广东以色列理工学院化学专业人才培养方案

（专业代码：070301H）

一、培养目标

化学是研究物质及其性质、结构和化学反应的科学。物质转化所遵循的基本定律是化学的主要组成部分。本专业旨在让学生牢固掌握有关化学所有分支领域的基础知识，夯实物理、数学和生物等辅助领域的坚实基础。专业课包括有机化学、无机化学、分析化学和物理化学等理论和实践训练课程。

完成化学专业学习的学生将获授化学学士学位，他们将通过专业教学了解物质的结构、组成、性质及其变化的基本知识。毕业生的就业领域包括学术研究机构、教育机构(中小学、技术院校、大学、研究所)、医疗机构(医院、制药企业)、中央工厂实验室和控制站、化工企业(塑料、合成纤维和织物、化肥的生产等)，以及食品、石油、聚合物、香料等行业。除此之外，本专业人才还可以进入环境保护机构和众多需要化学专业知识进行产品开发的初创公司。毕业生也可以选择继续深造，以期成为化学领域的科学家。

二、基本要求

1.思想政治和德育方面

按照教育部统一要求执行，所有学生均须修满规定的思想政治理论课程学分，并达到考核合格标准。

2.业务方面

（1）掌握化学基础知识、基本理论与实验基本技能。

（2）掌握本专业所需的数学、物理学和生物学等相关学科的基本内容。

（3）初步掌握化学研究或化学品设计、开发、检验、生产等的基本方法和手段，具备发现、提出、分析和解决化学及相关学科问题的初步能力。

（4）掌握必要的计算机信息技术，能够获取、处理和运用化学及相关学科信息.

（5）培养系统、连贯的学科思维，能够在化学各主干学科，乃至相关交叉学科间初步形成较为开阔的学科视野。

（6）具有开阔的国际视野和跨文化交流、竞争与合作能力。

（7）通过全英授课模式与教材，培养学生英语思维与逻辑能力，使学生具备在国际性大学就读所需的同等语言水平。

3.体育方面

遵循国家教育部和以色列理工学院规定设置的体育课要求，在四年的修学年限中，学生必须完成 2 个学分的体育课程。

掌握体育运动的一般知识和基本方法，形成良好的体育锻炼和卫生习惯，达到国家规定标准，且按照要求参加每年度的大学生体质健康水平测试。

4.培养规格

（1）修业年限：四年学制

（2）授予学位：广东以色列理工学院化学学士学位与以色列理工学院 Chemistry 学士学位

（3）专业总学分：144.5 分（另需完成教育部规定的思想政治理论课）

三、主要学习领域

广东以色列理工学院化学本科专业学习年限为四年，旨在让学生牢固掌握有关化学所有分支领域的基础知识，夯实物理、数学和生物等辅助领域的坚实基础。前两个学期的课程为数学、物理、计算机科学以及化学基础，为学生后续的专业学习奠定基础。随后专业教学将持续拓宽化学学科不同分支的知识——物理化学和理论化学、有机化学、无机化学和分析化学等。在最后两个学期，学生将有机会深入研究学习自己感兴趣的专业方向。他们可以选择专业教师开设的各类选修课，也可以选修其他专业经审核同意的课程。同时，专业课程设置还包括基础和高级实验课，以及各类本科生可以参与的科研项目等。

在专业学习的后续阶段，学校将提供各种跨学科专业学习机会，即将化学课程与其他学科专业课程相结合。学生也将有机会攻读以色列理工学院的双学位，获得化学专业和另一专业的联合学位，如化学工程、材料科学与工程或生物技术，或者化学与物理学的联合学位等。

四、主要实践性教学环节与主要专业实验

化学专业配备教学实验室，其中包括基础化学实验室、有机化学实验室、物理化学实验室、分析化学实验室、无机化学实验室等。这些实验室也对其他专业需要学习化学实验课程的学生全面开放。

学生将通过参与科研项目、实习等方式进行必要的实践能力训练。

五、毕业要求

本专业学生在规定年限内完成教学计划要求，取得不少于规定的 144.5 学分，并且每门课程达到 55 分以上，GPA 达 65 分以上，满足国家教育部规定的思想政治理论课的学分要求，可经审核准予毕业。

六、基本信息资源

以手册、网站等形式，提供本专业的培养方案，各课程的教学大纲、教学要求、考核要求、毕业审核标准等基本教学信息。

七、教材及参考书

选用反映国际水平的外文版教材，有利于稳妥地开展双语或全英文教学。

化学专业课程目录[1]

