Plant Breeding, Design and Analysis of Experiments, Seed Biology, Sciences of Seed Production, Seed Testing, Seed Processing and Storage, Soil and Plant Nutrition, Plant Protection, etc.

#### V. Hands-on Experience

The hands-on experience takes 46 weeks, including military training, physical work, practice of ideological

and political theory, engineering training, soil practice, biology internship, research training practice, comprehensive practice in summer, teaching internship, thesis (design), etc.

vi. Creans Anoc	ation							
			Courses					
Course	Com	pulsory		Optional	Hands-on	Total		
Credit	General	Specialize d	General	Specialized	Experience			
Credits	59.5	22.5	6+x	42 (Top-notch Type) 46.5 (Compound Type) 2	36	166+x( Top-notch Type) 170.5+x( Compound Type)		
Minimum Credits	59.5	22.5	6	36	36	160		
%Percentage	37.2	14.1	3.8	22.5	22.5	100		

## VI. Credits Allocation

Note: Practice teaching includes hands-on experience and experimental teaching. The ratio of hands-on experience to the total credits of this major = (36+18)/160=33.75%.

### VII. Duration of Study

Four years

## **VIII. Academic Degree**

Bachelor of Agriculture

## **IX. Credit Requirements**

Minimum credits for graduation: 160 credits (curricular)+8 credits (extracurricular).

Curricular: 82 credits for compulsory courses, 42 for elective courses, and 36 for hands-on experience. Extracurricular: 8 credits for Innovation, Entrepreneurship and Quality Development.

Total required for graduation: 168 credits.

	F			C. P.	Course	Course length allocation		Compulsory/	<b>C</b> 11	G (	77 1 1		
Co	urse Type	Code	Course litle	Credit	Length (Hours)	Lecture	Experi ment	Elective	College	Semester	Knowledge	Abilities	Qualities
	1	1181001	Essentials of Modern & Contemporary History of China	1.5	24	24			IIPE	2	Al	B2	C1C3
	olitica	1181002	Ideological and Moral Cultivation and Legal Essentials	2.5	40	40			IIPE	1	A1	B2	C1C3
	nd P	2181003	The Fundamental Principles of Marxism	2.5	40	40		Compulsory	IIPE	3	A1	B2	C1C3
	Ideology aı Scie	3181004	Introduction to Mao Zedong Thought and Theoretical System of Socialism with Chinese Characteristics	3.5	56	56		12 Credits	IIPE	6	A1	B2	C1C3
		2181005	Current Situation and Policy	2.0	8 times	within 4	years		IIPE	1~8	A1	B2	C1C3
		1191001	College English I	3.0	64	32	32		DFL	1	A11	B1	C2C3
ts	lish	1191002	College English II	3.0	64	32	32	Compulsory	DFL	2	A11	B1	C2C3
redi	Eng	2191001	College English III	3.0	64	32	32	12 Credits	DFL	3	A11	B1	C2C3
5.5 0		2191002	College English IV	3.0	64	32	32		DFL	4	A11	B1	C2C3
() (:		1241001	P.E. I	1.0	30	30			DPE	1	A1	B6B7 B11	C3C7
0.9%	ப்	1241002	P.E. II	1.0	30	30		Compulsor	DPE	2	A1	B6B7 B11	C3C7
s (4	P.	2241001	P.E. III	1.0	30	30		y 4 Credits	DPE	3	A1	B6B7 B11	C3C7
urse		2241002	P.E. IV	1.0	30	30			DPE	4	A1	B6B7 B11	C3C7
1 Co		1151003	Advanced Mathematics (B)	5.5	88	88			CS	1	A3	B2B9	C4
nera		1151005	Linear Algebra	2.0	32	32			CS	2	A3	B2B9	C4
Gei	ş	1151007	Probability Theory	2.0	32	32			CS	2	A3	B2B9	C4
	ence	2151107	College Physics (C)	3.0	48	48			CS	3	A3	B2B9	C4
	lScie	2151108	College Physics Experiments (B)	1.0	32		32	Compulsory	CS	4	A3	B2B4	C4C5
	tura	1151203	Inorganic and Analytical Chemistry	5.0	80	80		26 Credits	CS	1	A3	B2B9	C4
	Nat	1151205	Experiments of Inorganic and Analytical Chemistry	1.5	48		48		CS	2	A3	B2B4	C4C5
		1151201	Organic Chemistry	4.0	64	64		1	CS	2	A3	B2B9	C4
		2151202	Organic Chemistry Laboratory	2.0	64		64		CS	3	A3	B2B4	C4C5
	puter	1091002	Fundamentals of Computer Sciences (B)	2.5	48	32	16	Compulsory	CIE	1	A4	B12	C5
	Com	1091003	VB Fundamentals of Programming (VB)	3.0	56	36	20	5.5 Credits	CIE	2	A4	B9B12	C5

