

# 广东以色列理工学院机械工程<sup>1</sup>专业人才培养方案

## (专业代码: 080201H)

### 一、概述

本专业具有学科基础扎实、应用范围广泛的特点。专业特色在于立足富有深度与广度的课程体系,融合高水平的机械工程学科的专业教育。优秀本科生可参与专业教授指导的研究项目。在修业年限内学成的学生将获颁以色列理工学院学士学位证书,以及广东以色列理工学院本科毕业证书、学士学位证书。

### 二、培养目标

本专业融合了“大机械”理念,以实践教学为基石,鼓励学生跨专业跨学科学习,强调将自然科学、工程科学以及机械科学的专业系统相结合,将机械工程的知识运用到计算机化机械系统、海上与陆空运输载具、精密医疗器械、微电子芯片、自动化农业、机器人应用等多项领域。在广泛的学科交流学习中,专业期望培养出具有更高视野、更多维技能、更符合国家前沿科技需要的优秀工程师人才。

### 三、毕业学分要求

四年制本科专业的总学分为 157.5 学分,含 2 个学分的体育课。学生还需修满教育部规定的思想政治理论课程学分,并达到考核合格标准。

### 四、修业年限

四年,授予广东以色列理工学院机械工程专业工学学士学位,以色列理工学院 Mechanical Engineering 学士学位与机器人方向学习证书。

### 五、人才培养基本要求

1. 使学生接受系统的机械工程思维训练,掌握机械专业的思想方法,具有较扎实的机械工程设计原理基础和较强的设计创新能力。
2. 具备机械工程研究或运用机械工程知识解决实际问题的初步能力。
3. 了解机械工程的历史概况和广泛应用,以及当今机械工程领域的新进展。
4. 掌握资料查询、文献检索以及运用现代技术获取相关信息的基本方法。
5. 熟练使用计算机,达到良好的计算机水平,了解机械工程学科的发展现状和趋势。

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1.以色列理工学院对应专业名称为“Mechanical Engineering and Robotics, 机械工程与机器人”。

6. 采用全英授课模式，使用英文原版教材，培养学生英语思维与逻辑能力，使学生具备在英语国家大学就读所需的同等语言水平。学生应当具有一定的国际视野和跨文化交流、竞争与合作能力。

## **六、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 157.5 学分（包括专业核心课程 115 学分，专业选修课程 32.5 学分以及通识课 10 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。

## **七、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。

## **八、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。

## 机械工程专业课程目录<sup>2</sup>

专业必修课	115 分
专业选修课	32.5 分
通识选修课	10 分
<b>总分</b>	<b>157.5 分</b>

课程代码	课程名称（专业核心课程）	学分
<b>第一学期</b>		
01040041	微积分 1M	5
01040016	代数 1	5
01140051	物理学 1	2.5
02340128	科学计算导论（Python）	4
03240033	专业英语 B	3
<b>总学分</b>		<b>19.5</b>
<b>第二学期</b>		
01040043	微积分 2M	5
01040131	常微分方程/H	2.5
00340028	固体力学 1	4
01140081	物理实验 1H	1
01250001	普通化学	3
03140533	工程材料导论 1	3.5
03940800	体育	1
<b>总学分</b>		<b>20</b>
<b>第三学期</b>		
00340053	固体力学 2	5
00340061	技术制图和工程图	3.5
00340056	科学与工程计算基础	4
00340035	热力学 1	4
01040228	偏微分方程 M	3
01140052	物理学 2	3.5
00350026	机械工程创新概论（选修）	2.5
01250013	普通化学实验	0.5
<b>总学分</b>		<b>23.5</b>
<b>第四学期</b>		
00340030	制造工艺	3.5
00340010	动力学	5
00340055	流体流动学延伸	5
00340032	线性系统	4

2. 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。

03940800	体育	1
<b>总学分</b>		<b>18.5</b>
<b>第五学期</b>		
00340041	传热学	4
00340040	控制导论	3
00340054	机械设计 1 M	4
00340058	机械工程概率论与统计	3
00340051	振动机理与动力学	3
<b>总学分</b>		<b>17</b>
<b>第六学期</b>		
00340057	机械工程高级实验	4
00340371	设计制造项目	2.5
00340060	机电一体化和电动机概论	4
<b>总学分</b>		<b>10.5</b>
<b>第七学期</b>		
毕设项目：第一部分，选修以下课程之一		
00340379	毕设：工程项目 1	3
00340355	毕设：科学项目 1	3
00340353	毕设：新产品设计 1，需与以下课程同修	3
00340382	工程开发方法论 1	0.5
<b>总学分</b>		<b>9.5</b>
<b>第八学期</b>		
毕设项目：第二部分，选修以下课程之一		
00340380	毕设：工程项目 2	3
00340381	毕设：科学项目 2	3
00340354	毕设：新产品设计 2，需与以下课程同修	3
00340383	工程开发方法论 2	0.5
<b>总学分</b>		<b>9.5</b>

