

# **Tsinghua-Berkeley Shenzhen Institute (TBSI)**

## **PhD Program Design**

(Approved in July, 2020, Applicable to Class 2020)

### **1. SCOPE**

This Ph.D. program is applicable for all doctoral students (including the international and those from Hong Kong, Macau and Taiwan) enrolled in Tsinghua-Berkeley Shenzhen Institute (TBSI) in any of the following disciplines: Environment Science and New Energy Technology, Data Science and Information Technology, Precision Medicine and Healthcare.

- 1) Environmental Science and New Energy Technology (code: 99J200);
- 2) Data Science and Information Technology (code: 99J300);
- 3) Precision Medicine and Healthcare (code: 99J400)

### **2. OBJECTIVE**

Cultivate doctoral students to be **academic leaders** and **future industrial scientists** capable of solving regional and global challenging issues.

### **3. NORMATIVE TIME**

The normative time should meet the requirements of *Tsinghua University Graduate Student Status Management Regulations*.

### **4. EDUCATION FORMAT AND DEGREE AWARDING**

This is an English program with all technical courses taught in English. Doctoral students will be advised by advisor(group) formed by professors from Tsinghua University, UC Berkeley, and TBSI full-time faculty members. Dissertation should be completed in both Tsinghua University and UC Berkeley.

After the completion of the program requirements and upon the approval from the Academic Advisory Committee (AAC) and Tsinghua University, doctoral students will be awarded a doctoral degree and a diploma from Tsinghua University and a study certificate from UC Berkeley.

### **5. CURRICULUM DESIGN AND CREDIT REQUIREMENTS**

At the beginning of the first semester of residency, students must select, in consultation with advisor(group), one educational concentration within the students' discipline as the major

educational focus before submitting the plan of study. This selected concentration will determine the major and cross courses taken by the students.

Each concentration is a combination of an interdisciplinary discipline and a research track. There are 3 interdisciplinary disciplines representing the 3 centers. Each discipline has 3 concentrations, which are based on the following 3 tracks of research foundation:

- 1) Track 1: Physical Science and Technology
- 2) Track 2: Data Science and Technology
- 3) Track 3: Biomedical Science and Technology

These 3 tracks when intersected with the three disciplines result in 9 educational concentrations. D1T1 is the physical science and technology concentration under the interdisciplinary discipline of Environmental Science and New Energy Technology. D1T2 is the data science and technology concentration under the interdisciplinary discipline of Environmental Science and New Energy Technology. D1T3 is the biomedical science and technology concentration under the interdisciplinary discipline of Environmental Science and New Energy Technology. D2T1 is the physical science and technology concentration under the interdisciplinary discipline of Data Science and Information Technology. D2T2 is the data science and technology concentration under the interdisciplinary discipline of Data Science and Information Technology. D2T3 is the biomedical science and technology concentration under the interdisciplinary discipline of Data Science and Information Technology. D3T1 is the physical science and technology concentration under the interdisciplinary discipline of Precision Medicine and Healthcare. D3T2 is the data science and technology concentration under the interdisciplinary discipline of Precision Medicine and Healthcare. D3T3 is the biomedical science and technology concentration under the interdisciplinary discipline of Precision Medicine and Healthcare. These 9 concentrations are shown in the table below.

Discipline Track	Discipline 1 Environmental Science and New Energy Technology	Discipline 2 Data Science and Information Technology	Discipline 3 Precision Medicine and Healthcare
• Physical Science and Technology	• <b>D1T1</b> : Physical Science and Technology Intersected with Environmental Science and New Energy Technology	• <b>D2T1</b> : Physical Science and Technology Intersected with Data Science and Information Technology	• <b>D3T1</b> : Physical Science and Technology Intersected with Precision Medicine and Healthcare

• Data Science and Technology	• <b>D1T2:</b> Data Science and Technology Intersected with Environmental Science and New Energy Technology	• <b>D2T2:</b> Data Science and Technology Intersected with Data Science and Information Technology	• <b>D3T2:</b> Data Science and Technology Intersected with Precision Medicine and Healthcare
• Biomedical Science and Technology	• <b>D1T3:</b> Biomedical Science and Technology Intersected with Environmental Science and New Energy Technology	• <b>D2T3:</b> Biomedical Science and Technology Intersected with Data Science and Information Technology	• <b>D3T3:</b> Biomedical Science and Technology Intersected with Precision Medicine and Healthcare

Each concentration requires two types of course credits: major course units and cross course units.

