

浙江大学伊利诺伊大学厄巴纳香槟校区联合学院 Zhejiang University-University of Illinois at Urbana Champaign Institute

Innovative Engineering Education

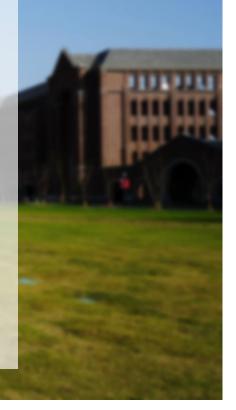
李尔平 Li ErPing, Professor, IEEE Fellow

Dean, ZJU-UIUC Institute

07 Dec. 2018

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Arts & humanities, social sciences; sciences; engineering; information technology; agriculture, life& environment sciences; medicine;



7 affiliated hospitals, more than 10 teaching hospitals



5 campuses in Hangzhou, 1 campus in Zhoushan, 1 campus in Haining

▲ Faculty and Students (Dec,2017)



24878

Undergraduates(full-time)



28795

Graduate Students (Including 10747 Ph.D. Candidates)



6,843

International Students



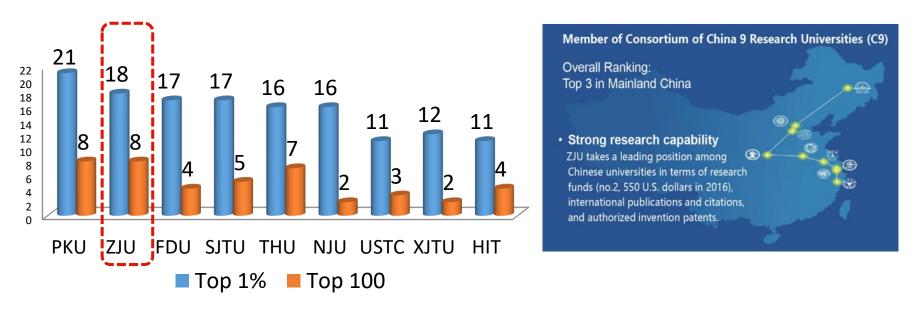
3611

Faculties



Total students: 53673

ESI Data



According to the data released by ESI, as of September 2017, 18 disciplines ranked top 1% among world-class academic institutions, and 8 ranked top 100 including the Agricultural Science, Chemistry, Computer Science, Engineering, Materials Science, Mathematics, Pharmacology, Plant & Animal Science.

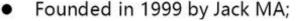
■ The most entrepreneurial region in China

The most active private economy in China

- Population: 55 million;
- the 4th of GDP total and the 5th of per capita in China;
- Private enterprises: 780,000
- 1 enterprise / 70 people



- the largest private automobile corp in China
- Taking a stake of Volvo





- E-commerce, B2B and B2C internet trade, internet finance, etc.
- Listed in the New York exchange, the market value is about 236 billion U.S. dollars





21世纪工程问题挑战

21st Century Grand Challenges For Engineering



Inexpensive Solar Energy 低成本太阳能



Energy from Fusion 聚变能源



Carbon Sequestration Method 碳吸存



Nitrogen Cycle 氮循环



Secure Cyberspace 网络空间安全



Access to Clean Water 清洁的饮用水



Restore and Improve Urban Infrastructure

修复改善城市设施



Advanced Health Informatics 先进健康信息学



Better Medicines 更好的医药



Brain Reverse Engineering 大脑逆向工程



Prevent Nuclear Terror 预防核威胁



Enhance Virtual Reality 增强虚拟现实



Advance Personalized Learning 个性化学习



Engineering the Tools Of Scientific Discovery 设计科学发现工具

•••••

Challenges of the 21st Century 21世纪的挑战

Technology advancement brings unprecedented interconnectivity

科技的进步带来史无前例的互联性

• The world is getting smaller yet the scale and complexity of issues and problems are getting bigger