机械工程 专业选修课程列表		
分类：	A. 计算类课程； B. 核心科目课程； C. 应用与综合类课程； D. 通识科学课程； E. 系内通识选修课程	
课程代码	课程名称	学分
<b>A. 计算类课程</b>		
00350022	工程分析中的有限元 <sup>R*</sup>	3.0

00350013	机械工程中的计算方法	2.5
00350199	计算流体力学	3.0
00360015	机械工程中的有限元方法 1*	3.0
00350039	信号处理	3.0
* 00360015 和 00350022 中只能任选一门		
<b>B. 核心科目课程</b>		
00350188	控制论 <sup>R</sup>	3.5
00350001	机器人概论 <sup>R</sup>	2.5
00360049	神经网络控制与诊断	2.5
00350091	热力学 2	3.5
00360009	传热传质学	3.0
00350035	流体力学 2	2.5
00360005	分析动力学	3.0
00350003	计算机辅助设计系统	3.0
00340016	机械工程设计 2	3.0
00350123	制造系统概论 1	2.5
00350043	弹性理论概论	3.0
00350041	微系统力学	3.5
00350034	材料失效	2.5
00350050	光学系统设计	3.5
00350052	线性光学及应用 1	3.5
00350062	结构分析	2.5
<b>C. 应用与综合类课程</b>		
00340401	先进机器人实验 <sup>R</sup>	2.5
00350026	机械工程创新概论	2.5
00350032	基于微处理器的产品设计	3.0
00340404	先进计算机辅助设计实验	2.0
00340406	先进控制与自动化实验	2.5
00340410	先进能源实验	2.5
00340411	内燃机实验	2.5
00340413	设计与制造实验	2.0
00340420	可再生能源先进实验	2.5
00340422	光学实验	2.5
00350048	综合设计与分析	2.5
00350051	最佳化机械设计	4.0
00360063	系统实验建模	3.0
00340047	流体力学高级实验	2.0
00360027	海洋结构动力学	3.0
<b>D. 通识科学课程</b>		

00360001	分析方法 1	4.0
01040215	复函数 A	2.5
<b>E. 系内通识选修课程</b>		
00350008	工业自动化	2.5
00350036	控制系统设计 <sup>R</sup>	2.5
00350033	传感器集成系统概论 <sup>R</sup>	3.0
02360327	数字图像和信号处理 <sup>R</sup>	3.0
00350010	机构运动学 <sup>R</sup>	2.5
00360026	机器人控制运动动力学 <sup>R</sup>	2.5
00360087	混杂动力学	3.0
00340205	气动及液动元件 1	3.0
00350053	可再生和可持续能源	3.0
00360038	界面传输过程	3.0
00350146	内燃机概率论	2.5
00860284	风力涡轮机	3.0
<b>同时向本科生和研究生开放的研究生课程列表</b>		
00360009	传热传质学	3.0
00360049	神经网络控制与诊断	2.5
00360001	分析方法 1	4.0
00360038	界面传输过程	3.0
00360026	机器人控制运动动力学 <sup>R</sup>	2.5
00360087	混杂动力学	3.0

\*R 标为机器人相关课程

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
<b>总分</b>		<b>19</b>
9	中华民族共同体概论（选修）	2

## **GTIIT Cultivation Scheme of Mechanical Engineering and Robotics Program**

### **1. Program Positioning**

The study program Mechanical Engineering has the characteristics of strong foundation of the relevant disciplines and wide application range. This program has a solid disciplinary foundation and a wide range of applications. The specialty is based on a curriculum system with depth and breadth, integrating high-level professional education in mechanical engineering. Excellent undergraduates can participate in research projects guided by professional professors. Students who complete their studies within the prescribed period will be awarded a bachelor's degree from the Technion, as well as a bachelor's degree and a graduation certificate from the Guangdong Technion-Israel Institute of Technology (GTIIT).

### **2. Cultivation Goal**

This program integrates the concept of "big machinery" and takes practical teaching as the cornerstone. It encourages students to learn across majors and disciplines, emphasizes the combination of natural sciences, engineering sciences and mechanical sciences, and applies the knowledge of mechanical engineering to computerized mechanical systems, marine and land and air transportation vehicles, precision medical equipment, microelectronic chips, automated agriculture, robotic applications and other fields. In the extensive exchange of disciplines, the major hopes to cultivate outstanding engineers with higher vision, more multi-dimensional skills and more in line with the needs of the country's cutting-edge science and technology.