Full-time students with an M.S. degree enrolled in the TBSI Ph.D. Program are required to take a minimum of 19 units of coursework, including a minimum of 6 units of common mandatory courses, 4 units of mandatory sessions, and a minimum of 9 units of technical courses from selected educational concentration. These 9 technical units include at least 6 major units and 3 cross units. International students are required to take a two-unit Chinese course in addition to the 19 units of coursework.

Full-time students without an M.S. degree enrolled in the TBSI Ph.D. Program are required to take a minimum of 29 units of coursework, including a minimum of 7 units of common mandatory courses, 4 units of mandatory sessions, and a minimum of 18 units of technical courses from selected educational concentration. These 18 technical units include at least 12 major units and 6 cross units. International students are required to take a two-unit Chinese course in addition to the 29 units of coursework.

Ph.D. students who were a Tsinghua postgraduate student immediately prior to enrolling in TBSI's Ph.D. program follow the same credit requirements as the Ph.D. students without a Master's degree. In addition, all Ph.D.-level courses previously taken at TBSI may be transferred to the Ph.D. program. For non-TBSI Tsinghua courses taken during the postgraduate period immediately prior to enrolling in TBSI's Ph.D. program, they may be transferred to the Ph.D. program provided that 1) advisor(group) agree, 2) instructors of matching TBSI courses approve, 3) no more than 4 technical courses can be transferred, and 4) up to 9 credit units can be used (at most 6 major units and at most 3 cross units).

## **6. SCHEDULE**

### 1) Plan of Study

Within the first three weeks, all Ph.D. students need to complete the plan of study for the curriculum advised and approved by the advisor(group). The plan of study will be checked by the head of Student Education Office (SEO) before it can be filed in SEO. During the registration of each semester, students can modify their plan of study after pre-approval from advisor(group) and the head of SEO and must submit the revised plan of study to SEO for final approval.

## 2) Preliminary Requirement (Prelim)

All Ph.D. students are expected to take and pass TBSI preliminary examination within 2 years after admission. The exam committee consists of TBSI core-PIs who will evaluate students' level of mastery of professional knowledge required for academic research in specific areas. The Preliminary Examination includes 2 independent tests: major and minor tests. Students must pass the Preliminary Examination (both major and minor tests) before taking the Qualifying Examination and applying for study at UC Berkeley. Failure to pass the Prelim before the end of second year or a second failure of either the major or minor test will result in the student being ineligible to complete the program. Ph.D. students without an M.S. degree and Ph.D. students who were a Tsinghua postgraduate student immediately prior to enrolling in TBSI's Ph.D. program could apply to transfer to Master program or dropout; Ph.D. students with an M.S. degree are suggested to apply to dropout; Otherwise, a withdrawal process would be started by the Institute. Special cases would be discussed by Committee of Student Education. Please refer to the *Preliminary Examination (Prelim) Rules and Instructions at TBSI* for details.

## 3) Qualifying Examination (Quals) and Progress

The Qualifying Examination is an important checkpoint meant to show that students are on a promising research progress toward the Ph.D. degree. The Qualifying Examination includes a written report and a presentation of dissertation proposal and ongoing work. The Quals Exam Committee of a Ph.D. student includes four TBSI faculty members designated by the student's advisor(group). This committee shall not only evaluate the student's dissertation proposal but also his/her dissertation progress.

Ph.D. students should pass the Quals before the end of their fourth year of program study. Passing the Quals one year or more in advance is recommended. Quals shall be re-taken for major changes in the dissertation topic. After passing the Quals, a student must spend at least one semester of residency at TBSI before defending his/her dissertation. Failure to pass the Quals on time or a second failure will result in the student being ineligible to complete the program. Ph.D. students without an M.S. degree and Ph.D. students who were a Tsinghua postgraduate student immediately prior to enrolling in TBSI's Ph.D. program could apply to transfer to Master program or dropout; Ph.D. students with an M.S. degree are suggested to apply to dropout; Otherwise, a withdrawal process would be started by the Institute. Special cases would be discussed by Committee of Student Education. Please refer to the *Qualifying Examination (Quals) Rules and Instructions at TBSI* for details.