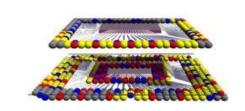
世界在变小,但问题的规模和复杂性在变大

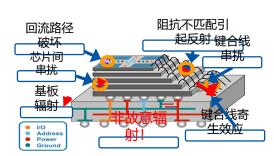
 We are confronted with more and more novel situation and ill-defined problems

我们面临着越来越多的新情况和不明确的问题

 We are also facing fewer moral certainties and more moral dilemmas

我们也面临着更多的道德不确定性和困境 Courtesy of Prof. Lap-Chee Tsui 香港大学前校长徐立之院士





The Internet of Things



Intercultural Development Continuum 跨文化发展的连续性



Intercultural Development Continuum(Ladder type arrow). The small black arrow shows the intercultural development of the 2013 cohort before and after the 6-week India summer program, measured using the intercultural Development Inventory(IDI; Hammer 2014). The cohort transitioned from polarization to the cusp of minimization.

Anu Ramaswami, Armistead Russell, Marian Chertow, et al." International, Interdisciplinary Education on Sustainable Infrastructure and Sustainable Cities: Key Concepts and Skills," The Bridge Fall 2014

China's engineering discipline development

- China is in a new period of industrial development and economic transformation.
- New Engineering Concept.

Student-centered / Lifelong Learning / Cross-disciplinary / Explore how things work/ Catch up with the pace of technological development

- The talent structure of new engineering.

 Lack of world leaders in engineering/ Lack of craftsman/ Lack of talent in basic, emerging, high-end technology areas.
- Knowledge system of new engineering.
 Knowledge on engineering education is out of date, out of touch with practice and social needs/ The elaborate division of the engineering subjects
- Education system of new engineering.
 Dramatic changes in teaching methods and modes, teaching environment and conditions etc.





21世纪的工程师教育 Educating Engineers For The 21st Century 2

- 我们的学生需要怎样的关键技能 What are the critical skills our students need
 - 在某一领域的技术深度
 - 创造力和创新性
 - 企业家精神
 - 沟通技巧
 - 能够在不同团队中进行良好的工作
 - 全球性的知识和经验
 - · 致力于终身学习

- Technical depth in a particular field
 Creativity and innovation
- Entrepreneurial outlook
- Communication skills
- Ability to work well as a member of diverse team Global knowledge and experience Commitment to life-long learning

Courtesy of Prof. Venky Narayanamurti , Former Dean of Harvard School of Engineering 哈佛工程学院院长

	1990	2020	2050
China	Track & Learning	Big Manufacturer	Strong Manufacturer
Industry	Automation	Intelligence	Intelligence, new sources of energy
Tech world	Nano	Quantum, Gene	Thinking Science (Unification of idealism and materialism?)
Zhejiang University	Research University	World-Class University – Innovation Education	Top University- educating top students

Courtesy: 2017 Engineering Education Forum



Thinking in the era of globalization:

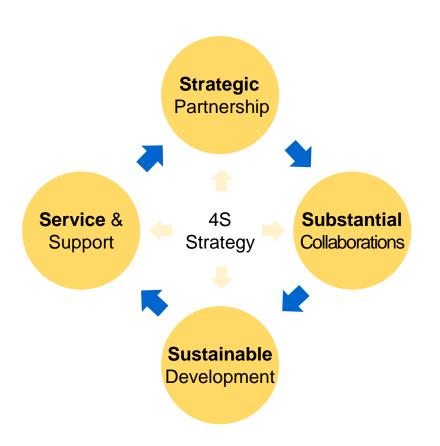


What kind of education should be provided? What kind of knowledge student need? What kind of abilities to be equipped with?

The mission of ZJU-UIUC Institute:

- Explore global collaboration for high education;
- Break traditional engineering boundaries, cultivating new engineering elites;
- Stand in China, blending Chinese and Western education essence, cultivating international leaders with global views.

International Strategy of Zhejiang University



- Enhancing global competitiveness of disciplines
- 2. Increasing international level of education
- Advancing internationalization of the faculty
- Forging higher-level international collaborations
- Developing the capacity for international service and support



1.1 Institute Introduction



The ZJU-UIUC Institute is a new cooperatively-run engineering college approved by Ministry of Education at February, 2016. By introducing engineering curricula and resources from UIUC, complemented with contributions from counterpart colleges from ZJU, ZJU-UIUC Institute provides a world-class engineering education.