## Table 1 List of Courses for Seed Science and Engineering

Co	Course Type		Codo	Course Title (		Course Length	Course alloca	length tion	Compulsory/	Collogo	Somostor	Knowlodgo	Abilities	Qualities
		ype	Coue		Crean	(Hours)	Lecture	Experi ment	Elective	Conege			Admities	Quanties
(%)				Freshman Seminar	1.0				Elective	CA	1	A5	B6	C5
(40.9 <sup>°</sup> its	65.5 credits General Electives			Technological Development and Civilization Heritage					Election -					
ourses 5 credi				Civilizations Communication and International Perspective					5 credits					
al C 65.:				Humanities and Life Values					for Public					
nera				Natural Environment and Social Development					Art Courses)					
Ğ				Economic Management and Social Sciences										
(%)			1122101	Botany	3.0	48	48			CLS	1	A6	B2B4 B8	C2C4 C5
40.9		ຍ	1122102	Botany Experiment	1.0	32		32		CLS	1	A6	B2B4 B8	C2C4 C5
ses ( edit	ral Disciplin	lplin	2122201	General Biochemistry	3.0	48	48			CLS	3	A6	B2B4 B8	C2C4 C5
our: 5 cr		JISCI	2122202	Basic Biochemistry Experiment	1.0	32		32		CLS	3	A6	B2B4 B8	C2C4 C5
65.		ral I	2122103	Plant Physiology	3.0	48	48			CLS	4	A6	B2B4 B8	C2C4 C5
Subje		Cene	2122104	Experiment on Plant Physiology	1.0	32		32	Compulsory 22.5 Credits	CLS	4	A6	B2B4 B8	C2C4 C5
		ses in	2012001	Genetics	3.5	64	48	16		CLS	4	A6 A7	B2B3 B4B7 B8	C2C4 C5
	C	Cour	1152199	Agricultural and Forest Meteorology	2.5	48	32	16		CS	2	A5 A6	B2B3 B4B6 B7	C2C4 C5
redits		Basic	2012002	Agroecology	2.0	32	32			CA	3	A5 A6	B2B3 B4B6 B7	C2C4 C5
58.5 c			2122301	Microbiology	2.5	48	32	16		CLS	3	A5 A6	B2B3 B4B6 B7	C2C4 C5
(36.6%)		line	3013057	Seed Biology	2.5	48	32	16		CA	5	A6 A7 A8	B2B3 B4B6 B7B10	C2C4 C5
Courses	h Type	in Discip	3013009	Plant Breeding	3.0	48	48		Elective 22.5 Credits	CA	5	A6 A7	B2B3 B4B6 B7B8	C1C2 C4C5
ıbject	o-notc]	urses i	2013004	Experimental Design and Analysis	2.0	32	32			CA	4	A9	B2B3 B6B9	C2C4 C5
St	Tor	3asic Co	2013045	Plant Molecular Biology	2.0	32	32			CA	4	A6 A7 A8	B2B3 B7B8	C2C4 C5
		I	3023097	Plant protection	2.0	40	24	16		CPP	5	A5 A6	B2B3 B4B6 B7	C2C4 C5

Co	Course Type		Codo	Course Title		Course	Course alloca	length ation	Compulsory/	Compulsory/ College		Somostor Knowledge		Qualities
	urse ry	pe	Code	Course Thie	Creun	(Hours)	Lecture	Experi ment	Elective	Conege	Semester	Kilowieuge	Abilities	Quanties
			3133013	Principles of Management	2.0	32	32			CEM	5	A5 A10	B4B10 B11	C2C3 C4C5
			2063707	Soil and Plant Nutrition	2.0	40	24	16		CNRE	5	A5 A6	B2B3 B4B6 B7	C2C4 C5
		sipline	3013052	Plant Germplasm Resources	2.0	32	32			СА	5	A5 A6 A7	B2B3 B6B7	C2C4 C5
		in Disc	3013041	Cell Biology	1.5	24	24			CA	5	A7	B2B3 B7B8	C2C4 C5
	ourses	ourses	3013068	Agricultural Biotechnology	2.0	40	24	16		CA	5	A7	B2B3 B7B8	C2C4 C5
lits		asic Co	4013049	Plant Genomics and Proteomics	1.5	24	24			СА	7	A7	B2B3 B7B8	C2C4 C5
58.5 cree	Эс	B	3013038	Bioinformatics	1.5	28	20	8		CA	6	A4 A5 A6	B2B3 B7B8	C2C4 C5
s (36.6%)	notch Ty <sub>l</sub>		3013060	Plant Tissue and Cell Culture	1.5	40	8	32		CA	5	A4 A5 A6	B2B3 B7B8	C2C4 C5
Course	Top-		3014056	Plant Production	3.0	48	48			CA	6	A8	B2B3 B6B7 B10	C2C4 C5
lbject (			3014055	Seed Test Science	2.5	48	32	16		СА	6	A8	B2B3 B6B7 B10	C2C4 C5
Su		ses	3133002	Marketing	2.0	32	32			CEM	6	A5 A10	B4B10 B11	C2C3 C4C5
		l Cours	3014054	Seed Storage and Processing	2.0	32	32		Elective	CA	6	A8	B2B3 B6B7 B10	C2C4 C5
		cializeo	4013046	Plant Molecular Genetics	1.5	24	24		13.5 Credit	CA	7	A7	B2B3 B7B8	C2C4 C5
		Spe	3013048	Genetic Engineering	2.0	40	24	16		СА	6	A7	B2B3 B7B8	C2C4 C5
			3014039	Utilization of Experimental Plants	2.0	32	32			СА	6	A7	B2B3 B8	C2C4 C5
			4013021	Commonly used Biotechnological Software	1.5	40	8	32		СА	7	A7	B2B3 B7B8	C2C4 C5