专业必修课	106.5 分
专业选修课	30 分
通识选修课	8 分
总分	**144.5 分**

课程代码	课程名称 （专业核心课程）	学分
第一学期		
01040003	微积分 1M	5
01040019	线性代数 M	4.5
01140051/01140077	物理学 1 / 物理学 1L	2.5
01340058	生物学 1	3
01240117	化学原理 A	3
03940800	体育	1
	总学分	**19**
第二学期		
01040004	微积分 2	5
01040131	常微分方程/H	2.5
01140052	物理学 2	3.5
01240118	化学原理 B	3
02340128	科学计算导论（Python）	4
01240220	分析化学 1	3
	总学分	**21**
第三学期		
01240408	量子化学导论及应用	3.5
01240415	物理化学 - 化学热力学	4
01240708	有机化学 1	5
01240305	无机化学	2.5
01240212/01250102	分析化学实验 1	2
01240611	化学物理实验导论	1.5
03240033	专业英语 B	3
03940800	体育	1
	总学分	**22.5**
第四学期		
01240213	分析化学 2	1.5
01240417	物理化学-分子光谱学	3.5
01240413	统计热力学	2.5

1.开设课程与学期根据以色列理工学院教学计划与实际教学安排可能进行动态调整。

01240414	物理化学-化学反应动力学	2.5
01240610	物理化学实验 1	3
01240711	有机化学 2	4
01240911	有机化学实验 1	3
	总学分	**20**
第五学期		
01240214	分析化学实验 2	2
01240210	生物无机化学	2.5
01240416	电磁学与物质	2.5
01240703	结构与活性有机化学	2.5
01340019	生物化学与酶化学导论	2.5
以下实验课选一：		
01240912	有机化学实验 2	3
01240605	物理化学实验 2	2.5
	总学分	**14.5/15**
第六学期		
第六学期需修满 19.5 个学分的选修课程。 **其中必须包含以下五门高等课程中的一门：**		
01260600	高等物理化学实验	3
01260901	高等有机化学实验	3
01260902	高等物理有机化学实验	3
01260302	高等环境监测实验	2
01260303	高等无机化学实验	3
专业选修课必须包括以下课程中的两门：		
01260200	高等无机化学	3
01260601	高等理论物理化学	3
01260602	高等实验物理化学	3
01260700	高等有机化学	3
01270427	固体化学	3.5
01270206	高等分析化学	2
	总学分	**19.5**
第七学期		
第七学期需修满 10.5 个学分的选修课程。 **其中应包括以下五门高等课程中的一门（之前未修读过）：**		
01260600	高等物理化学实验	3
01260901	高等有机化学实验	3
01260902	高等物理有机化学实验	3
01260302	高等环境监测实验	2
01260303	高等无机化学实验	3
以下两门化学实验课程之一（之前未修读过）：		

01240605	物理化学实验 2	2.5
01240912	有机化学实验 2	3
从以下课程中选修 4.5 个学分：		
01270724	高分子化学	2
00540135	化学工程导论	3.5
01270206	激光分析化学	2
01270433	表面科学实验方法	2
01270445	电化学及其应用	2.5
01260601	高等理论物理化学	3
	其他院系认可课程	
	总学分	**10.5**
第八学期		
以下两门课程为必修课：		
01240355	拓展性化学研究项目	6
01240358	专业实践	3
	总学分	**9**

具体思政课程要求如下表：

序号	课程名称	学分
1	马克思主义基本原理	3
2	毛泽东思想和中国特色社会主义理论体系概论	3
3	中国近现代史纲要	3
4	思想道德与法治	3
5	习近平新时代中国特色社会主义思想概论	3
6	形势与政策	2
7	走在前列的广东实践	1
8	大学生国家安全教育	1
	总分	**19**
9	中华民族共同体概论（选修）	2

GTIIT Cultivation Scheme of Chemistry Program

1. Talent-cultivation Goal

Chemistry is the science of substances, their properties, structure, and of chemical reactions. The fundamental laws to which these transformations are subject is also a major part of Chemistry.

Areas of employment for a chemist include academic research institutes, chemical enterprises (for the production of plastics, synthetic fibers and fabrics, fertilizers, etc.), educational institutions (schools, technical schools, institutes, universities), medical institutions (hospitals, pharmaceutical industry), central factory laboratories and control stations; food industry enterprises, pharmaceuticals, petroleum, polymer, perfumery and others industries. In addition, chemists are employed in environmental protection agencies, and in numerous start-up companies that require chemical input to the development of their product. Chemistry graduates can also continue studying to make a career in chemistry as scientists.