#### 4) Annual Research Progress Report

After completing their Prelim or after their second year of residency (whichever comes first), students are required to submit annually a research progress report, and then reviewed by advisor(group). After being reviewed by advisor (group), students are required to improve their work as suggested if their research progress is deemed as unsatisfactory. For 2<sup>nd</sup> unsatisfactory of the annual progress, a student will receive further suggestions of diversion. Special cases would be discussed by Committee of Student Education.

#### 5) Dissertation and Final Defense

- Students shall spend a minimum of two years of actual research on their doctoral dissertation. Doctoral dissertation shall be written in English.
- Dissertation related academic innovation achievements during their studies at TBSI should meet the requirements of *Innovation Achievement Requirements for Graduate Degree Applications at Tsinghua-Berkeley Shenzhen Institute (TBSI)* and the requirements set by the advisor (group) according to the characteristics of the relevant research field.
- Dissertation review and defense: The dissertation should be reviewed and approved for public review by the review group firstly and then peer-reviewed by five experts. Prior to applying for defense, a Ph.D. candidate must receive all reviews; In addition to dissertation review, a doctoral candidate needs to apply, schedule, and give a final defense to his/her dissertation. A defense committee must be nominated by the advisor(group) and approved by the AAC. Please refer to *Procedures and Requirements of Ph.D. Dissertation and Defense at TBSI* for other detailed requirements.
- After passing the final defense, a doctoral candidate can submit his/her Ph.D. degree application to the Academic Degree Committee of Tsinghua University.

### **APPENDICES**

#### **Appendix I: Ph.D. Coursework**

Full-time students with an M.S. degree enrolled in the TBSI Ph.D. Program are required to take a minimum of 19 units of coursework, including a minimum of 6 units of common mandatory courses, 4 units of mandatory sessions, and a minimum of 9 units of technical courses from selected educational concentration. These 9 technical units include at least 6 major units and 3 cross units. International students are required to take a two-unit Chinese course in addition to the 19 units of coursework.

Full-time students without an M.S. degree enrolled in the TBSI Ph.D. Program are required to take a minimum of 29 units of coursework, including a minimum of 7 units of common mandatory courses, 4 units of mandatory sessions, and a minimum of 18 units of technical

courses from selected educational concentration. These 18 technical units include at least 12 major units and 6 cross units. International students are required to take a two-unit Chinese course in addition to the 29 units of coursework.

Ph.D. students who were a Tsinghua postgraduate student immediately prior to enrolling in TBSI's Ph.D. program follow the same credit requirements as the Ph.D. students without a Master's degree. In addition, all Ph.D.-level courses previously taken at TBSI may be transferred to the Ph.D. program. For non-TBSI Tsinghua courses taken during the postgraduate period immediately prior to enrolling in TBSI's Ph.D. program, they may be transferred to the Ph.D. program provided that 1) advisor(group) agree, 2) instructors of matching TBSI courses approve, 3) no more than 4 technical courses can be transferred, and 4) up to 9 credit units can be used (at most 6 major units and at most 3 minor units).

### 1) Common Mandatory Courses

#### ■ Political Theory Courses<sup>(a)</sup>

##### **For students with an M.S. degree [2 units]:**

- Contemporary Philosophy in China (90680032)\_\_\_\_\_ [2 units]

##### **For students without an M.S. degree [3 units]:**

- Contemporary Philosophy in China (90680032)\_\_\_\_\_ [2 units]
- Introduction to Dialectics of Nature (60680021)\_\_\_\_\_ [1 unit]

#### ■ Professional Development [1 unit]

- Professional Development and Presentation (66000022)\_\_\_\_\_ [2 units]
- Creative Innovation, Entrepreneurship and Venture Capital (66000011)\_\_\_\_\_ [1 unit]

#### ■ English Language [2 units]

- English Academic Writing and Communication (76000102)\_\_\_\_\_ [2 units]

#### ■ Capstone Project<sup>(b)</sup> [1 unit]

- Capstone Project (76000041)\_\_\_\_\_ [1 unit]

#### ■ Chinese Language [2 units] Only for International Students

International students must meet the Chinese Language requirement by providing proofs of Chinese language proficiency or taking Chinese Course, depending on the students' Chinese language level.