208 alumni: members of Chinese Academy of Science and Engineering



Zhejiang University (ZJU)

- one of China's oldest, and most prestigious institutions
- Chinese Ministry of Education Double First-Class University
- member of the Association of Pacific Rim Universities
- 2016 US News & World Report world university ranking, engineering ranks 4

24 Nobel Memorial Prize Laureates 28 Pulitzer Prize Winners

University of Illinois at Urbana-Champaign (UIUC)

- public research university and the flagship institution of the University of Illinois System
- participant in the Big Ten Academic Alliance
- Public Ivy and called the Big Three of American public universities together with UC Berkeley and University of Michigan
- 2016 Shanghai Academic Ranking of World University, engineering ranks world 4

1.2 Institute Milestone



发展历程

Sep. 2013

ZJU and UIUC signed a strategic cooperation agreement

Feb.1, 2016

The Ministry of Education approved the ZJU-UIUC Institute



Sep.10, 2016
The Class of 2020
(30 undergraduates)



Sep.10, 2018The Class of 2022 (155 undergraduates, 14 Ph.D.)

Nov.6, 2014

ZJU submits an official request to the People's Government of Zhejiang to establish the ZJU-UIUC Institute

Apr.11, 2016

The ZJU-UIUC Institute launch ceremony was held



Sep.15, 2017

The Class of 2021 (144 undergraduates, 12 Ph.D.)





- By cross-disciplinary English education, cultivate engineering leaders with global vision
- Based on frontier engineering cross-disciplinary research, form cross-disciplinary engineering and science research base)
- Within five years, build <u>engineering science research platform</u> based on three cross disciplines
- Taking undergraduate education oriented talent training mode, grant double degrees, explore and implement new degree award system based on cross disciplines.

1.3 Institute Organization Chart

Dean 院长

院长助理

Vice Dean 副院长

Executive Dean 执行院长





Dean: LI Erping



Office Director 办公室主任

Publicity

宣传管理岗

Admission

招生管理岗

科研管理岗

Outreach

外事岗

Research Affairs



Executive Dean: Philip Krein

Human Resources 人事管理岗

Academic Affairs 教务管理岗

Financial Affairs 财务管理岗

Administration 综合行政岗

Development&Liaison 发展联络岗

Lab Director 实验室主管

Joint Management Committee

联合管理委员会

ECE Lab Technician 计算机实验室工程师

ME Lab Technician 机械实验室工程师

EE Lab Technician 电气实验室工程师

CEE Lab Technician 土木实验室工程师

Physics Lab Technician 物理实验室工程师

International Advisory Board 国际咨询委员会

Operation Committee 运营委员会

Academic Committee 学术委员会

Faculty Search Committee 教师聘任委员会

Promotion & Tenure Committee 晋升评职委员会

Admissions Committee 招生委员会

1.5 International Advisory Board





Yang Wei

Academician of the Chinese Academy of Sciences, a member of the Third World Academy of Sciences, and a Foreign Member of the National Academy of Engineering (USA).

Thomas Magnanti

Institute Professor and former Dean of Engineering at Massachusetts Institute of Technology (MIT), and the Former SUTD President.

Venky Narayanamurti

Former Dean of Engineering at Harvard the Institute for University. He is member of the National Academy of Engineering, USA, the Royal Swedish Academy of Engineering Sciences, and the American Academy of Arts and Sciences.

Dim-Lee Kwong

Executive Director of Infocomm Research (I2R) and Institute of Microelectronics (IME). Agency for Science, Technology and Research (A*STAR), Singapore and a Chair Professor at the National University of Singapore (NUS).

Huang Wei

Executive Vice President of North-West Polytechnic University, China. He was elected as Academician of the Chinese Academy of Sciences in 2011 and as a foreign academician of the Russian Academy of Sciences in 2016.