2. Basic Requirements for Talents Cultivation

(1) MOE Ideological and Political Theory Course Education

In accordance with the unified requirements of the Ministry of Education of China (MOE), all students are required to complete the designated credits in ideological and political theory courses and achieve a passing assessment standard.

(2) Professional

- Master the basic knowledge, theories and lab skills of chemistry.
- Master the basic content of mathematics, physics, biology and other related disciplines required by the study program.
- Master the basic methods and means of chemistry research or chemistry design, development, inspection, production, etc., and have the initial ability to discover, propose, analyze and solve problems in chemistry and related disciplines.
- Master the essential computer information technology, and have the ability to obtain, process and use the knowledge of chemistry and other related disciplines.
- Cultivate systematic and coherent disciplinary thinking, which can initially form a relatively broad disciplinary vision among the main disciplines of chemistry and even related interdisciplinary disciplines.
- Have a broad international vision and cross-cultural communication, competition and cooperation capabilities.

- Cultivate students' English thinking and logic ability through English-only teaching mode and English textbooks, so that students can have the same language proficiency required for studying in universities in English-speaking countries.

(3) Physical Education

In accordance with the MOE requirements and the Technion to set up physical education, students are required to complete 2 credits of physical education courses during the 4-year study.

Master the general knowledge and basic methods of sports, form good physical exercise and hygiene habits, meet the national standards, and participate in the MOE annual physical health test of college students as required.

(4) Cultivating specification

- Duration of study: 4 years
- Degree Awarded: Bachelor of Science in Chemistry from GTIIT and the Technion respectively
- Total credits: 144.5 credits (MOE courses not included)

3. Curriculum

GTIIT offers a four-year program in Chemistry. It is designed to provide a strong background in all branches of Chemistry, as well as a solid foundation in the complementary fields of Physics, Mathematics and Biology. The program awards the degree of Bachelor of Science (B.Sc.) in Chemistry.

The courses studied in the first two semesters provide strong foundations in mathematics, physics and computer science, as well as the basics of chemistry. The next semesters are used to broaden knowledge in the different branches of chemistry - physical and theoretical, organic, inorganic and analytical. In the last two semesters the students may deepen their studies according to their interests. They may choose their lecture curricula from a variety of electives courses given by members of the Chemistry program and may also attend approved courses at other academic programs at GTIIT. The curriculum is also composed of basic and advanced laboratory work and offers participation in short research projects.

In the second stage, GTIIT will also offers a variety of joint programs, based on curricula combining course-work in chemistry with courses in other subjects. Students will also pursue

a dual degree program, leading to a joint degree from the Chemistry program and another program, such as Chemical Engineering or Materials Science and Engineering or Biotechnology. Other possible combinations include joint programs of Chemistry and Physics.

4. Practical Teaching (Lab and Internship)

The professional teaching labs include Fundamental of Chemistry lab, Organic Chemistry lab, Physical Chemistry lab, Analytical Chemistry lab, Inorganic Chemistry lab, etc. The Chemistry teaching labs also support students from other departments/programs that their curriculum requires chemistry labs.

Students will also receive necessary practical skills training by participating in research projects, internships, etc.

5. Graduation Requirements

Students must complete the required credits stipulated by the teaching plan within the prescribed years, obtaining no less than the specified 144.5 credits. Additionally, each course must be passed with a minimum grade of 55, and the GPA above 65. Fulfilling the requirement of MOE moral and political theory courses, students may be approved for graduation upon review.

6. Basic Information Resources

The program cultivation scheme, syllabus, teaching requirements, assessment criteria, graduation evaluation standard, as well as other fundamental teaching information, are available in the form of brochures, websites, etc.

7. Textbooks and References

The selection of textbooks that reflect international standards, particularly those in foreign languages, is conducive to the stable implementation of bilingual or fully English-medium instruction.