## 2) Mandatory Sessions [4 units]

Preliminary Examination (99990061)\_\_\_\_\_ [1 unit]

Qualifying Examination (99990041)\_\_\_\_\_ [1 unit]

Academic Activity<sup>(c)</sup>(99990032)\_\_\_\_\_ [2 units]

## 3) Technical Courses from Selected Educational Concentration

### For students with an M.S. degree [minimum of 9 units]

■ Major “M” courses under the selected concentration\_\_\_\_\_ [6 units]

■ Cross “C” courses under the selected concentration\_\_\_\_\_ [3 units]

### For students without an M.S. degree [minimum of 18 units]

■ Major “M” courses under the selected concentration\_\_\_\_\_ [12 units]

■ Cross “C” courses under the selected concentration\_\_\_\_\_ [6 units]

Note:

All doctoral students must finish one 1-unit 100-level course from selected concentration (track). This one unit can be used as either a major or cross unit, but not both.

Upon the approval of advisor(group) and CSE, a student can replace at most 3 major units by cross units, or replace at most 3 cross units by major units. In addition, students should take at least one cross course.

In addition to the courses listed in the following table, upon the approval of advisor(group), other technical courses within TBSI and no more than 3 units of English instructed courses from other non-TBSI programs at Tsinghua Shenzhen International Graduate School (Tsinghua SIGS) may also meet certain unit requirements. These courses could be recognized as degree courses only if registered under the Optional Courses (Course No. 00000003) with application materials submitted.

## 4) Complementary Courses

Doctoral students without prerequisite background knowledge or undergraduate course(s) will be required by advisor(group) to take complementary course(s) which cannot be counted as the technical course units for fulfilling the Ph.D. coursework requirement.

- (a) Note: Students from Hong Kong, Macau, and Taiwan can choose the listed political theory courses; or they can take courses listed under “General Introduction of China” (Course No. 00000007, 2-3 units) to replace the political theory courses, and after taking these courses, technical courses can be taken to make up the remaining units.

International students can choose courses listed under “General Introduction of China” (Course No. 00000007, 2 to 3 units) to replace the political theory courses. After taking these courses, technical courses can be taken to make up the remaining units.

Detailed requirements and list of “General Introduction of China” courses can be found in the document “Overview of the Courses Exempted for Students from Hong Kong, Macau, and Taiwan, and International Students (Postgraduate) of Tsinghua University”.

- (b) Note: Students are encouraged to form interdisciplinary teams to study and try to solve interdisciplinary open problems or industry-involved projects.
- (c) Note: TBSI encourages Ph.D. students to attend academic activities. The academic activity requirement includes three categories. The first category consists of important and mandatory activities, which are organized by TBSI; and all students must participate. The second category is academic integrity and ethics. All students must fulfill the academic integrity and ethics requirement by taking either two seminars on academic integrity and/or work ethics hosted at TBSI or a course on academic integrity and/or ethics at TBSI or Tsinghua SIGS or Graduate School at Shenzhen, Tsinghua University. The third category is a series of research seminars. Students must attend at least 8 seminars per semester. Students should write a brief summary with no less than 300 words for each seminar attended. A final report containing all summaries and proofs of attendance must be submitted to SEO at the end of each semester. This Academic Activity course is held every semester and will be graded as Pass or Fail. Students could earn at most 1 unit per year. 2 units are required for the Ph.D. degree program.



## Appendix II. Course List for Nine Educational Concentrations

The following table lists all TBSI technical courses. Whether a course is major or cross depends on a student's selected concentration. The 9 concentrations are Columns 5 to 13 of the following table. Each student should follow the column corresponding to his/her selected concentration when deciding the major and cross courses to meet the minimum major and cross unit requirements. For example, a student of D1T3 (Discipline 1 and Track 3) should follow the 7th column in the table. In addition to the courses listed in the following table, upon the approval of advisor(group), other technical courses within TBSI and no more than 3 units of English instructed courses from other non-TBSI programs at Tsinghua Shenzhen International Graduate School (TSIGS) may also meet certain unit requirements

Courses are grouped based on track. Notation: "M" means major course and "C" cross course.