Wei Shyy

Executive Vice-President, Provost and President-elect of the Hong Kong University of Science and Technology (HKUST). He is currently a Chair Professor of Mechanical and Aerospace Engineering



2.1 Dual Degrees and Majors



Innovative Education



Dual degree

Bachelor of ZJU Bachelor of UIUC 4+0 mode, English









Manufacturing Dynamic System Mechanics

Structure Environment

Water Resource Control Transportation

Optics

Electrification Computer Microelectronic

Flectronics

Communication

ZJU and UIUC Preponderant Major Collaboration

Civil **Engineering**

UIUC rank 1 in America ZJU discipline assessment A

ZJU and UIUC preponderant majors

Computer **Engineering**

UIUC rank 4 in **America** ZJU discipline assessment A+

Electrical Engineering

UIUC rank 5 in America ZJU discipline assessment A-

Mechanical Engineering

UIUC rank 6 in America ZJU discipline assessment A

International Training System



Basically refer to UIUC academic requirements and standards, develop major training plan, curriculum, quality standard and guarantee system, which meet the graduation requirements of UIUC and ZJU.

- 1 Foundational Mathematics and Science
- 2 Technical Core
- 3 Technical Electives
- **4 Free Electives**
- **5 Liberal Education**
- 6 Compulsory General Education Course (30.5)

credits)



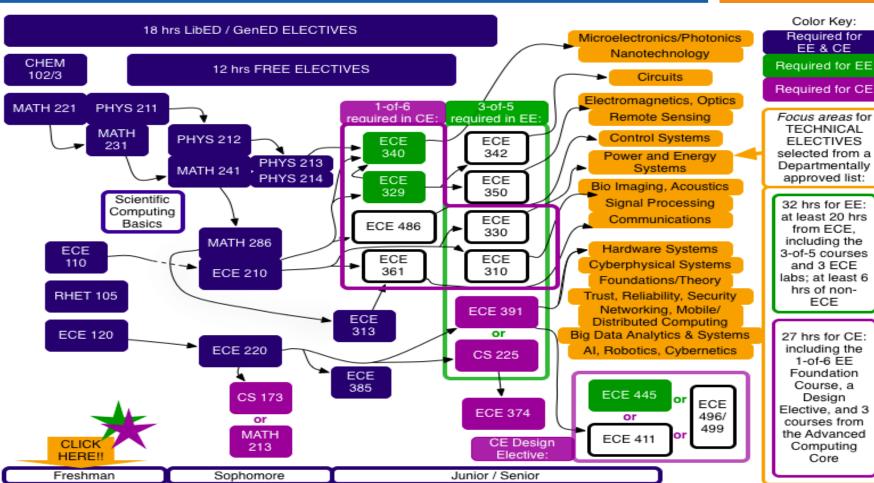
ZJUI EE training plan (128+30.5credits):



teaching credits by ZJUI:ZJU:UIUC Instructors = 1/3: 1/3: 1/3

2.2 Course Map for Electrical and Computer Engineering





EE Curriculum



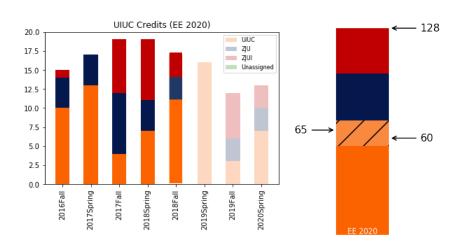
SP

2017 (17)

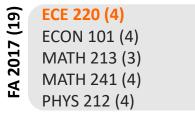
2018 (19)

SP 2019 (16)

- Exchange to UIUC in SP 2019 semester
- EE ELECs are decided upon by exchange and ZJUI faculty. Should be chosen to allow CompE and MechSE students to satisfy elective requirements.
- EE TECHs are chosen from MechSE and CEE courses taught by UIUC or ZJUI
- Note: Current UI-taught count is 6 credits high



FA 2016 (15)	CHEM 102/103 (3+1) CS 101 (3) ENGR 100 (1) MATH 221 (4) RHET 101 (3)
	RHET 101 (3)