Co	Course Type		Cada	Course Title	Credit	Course	Course alloca	length ation	Compulsory/	Callaga	Somostor	Unovilodge	Abilition	Qualities
	urse Ty	pe	Code	Course The	Creun	(Hours)	Lecture	Experi ment	Elective	Conege	Semester	Knowledge	Admities	Quanties
			3013057	Seed Biology	2.5	48	32	16		CA	5	A6 A7 A8	B2B3 B4B6 B7B10	C2C4 C5
			3013009	Plant Breeding	3.0	48	48			CA	5	A6 A7	B2B3 B4B6 B7B8	C1C2 C4C5
			2013004	Experimental Design and Analysis	2.0	32	32			СА	4	A9	B2B3 B6B9	C2C4 C5
		scipline	2013045	Plant Molecular Biology	2.0	32	32			CA	4	A6 A7 A8	B2B3 B7B8	C2C4 C5
		in Di	3023097	Plant protection	2.0	40	24	16	Compulsor	CPP	5	A5 A6	B2B3 B4B6 B7	C2C4 C5
redits		ourses	3133013	Principles of Management	2.0	32	32		20.5 Credits	CEM	5	A5 A10	B4B10 B11	C2C3 C4C5
58.5 c	e	tsic C	2063707	Soil and Plant Nutrition	2.0	40	24	16		CNRE	5	A5 A6	B2B3 B4B6 B7	C2C4 C5
(36.6%)	und Typ	B B	3013052	Plant Germplasm Resources	2.0	32	32			CA	5	A5 A6 A7	B2 B3 B6B7	C2C4 C5
urses	Jompc		3013071	Geoponics	2.0	32	32			CA	6	A6 A8	B2B3 B6B7	C2C4 C5
nic Co	0		3013023	Dryland Farming	2.0	32	32			CA	6	A6 A8	B2B3 B6B7	C2C4 C5
Botar			3013060	Plant Tissue and Cell Culture	1.5	40	8	32		CA	5	A4 A5 A6	B2B3 B7B8	C2C4 C5
			3014056	Plant Production	3.0	48	48			CA	6	A8	B2B3 B6B7 B10	C2C4 C5
		Irses	3014055	Seed Test Science	2.5	48	32	16		CA	6	A8	B2B3 B6B7 B10	C2C4 C5
		id Cou	3133002	Marketing	2.0	32	32		Elective	CEM	6	A5 A10	B4B10 B11	C2C3C4C 5
		cialize	3014054	Seed Storage and Processing	2.0	32	32		Credits	CA	6	A8	B2B3 B6B7 B10	C2C4 C5
		Spe	3014053	Seed Regulations and Management	2.0	32	32			CA	6	A10	B2B3 B10	C2C4 C5
			3014031	Regional Development and Industrialization of Agriculture	2.0	32	32			CA	5	A6	B2B3 4B6 B11	C2C4 C5