No.	课程名称 Course Title	课号 Course No	学分 Credit	专业一：环境科学与新能源技术 D1: Environmental science and new energy technology			专业二：数据科学和信息技术 D2: Data Science and Information Technology			专业三：精准医学与公共健康 D3: Precision medicine and healthcare		
				D1T1	D1T2	D1T3	D2T1	D2T2	D2T3	D3T1	D3T2	D3T3
	<b>方向 (Track) 1:</b>											
1	Introduction of physics chemistry disciplines 物理化学学科介绍	86000681	1	M	C	C	M	C	C	M	C	C
2	Nano-energy Materials 纳米能源材料	86000012	2	M	C	C	M	C	C	M	C	C
3	Dynamics of Environmental Systems: Principles of Mass Transformation and Energy Flow 环境系统与过程原理	86000032	2	M	C	C	C	C	C	C	C	C
4	Sustainable Development: Ethics, Physics and Technology 可持续发展：伦理，机理和应用技术	86000241	1	M	M	M	M	C	C	M	C	C

5	Chaos and Complexity – System Dynamics Approach 混沌和复杂性--系统动力学方法	86000651	1	M	M	M	M	M	C	M	M	C
6	Computational Materials and Materials Genome Initiative 计算材料学与材料基因组工程	86000373	3	M	C	C	M	C	C	M	C	C
7	Materials Physics 材料物理	86000433	3	M	C	C	M	C	C	M	C	C
8	Materials Chemistry 材料化学	86000383	3	M	C	C	M	C	C	M	C	C
9	Principle of Environmental Behavior 环境行为学原理	86000312	2	M	C	C	C	C	C	C	C	C
10	Advanced Materials Characterization: Principles and New Developments 先进材料表征：原理和最新进展	86000423	3	M	C	C	M	C	C	M	C	C
11	MEMS and Its Application MEMS 及其应用	86000103	3	M	M	M	M	M	M	M	C	C
12	Materials Science and Engineering 材料科学与工程	86000663	3	M	C	C	M	C	C	M	C	C
13	Micro Sensors 微传感器	86000122	2	M	M	M	M	M	M	M	C	C
14	Introduction of Photonics 光电子概论	86000523	3	M	C	C	M	C	C	M	C	C
15	Nanomaterials and Nanotechnology 纳米材料与技术	86000533	3	M	C	C	M	C	C	M	C	C
16	Optical Fiber Communications 光纤通信	86000573	3	M	C	C	M	C	C	M	C	C
17	Nanoscale Fabrication and Optoelectronic Devices 纳米加工和光电子器件导论	86000322	2	M	C	C	M	C	C	M	C	C
18	Special Issues In Semiconductor Opto-Electronic Device Manufacture 半导体光电器件制造中的特殊问题	86000822	2	C	M	C	C	M	C	C	M	C
19	Semiconductor Physics and Devices 半导体物理与器件	86000733	3	M	C	C	M	C	C	M	C	C
20	Sustainable Nanotechnology: Environmental Applications and Implications 可持续纳米技术：环境应用及其影响	86000783	3	M	C	C	M	C	C	M	C	C

21	Introduction to Statistical Mechanics and Molecular Simulation 统计力学与分子模拟简介	86000843	3	M	C	C	M	C	C	M	C	C
22	Partial Differential Equations for Practical Applications in Engineering 数理方程在工程科学中的实践应用	86000773	3	M	C	C	M	C	C	M	C	C
23	Opto-electronic Materials & Devices 光电子材料与器件	86000862	2	M	C	C	M	C	C	M	C	C
24	Environmental Monitoring and Analysis 环境污染物监测与分析	86000873	3	M	C	C	M	C	C	M	C	C
25	Nanoscale energy transfe 微纳尺度能量输运	86000893	3	M	C	C	M	C	C	M	C	C
26	Introduction to Quantum Chemistry: Theory and Application 量子化学简介：理论与应用	86000883	3	M	C	C	M	C	C	C	C	C
27	Thermal Physics and Engineering 热物理学与工程	86000023	3	M	C	C	M	C	C	M	C	C
28	Organic Electronics: Materials and Emerging Technologies 有机电子：材料与新兴技术	86000943	3	M	C	M	M	C	C	M	C	C
29	Materials and Devices for Energy Storage and Conversion 能源储存与转化：材料与器件	86000413	3	M	C	C	M	C	C	M	C	C
30	Techniques in Computational Materials Science 材料学计算技术入门	86000953	3	M	C	C	M	C	C	M	C	C
31	Lectures on frontier research about low-dimensional materials 低维材料前沿研究讲座	86000963	3	M	C	C	M	C	C	M	C	C
32	Principles and Applications of Electrochemistry 电化学原理及应用	86000973	3	M	M	M	M	C	C	M	C	C
	<b>方向 (Track) 2:</b>			<b>D1T1</b>	<b>D1T2</b>	<b>D1T3</b>	<b>D2T1</b>	<b>D2T2</b>	<b>D2T3</b>	<b>D3T1</b>	<b>D3T2</b>	<b>D3T3</b>
33	Energy-Environment and Data-Information 100 level course 能源环境与数据信息概论	86000691	1	C	M	C	C	M	C	C	M	C