Chemistry Program Curriculum[2]

Compulsory Courses	106.5	points
Program Elective Courses	30	points
General Elective Courses	8	points
TOTAL	**144.5**	**points**

Course Code	Course Name (Program Core Course)	Credits
Semester 1		
01040003	Differential and Integral Calculus 1	5
01040019	Linear Algebra M	4.5
01140051/01140077	Physics 1 / Physics 1L	2.5
01340058	Biology 1	3
01240117	Principles of Chemistry A	3
03940800	Physical Education Courses	1
	Total	**19**
Semester 2		
01040004	Differential and Integral Calculus 2	5
01040131	Ordinary Differential Equations/H	2.5
01140052	Physics 2	3.5
01240118	Principles of Chemistry B	3
02340128	Introduction to Computing with Python	4
01240220	Analytical Chemistry 1	3
	Total	**21**
Semester 3		
01240408	Quantum Theory and Chemical Applications	3.5
01240415	Physical Chemistry-Chemical Thermodynamics	4
01240708	Organic Chemistry 1	5
01240305	Inorganic Chemistry	2.5
01240212/01250102	Analytical Chemistry Lab 1	2
01240611	Chemical Physics Lab	1.5
03240033	Advanced Technical English	3
03940800	Physical Education Courses	1
	Total	**22.5**
Semester 4		
01240213	Analytical Chemistry 2	1.5
01240417	Physical Chemistry-Molecular Spectroscopy	3.5

2. Course offerings and scheduling may be properly adjusted in accordance with the Technion's academic plan and actual teaching arrangements.

01240413	Statistical Thermodynamics	2.5
01240414	Physical Chemistry-Chemical Kinetics	2.5
01240610	Physical Chemistry Lab 1	3
01240711	Organic Chemistry 2	4
01240911	Organic Chemistry Lab 1	3
	Total	**20**
Semester 5		
01240214	Analytical Chemistry Lab 2	2
01240210	Bio-inorganic Chemistry	2.5
01240416	Electromagnetism and Matter	2.5
01240703	Structure and Activity Organic Chemistry	2.5
01340019	Introduction to Biochemistry and Enzymology	2.5
One of the following labs:		
01240912	Organic Chemistry Lab 2	3
01240605	Physical Chemistry Lab 2	2.5
	Total	**14.5/15**
Semester 6		
19.5 credits of program elective courses in Semester 6. They must include one of the below five advanced courses:		
01260600	Advanced Physical Chemistry Lab	3
01260901	Advanced Organic Chemistry Lab	3
01260902	Advanced Physical Organic Chemistry Lab	3
01260302	Advanced Environmental Monitoring Lab	2
01260303	Advanced Inorganic Chemistry Lab	3
The program elective courses must also include two of the following courses:		
01260200	Advanced Inorganic Chemistry	3
01260601	Advanced Theoretical Physical Chemistry	3
01260602	Advanced Experimental Physical Chemistry	3
01260700	Advanced Organic Chemistry	3
01270427	Solid State-Expanded	3.5
01270206	Advanced Analytical Chemistry	2
	Total	**19.5**
Semester 7		
10.5 credits of program elective courses in Semester 7. It should include one of the below five advanced courses (not taken before)		
01260600	Advanced Physical Chemistry Lab	3
01260901	Advanced Organic Chemistry Lab	3
01260902	Advanced Physical Organic Chemistry Lab	3
01260302	Advanced Environmental Monitoring Lab	2
01260303	Advanced Inorganic Chemistry Lab	3

One of the below two chemistry lab courses (not taken before)		
01240605	Physical Chemistry Lab 2	2.5
01240912	Organic Chemistry Lab 2	3
4.5 credits out of the below courses		
01270724	Polymer Chemistry	2
00540135	Introduction to Chemical Engineering	3.5
01270206	Analytical Chemistry Using Lasers	2
01270433	Experimental Methods in Surface Science	2
01270445	Electrochemistry and Its Applications	2.5
01260601	Advanced Theoretical Physical Chemistry	3
	Approved Courses from Other Faculties	
	Total	**10.5**
Semester 8		
Two program compulsory courses as below		
01240355	Expanded Research Project in Chemistry	6
01240358	Internship	3
	Total	**9**

The specific MOE courses are listed below:

No.	Course Name	Credit
1	Basic Principles of Marxism	3
2	Introduction to Mao Zedong Thought and the Theoretical System of Socialism with Chinese Characteristics	3
3	An Outline of Modern and Contemporary Chinese History	3
4	Ideological and Moral Cultivation and the Rule of Law	3
5	An Introduction to Xi Jinping's Thought of Socialism with Chinese Characteristics in the New Era	3
6	Situation and Policy	2
7	Guangdong's Pioneering Practices	1
8	National Security Education	1
	Total	**19**
9	Introduction to the Chinese National Community (Elective)	2