### **3. Total Credits for Graduation**

The total credits of the 4-year undergraduate program are 157.5, including 2 credits of physical education courses. Students are also required to complete the credits in ideological and political theory courses as stipulated by the Ministry of Education of China (MOE) and meet the passing assessment standards.

### **4. Study Years**

4 years, students will be awarded the bachelor's degree in Mechanical Engineering of GTIIT, the bachelor's degree in Mechanical Engineering and the certificate of the track of Robotics in Mechanical Engineering from the Technion.

## **5. Basic Requirements for Talents Cultivation**

- a. Students will receive systematic training in mechanical engineering thinking, master the thinking methods of mechanical engineering, and have a solid foundation in mechanical engineering design principles and strong design innovation capabilities.
- b. Students will have the preliminary ability to conduct mechanical engineering research or apply mechanical engineering knowledge to solve practical problems.
- c. Students will be familiar with the historical overview of mechanical engineering and its wide applications, as well as the latest advancements in contemporary mechanical engineering.
- d. Students will master the basic methods of information retrieval, literature search, and the use of modern technology to obtain relevant information.
- e. Students will be proficient in the use of computers, achieving a good level of computer literacy, and be aware of the current state and trends in the development of mechanical engineering.
- f. Adopt a full English teaching model, using English-language original textbooks to cultivate students' English thinking and logical abilities, ensuring they have the equivalent language level required for studying at universities in English-speaking countries. Students will have a certain international perspective and the ability to engage in cross-cultural communication, competition, and cooperation.

## **6. Graduation Requirements**

Students must complete the required credits stipulated by the teaching plan within the prescribed years, obtaining no less than the specified 157.5 credits (including 115 credits for program core courses, 32.5 credits for elective courses, and 10 credits for general education). Additionally, each course must be passed with a minimum grade of 55, and the GPA above 65. Fulfilling the requirement of MOE ideological and political theory courses, students may be approved for graduation upon review.

## **7. 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.

## **8. 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.

### Mechanical Engineering and Robotics Program Curriculum<sup>3</sup>

Compulsory Courses	115 points
Program Elective Courses	32.5 points
General Elective Courses	10 points
<b>TOTAL</b>	<b>157.5 points</b>

Course Code	Course Name (Program Core Course)	Credits
<b>Semester 1</b>		
01040041	Differential and Integral Calculus 1M	5
01040016	Algebra 1/Extended	5
01140051	Physics 1	2.5
02340128	Introduction to Computing with Python	4
03240033	Technical English - Advanced B	3
<b>Total</b>		<b>19.5</b>
<b>Semester 2</b>		
01040043	Differential and Integral Calculus 2 M	5
01040131	Ordinary Differential Equations/H	2.5
00340028	Solid Mechanics 1	4
01140081	Laboratory in Physics 1 H	1
01250001	General Chemistry	3
03140533	Introduction to Materials Engineering M1	3.5
03940800	Physical Education Courses	1
<b>Total</b>		<b>20</b>
<b>Semester 3</b>		
00340053	Solid Mechanics 2 Extended	5
00340061	Technical Drawing and Engineering Graphics	3.5
00340056	Intro to Scient and Eng. Calculations	4
00340035	Thermodynamics 1	4
01040228	Partial Differential Equations	3
01140052	Physics 2	3.5
00350026	Creative Intro. in Mech Eng. (elective)	2.5
01250013	General Chemistry Laboratory	0.5
<b>Total</b>		<b>23.5</b>
<b>Semester 4</b>		
00340030	Manufacturing Processes	3.5
00340010	Dynamics	5
00340055	Fluid flow Extended	5

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

00340032	Linear systems	4
03940800	Physical Education Courses	1
<b>Total</b>		<b>18.5</b>
<b>Semester 5</b>		
00340041	Heat Transfer	4
00340040	Introduction to Control	3
00340054	Mechanical Design 1M	4
00340058	Probability and Statistics in Mech. Eng.	3
00340051	Dynamics and Mechanics of Vibrations	3
<b>Total</b>		<b>17</b>
<b>Semester 6</b>		
00340057	Advanced Lab in Mech. Eng.	4
00340371	Project in Design for Manufacturing	2.5
00340060	Intro to Mechatronics, and Electric Motors	4
<b>Total</b>		<b>10.5</b>
<b>Semester 7</b>		
Final Project: Part 1, one of the lists		
00340379	Final Engineering Project 1	3
00340355	Final Scientific Project 1	3
00340353	Final Project New Product Design 1 *** *** should be together with the below course	3
00340382	Methodology of Eng. Development 1	0.5
<b>Total</b>		<b>9.5</b>
<b>Semester 8</b>		
Final Project: Part 2, one of the lists		
00340380	Final Engineering project 2	3
00340381	Final Scientific Project 2	3
00340354	Final Project New Product Design 2 *** *** should be together with the below course	3
00340383	Methodology of Eng. Development 2	0.5
<b>Total</b>		<b>9.5</b>