FA 2019 (12)	ECE 345 (3) EE ELEC (3)	
	EE LAB (3) GEN ED3 (3)	
_		

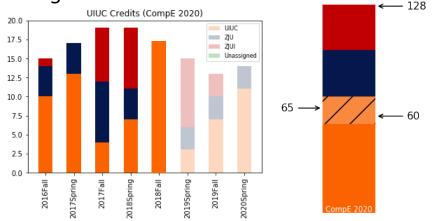
```
ECE 110 (3)
ECE 120 (4)
ENGR 199 (0)
MATH 231 (3)
PHYS 211 (4)
RHET 102 (3)
CS 225 (4)
ECE 210 (4)
ENG 200 (0)
ENGL 115 (3)
MATH 286 (4)
PHYS 213/214 (2+2)
ECE 313/314 (3+1)
ECE 330 (3)
              TERM
ECE 385 (3)
                IN
EE TECH (3)
URBANA
GEN ED5 (3)
ECE 445 (4)
```

EE ELEC (3) EE LAB (3) GEN ED6 (3) SP 2020 (13)

CompE Curriculum



- Exchange to UIUC in FA 2018 semester
- COMPE ACE are decided upon by exchange and ZJUI faculty. Should be chosen to allow EE and MechSE students to satisfy elective requirements
- COMPE TECHs are chosen from MechSE and CEE courses taught by UIUC or ZJUI
- Note: Current UI-taught count is 8 credits high



FA 2016 (15)	CH CS EN M
FA 2017 (19)	EC M M Ph
FA 2018 (17)	CC CC EC EE GI UI
[3)	CC

CHEM 102/103 (3+1)
CS 101 (3)
ENGR 100 (1)
MATH 221 (4)
RHET 101 (3)

ECE 220 (4) ECON 101 (4) MATH 213 (3) MATH 241 (4) PHYS 212 (4)

COMPE ACE1 (3)
COMPE TECH1 (3)
ECE 374 (4) TERM
EE 391 (4) IN
GEN ED5 (3)
URBANA

COMPETECH3 (3) ECE 313/314 (3+1) ECE 345 (3) GEN ED3 (3) ECE 110 (3) ECE 120 (4) ENGR 199 (0) MATH 231 (3) PHYS 211 (4) RHET 102 (3)

CS 225 (4) ECE 210 (4) ENGL 115 (3) MATH 286 (4) PHYS 213/214 (2+2)

COMPE ACE2 (3)
COMPE TECH2 (3)
ECE 329 (3)
ECE 385 (3)
GEN ED2 (3)

COMPE TECH4 (3) ECE 411 (4) ECE 445 (4) GEN ED6 (3)

SP 2020 (14)

SP 2017 (17)

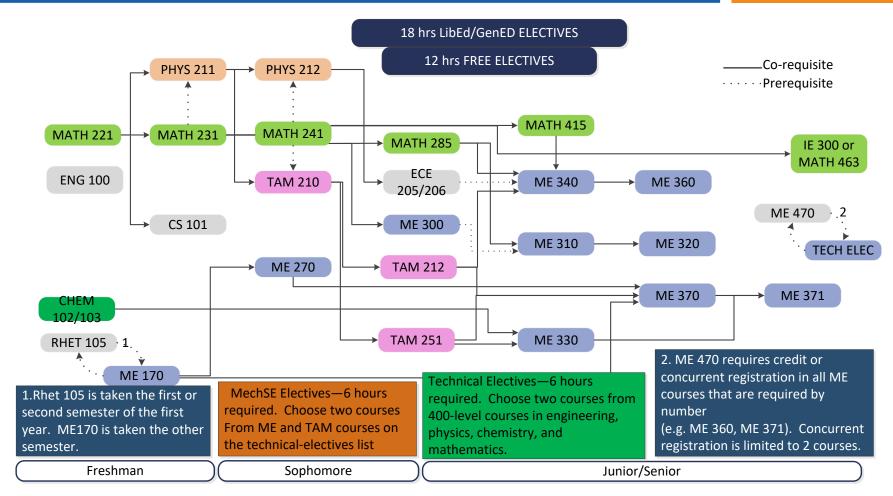
2018 (19)