34	Fundamentals of Applied Information Theory 应用信息论基础	86000132	2	C	M	C	M	M	M	C	M	C
35	Introduction of Smart Grid 智能电网导论	86000042	2	M	M	M	M	M	M	C	M	C
36	Supply Chain Design and Management 供应链设计与管理	86000054	4	C	M	C	M	M	M	C	C	C
37	Computational Photography 计算摄像学	86000603	3	C	C	C	M	M	M	C	C	C
38	Introduction to Probability Theory 概率论	76000073	3	C	M	C	M	M	M	C	M	C
39	Optimization Methods for Power Systems 电力系统优化方法论	86000451	1	C	M	M	C	M	C	C	C	C
40	Markov Chains: Theory and Applications 马尔科夫链：理论与应用	86000471	1	C	M	C	C	M	C	C	M	C
41	Discrete-Event Simulation 离散事件系统仿真	86000493	3	C	M	C	M	M	M	C	M	C
42	Inference and Information 信息推论	86000513	3	C	M	C	C	M	C	C	C	C
43	Learning from Data 数据学习	86000503	3	M	M	M	M	M	M	M	M	M
44	Distributed Control and Optimization of Power Systems 电力系统分布式控制与优化	86000583	3	C	M	C	M	M	M	M	M	C
45	Mathematical Statistics and Application in R 数理统计与 R 语言应用	86000563	3	M	M	M	M	M	M	C	M	C
46	Introduction to Queuing Theory and its Applications 排队论及其应用	86000593	3	C	M	C	M	M	M	C	C	C
47	Seminar in Data Science and Information Technology 数据科学与信息技术讨论课	86000362	2	C	M	C	M	M	M	C	M	C
48	Fundamentals of Digital Image and Video Processing 数字图像与视频处理	86000633	3	C	M	C	M	M	M	C	M	C
49	Operations Research 运筹学	76000093	3	C	M	C	M	M	M	C	C	C
50	Estimation and Control of Dynamical Systems 动力系统的评估与控制	86000643	3	C	M	C	C	M	C	C	M	C
51	Advanced Managerial Economics 高级管理	86000072	2	C	M	C	C	M	C	C	M	C

	经济学											
52	Foundations for Big Data Analytics 大数据分析基础	86000152	2	C	M	C	M	M	M	C	M	C
53	ITS and High-accuracy Positioning Technologies 智能交通高精度定位	86000062	2	C	M	C	C	M	C	C	M	C
54	Mobile and Pervasive Computing 移动设备和普适计算	86000111	1	C	M	C	C	M	C	C	M	C
55	Analysis and Optimization on Logistics System 物流系统分析及优化	86000292	2	C	M	C	C	M	C	C	M	C
56	Introduction to Advanced ITS 现代智能交通系统导论	86000442	2	C	M	C	C	M	C	C	M	C
57	Traffic Modeling and Simulation 交通建模与仿真	86000402	2	C	M	C	C	M	C	C	M	C
58	Resilience-based Engineering of Smart Infrastructure Systems 基于弹性工程学的智慧建筑系统	86000711	1	C	M	C	M	M	M	C	M	C
59	Introduction to Nonlinear Optimization 非线性优化概述	86000461	1	C	M	C	M	M	M	C	M	C
60	Introduction to Quantitative Investment 量化投资概论	76000082	2	C	M	C	C	M	C	C	M	C
61	Optimization Theory and Machine Learning 优化理论和机器学习	86000611	1	C	M	C	M	M	M	C	M	C
62	Compressive Sensing with Sparse Models:Theory, Algorithms, and Applications 压缩感知与稀疏模型：理论、算法与应用	86000621	1	C	M	C	M	M	M	C	M	C
63	Power Systems and Market Operations 电力系统与市场运行	86000763	3	C	M	C	C	C	C	C	C	C
64	Computational Methods for Electric Power Systems 电力系统计算方法	86000722	2	C	C	C	C	M	C	C	C	C
65	System Miscellanies 系统杂论	86000742	2	C	C	C	C	M	C	C	C	C