<b>MER Program Elective Courses</b>		
<b>Definition:</b>	A. Computational Courses; B. Courses in Core Subjects; C. Applied and Integrative Courses; D. General Science Courses; E. General Elective Courses in the Department	
<b>Course Code</b>	<b>Course Name</b>	<b>Credits</b>

<b>A. Computational Courses</b>		
00350022	Finite Elements for Engineering Analysis <sup>R*</sup>	3.0
00350013	Computational Methods in Mech. Eng.	2.5
00350199	Computational Fluid Dynamics	3.0
00360015	Finite Element Methods in Mech. Eng. 1*	3.0
00350039	Signal Processing	3.0
*One should take only one course from either 00360015 or 00350022.		
<b>B. Courses in Core Subjects</b>		
00350188	Control Theory <sup>R</sup>	3.5
00350001	Introduction to Robotics <sup>R</sup>	2.5
00360049	Neural Networks for Control and Diagnostic	2.5
00350091	Thermodynamics 2	3.5
00360009	Heat and Mass Transfer	3.0
00350035	Fluid Mechanics 2	2.5
00360005	Analytical Dynamics	3.0
00350003	Computer-Aided Design Systems	3.0
00340016	Mechanical Engineering Design 2	3.0
00350123	Intro to Manufacturing Systems 1	2.5
00350043	Intro to the Theory of Elasticity	3.0
00350041	Mechanics of Microsystems	3.5
00350034	Failure of Materials	2.5
00350050	Optical Systems Design	3.5
00350052	Linear Optics and Applications 1	3.5
00350062	Analysis of Structures	2.5
<b>C. Applied and Integrative Courses</b>		
00340401	Advanced Robotics Lab <sup>R</sup>	2.5
00350026	Creative Intro. in Mech Eng.	2.5
00350032	Microprocessor-Based Product Design	3.0
00340404	Advanced Computer-Aided Design Lab	2.0
00340406	Advanced Control and Automation Lab	2.5
00340410	Advanced Energy Lab	2.5
00340411	Internal Combustion Engines Lab	2.5
00340413	Design and Manufacturing Lab	2.0
00340420	Advanced Lab in Renewable Energy	2.5
00340422	Optics Lab	2.5
00350048	Integrated Design and Analysis	2.5
00350051	Optimal-Mechanical Design	4.0
00360063	Experimental Modeling of Systems	3.0
00340047	Advanced Lab in Fluid Mechanics	2.0

00360027	Dynamics of Marine Structures	3.0
<b>D. General Science Courses</b>		
00360001	Analytical Methods 1	4.0
01040215	Complex Functions A	2.5
<b>E. General Elective Courses in the Department</b>		
00350008	Industrial Automation	2.5
00350036	Control System Design <sup>R</sup>	2.5
00350033	Intro to Sensor-Integrated Systems <sup>R</sup>	3.0
02360327	Digital Img. & Sig. Processing <sup>R</sup>	3.0
00350010	Kinematics of Mechanisms <sup>R</sup>	2.5
00360026	Kine., Dyn. Control of Robots <sup>R</sup>	2.5
00360087	Hybrid Dynamics	3.0
00340205	Pneum.&Hydrau. Components 1	3.0
00350053	Renewable and Sus. Energy	3.0
00360038	Interfacial Transport Processes	3.0
00350146	Intro to Internal Comb Engines	2.5
00860284	Wind Turbines	3.0
<b>Graduate Level Course List offered to both Undergraduate &amp; Graduate students</b>		
00360009	Heat and Mass Transfer	3.0
00360049	Neural Networks for Control and Diagnostic	2.5
00360001	Analytical Methods 1	4.0
00360038	Interfacial Transport Processes	3.0
00360026	Kine., Dyn. Control of Robots <sup>R</sup>	2.5
00360087	Hybrid Dynamics	3.0

\*Courses with R superscript are robotics-related.

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
<b>Total</b>		<b>19</b>
9	Introduction to the Chinese National Community (Elective)	2