SP

2019 (15

2.3 Course Map for Mechanical Engineering





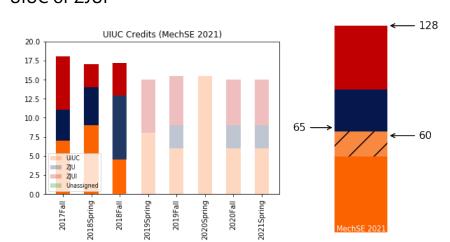
MechSE Curriculum



- ECE 211 taught by ECE (2/3 of ECE 210)
- TAM 210 taught be MechSE (2/3 of TAM 211 taken by CEE)
- ECON 101 satisfies ECON 102 requirement
- ME SCI ELEC is CHEM 104/105
- **Exchange to UIUC in SP 2020 semester**
- ECE 313 (Stats Elective) taught by ECE
- ME ELECs are decided upon by exchange and ZJUI faculty
- 2018 elective requirements ME TECHs are chosen from ECE and CEE courses taught by

Should be chosen to allow CEE and ECE students to satisfy

UIUC or **ZJUI**



CHEM 102/103 (3+1) CS 101 (3)

ECE 110 (3) ENGR 100 (1)

(18)

(11)

MATH 221 (4)

RHET 101 (3)

ECON 101 (4) MATH 241 (4)

ME 270 (3)

PHYS 212 (4) **TAM 210 (2)**

GEN ED4 (3)

MATH 415 (3) ME 310 (3)

ME 340 (3.5) ME 370 (3)

ECE 313 (3) FA 2020 (15) **GEN ED3 (3)** ME 371 (3)

ME ELEC (3) ME TECH (3) **MATH 231 (3)** ME 170 (3) PHYS 211 (4)

MATH 286 (4)

RHET 102 (3)

CHEM 104/105 (3+1)

ECE 211 (2)

ME 300 (3) ME 390 (0)

TAM 212 (3)

TERM

IN

TAM 251 (3) **GEN ED5 (3)** ME 310/320 LAB (2)

ME 320 (3) ME 330 (4)

ME 360 (3.5) **URBANA**

GEN ED2 (3) GEN ED6 (3)

ME 470 (3) ME ELEC (3)

ME TECH (3)

SP 2021 (15)

2018 (17)

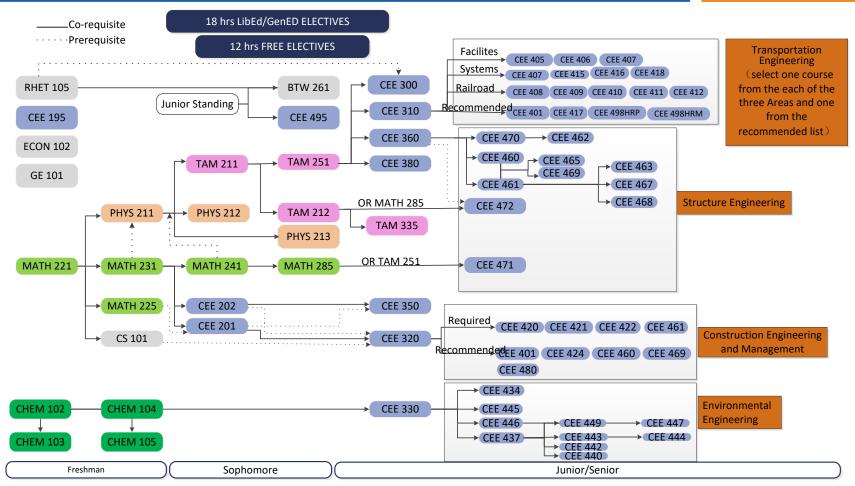
2019 (15

SP

2020 (15.5)

2.4 Course Map for Civil and Environmental Engineering





CEE Curriculum

ZJUI ZJUI

CHEM 104/105 (3+1)

MATH 231 (3)