66	Quantitative Method for Business and Policy Analysis 商业和政策分析的定量方法	86000753	3	C	M	C	C	M	C	C	M	C
67	Large Network Steady-State Analysis 大型网络稳态分析方法	86000803	3	C	M	C	C	C	C	C	C	C
68	Information Theory and Statistical Learning 信息论与统计学习	86000793	3	C	M	C	C	M	C	C	M	C
69	Reinforcement Learning for Energy Systems 能源系统的强化学习	86000811	1	C	M	C	C	M	C	C	M	C
70	Machine learning, with application to medical and financial data 机器学习及其在医疗和金融数据上的应用	86000851	1	C	C	C	C	M	C	C	C	C
71	Bayesian Learning and Data Analysis 贝叶斯学习与数据分析	86000912	2	C	C	C	M	M	M	C	C	C
72	Random Processes 随机过程	76000113	3	C	M	C	M	M	M	C	M	C
73	Advanced Signal Processing: Methods and Practice 高级信号处理：方法与实践	86000923	3	C	M	C	M	M	M	C	M	C
74	Nanogenerators and Self-powered Systems 纳米发电机与自驱动系统	86000993	3	M	M	M	M	M	M	M	C	C
75	Time series analysis 时间序列分析	86000933	3	C	M	C	M	M	M	C	M	C
	<b>方向 (Track) 3:</b>			<b>D1T1</b>	<b>D1T2</b>	<b>D1T3</b>	<b>D2T1</b>	<b>D2T2</b>	<b>D2T3</b>	<b>D3T1</b>	<b>D3T2</b>	<b>D3T3</b>
76	Design of Precision Medicine Platforms for Disease Diagnosis and Therapeutics 精准医疗平台的设计及其疾病诊断和治疗应用	86000701	1	C	C	M	C	C	M	M	M	M
77	Translational Research(C)转化研究 (C)	86000221	1	C	C	M	C	C	M	C	C	M
78	Introduction to Mechanobiology 机械生物学介绍	86000542	2	C	C	M	C	C	C	M	M	M
79	Technology Advances for Regenerative Medicine 再生医学技术进展	86000553	3	C	C	M	C	C	C	M	M	M

80	Biophotonics for Engineers 生物光子学方法与 与实践	86000333	3	M	C	M	M	C	C	M	M	M
81	Introduction to Computer-Aided Tissue Engineering 计算机辅助组织工程	86000202	2	C	C	M	C	C	M	M	M	M
82	Translational Research (B)转化研究 (B)	86000211	1	C	C	M	C	C	M	M	M	M
83	Introduction to Advanced Medical Device Design and Fabrication 高端医疗器械设计 及制造概论	86000341	1	C	C	M	C	C	M	M	M	M
84	Tissue Engineering 组织工程	86000231	1	C	C	M	C	C	M	M	M	M
85	Soft Material Module 1: Biological Soft Materials 软质材料模块 1: 生物软质材料	86000261	1	C	C	M	C	C	M	M	M	M
86	Soft Material Module 2: Synthetic and Hybrid Soft Materials 软质材料模块 2: 合 成、混合软材料	86000271	1	C	C	M	C	C	M	M	M	M
87	Soft Material Module 3: Fabrication of Biomaterials 软质材料模块 3: 生物材料制 造工程	86000281	1	C	C	M	C	C	M	M	M	M
88	Vision and Imaging Science 视觉及影像科 学	86000351	1	C	C	M	C	C	M	M	M	M
89	Current Topics in Cancer Biology 癌症生物 学的研究现状	86000673	3	C	C	M	C	C	M	M	M	M
90	fMRI physics and practical data analysis 磁 共振成像物理原理与数据分析	86000833	3	C	C	M	C	C	M	M	M	M
91	Experimental biology 实验生物学	86000903	3	C	C	M	C	C	M	C	C	M
92	The molecular basis of cancer 癌症的分子学 基础	76000123	3	C	C	M	C	C	M	M	M	M
93	The Immunology of Emerging Infectious Diseases 新兴传染病的免疫学	86000983	3	C	C	M	C	C	M	C	C	M
94	Introduction to traditional chinese medicine 中 药基础理论	66000032	2	C	C	C	C	C	C	C	C	C