Co	Course Type		Cada	Course Title		Course	Course alloca	length ation	Compulsory/	Callaga	Somostor	Vnovdodao	Abilition	Qualities
	urse 1y	pe	Code	Course Thie	Credit	(Hours)	Lecture	Experi ment	Elective	Conege	Semester	Knowledge	Admities	Quanties
5%)		S	3013024	Computer Data Processing	2.0	40	24	16		CA	7	A4 A9	B2B3 B9	C2C4 C5
s (36. lits	Type	Course	4014029	Introduction to Agricultural Standardization	2.0	32	32			CA	7	A6	B2B3 B6B10	C2C4 C5
Course	punoc	lized (	3014033	Agricultural popularization	2.0	32	32			CA	6	A10	B2B3 B4B11	C2C4C5
anic C 58.	Com	pecial	3014035	Agricultural Information Technology	2.0	32	32			CA	6	A4A9	B2B3 B9	C2C4 C5
Bot	Š.		4134155	Customer Relationship Management	2.0	32	32			CEM	7	A5 A10	B4 B11 B12	C2C3 C4C5 C6
			1305102	Military Training	1.0	2 weeks								
			1301001	National Defense Education	1.0									
			1305201	Physical Labor		4 weeks								
			1305301	Social Practice Activities										
ts			1185007	Practice of Ideological and Political Theories	4.0	4 weeks				IIPE	2	A1	B2	C1C3
redi			1085003	Engineering Training (C)	1.0	1 weeks				CMEE	1	A5	B2B3 B4	C2C4 C5
6)36 c		cilce	1125106	Biology Internship	1.0	1 weeks				CLS	2	A5A6 A9	B2B4	C2C4 C5C7
(22.5%		e rrao	2015026	Research Training I	2.0	2 weeks				CA	3	A7A8 A9	B2B4 B8	C2C4 C5C7
Experience		mprenensiv	2015027	Research Training II	2.0	2 weeks			Compulsory 36 Credits	CA	4	A7A8 A9	B1B2 B3B4 B6B8 B9B10	C2C3 C4C5 C6C7
Hands-on	Č		2015040	Comprehensive Practices in Summer	2.0	2 weeks				CA	4	A6A7 A8A9 A11	B1B2 B3B4 B6B7 B10	C2C4 C5C6 C7
			3015025	Teaching Practice	12	12 weeks				СА	5, 6	A6A7 A8A9 A11	B1B2 B3B4 B6B7 B10	C2C4 C5C6 C7
			4305001	Dissertation	10	14 weeks				CA	7, 8	A6A7 A8A9 A11	B1B2 B3B4 B6B7 B10	C2C4 C5C6 C7
		Innova	ation, Entreprene	eurship and Quality Development	8.0				Compulsory		1~8			

	First Semester		Second Semester					
Course Code	Course Title	Credit	Course Code	Course Title	Credit			
1181002	Ideological and Moral Cultivation and Legal Essentials	2.5	1181001	Essentials of Modern & Contemporary History of China	1.5			
1191001	College English I	3.0	1191002	College English II	3.0			
1241001	P.E. I	1.0	1241002	P.E. II	1.0			
1151003	Advanced Mathematics (B)	5.5	1151005	Linear Algebra	2.0			
1151203	Inorganic and Analytical Chemistry	5.0	1151007	Probability Theory	2.0			
1091002	Fundamentals of Computer Sciences (B)	2.5	1151205	Experiments of Inorganic and Analytical Chemistry	1.5			
1122101	Botany	3.0	1151201	Organic Chemistry	4.0			
1122102	Botany Experiment	1.0	1091003	VB Fundamentals of Programming (VB)	3.0			
			1152199	Agricultural and Forest Meteorology	2.5			
Total	23.5 Credits (compulsory)		Total	20.5 Credits (compulsory)				
* 2 compt	<ul> <li>* 2 credits for Elective General Courses.</li> <li>alsory credits for Military Training (National Defense Education)</li> <li>* 1 credit for Engineering Training (C).</li> </ul>	ation).	* 4 credits for Practice of Ideological and Political Theories.     * 4 credits (compulsory) for Biology Internship.					
	Third Semester		Fourth Semester					
<b>Course Code</b>	Course Title	Credit	Course Code	Course Title	Credit			
2181003	The Fundamental Principles of Marxism	2.5						
2191001	College English III	3.0	2191002	College English IV	3.0			
2241003	P.E. III	1.0	2241004	P.E. IV	1.0			
2151107	College Physics (C)	3.0	2151108	College Physics Experiments (B)	1.0			
2151202	Organic Chemistry Laboratory	2.0	2122103	Plant Physiology	3.0			
2122201	General Biochemistry	3.0	2122104	Experiment on Plant Physiology	1.0			
2122202	Basic Biochemistry Experiment	1.0	2012001	Genetics	3.5			
2012002	Agroecology	2.0						
2122301	Microbiology	2.5						
Total	20 Credits (compulsory)		Total	12.5 Credits (compulsory)				
	Total credits for this semester is 24.		*Total credits for this semester is 22.5.					

# Table 2 Guidance Teaching Plan for Seed Science and Engineering

* 2 credits for Elective General Courses.	* 2 credits for Elective General Courses.
*2 credits for Research Training.	2 credits for Research Training.
	2 credits (compulsory) for Comprehensive Practices in summer vocation.
	* 4 credits courses are suggested from elective courses.