RHET 102 (3)

ME 170 (3) PHYS 211 (4) SP

2018 (17)

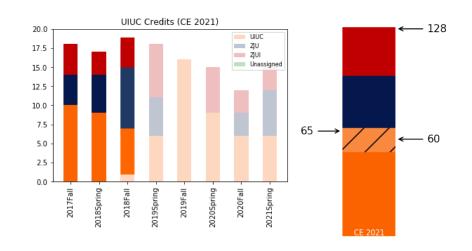
SP 2019 (18)

SP

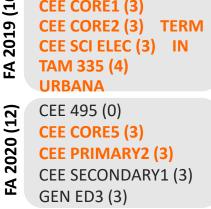
2020 (15)

SP 2021 (15)

- ECON 101 satisfies ECON 102 requirement
- Exchange to UIUC in FA 2019 semester
- CEE CORE/PRIMARY/SECONDARY courses TBD based on student interest
- Note: Current UI-taught count is 3 credits high



FA 2017 (18)	CEE 195 (3) CHEM 102/103 (3+1) CS 101 (3) ENGR 100 (1) MATH 221 (4) RHET 101 (3)
FA 2018 (18)	CEE 201 (3) ECON 101 (4) MATH 241 (4) PHYS 212 (4) TAM 211 (3)
, 2019 (16)	BTW 261 (3) CEE CORE1 (3) CEE CORE2 (3) TERM CEE SCI ELEC (3) IN



CEE 202 (3) GEN ED2 (3) MATH 286 (4) PHYS 213 (2) TAM 212 (3) TAM 251 (3)
CEE CORE3 (3) CEE CORE4 (3) CEE PRIMARY1 (GEN ED4 (3) MATH 415 (3)
CEE PRIMARY3 (CEE PRIMARY4 (CEE SECONDARY GEN ED5 (3)

GEN ED6 (3)

2.5 Teaching Lab



- Safe and open
- Emphasize the teaching effect, promote the students' interest, and close to the industry
- Build new experimental platform and project



24/7 Innovative Open Lab









Cultivation Procedure

"T型"学生 "T-Shaped Student"?





传统学生: 学科深度)

Conventional students: depth in discipline

专业领域的 深度(Depth in major area) 跨学科的宽度 Breadth across disciplines

T型学生即知专 业自身,也知其 他广阔领域

("T students" know their subject matter, but also broader areas)

> 社会影响、团 队合作的宽度 (Breadth in societal impact, teamwork)

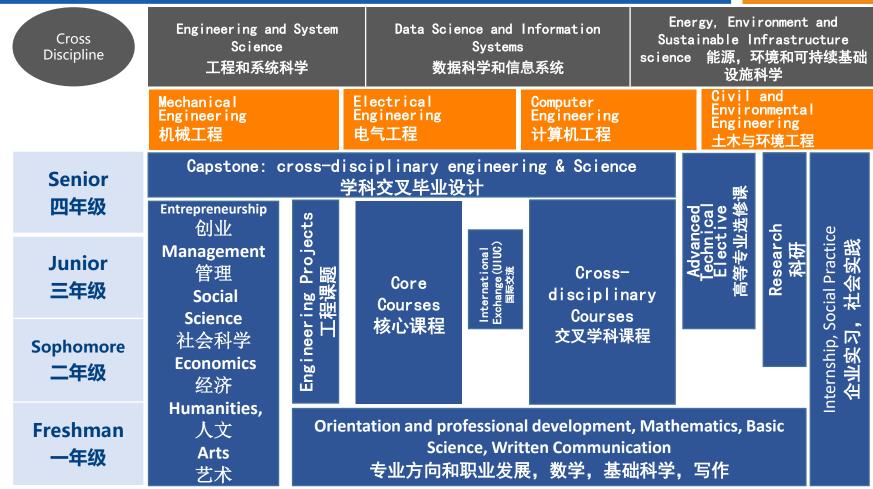
专业领域深 度(Depth in major area)

传统职业(Conventional career)

高影响力职业(High-impact career)

4.1 Student Training Plan

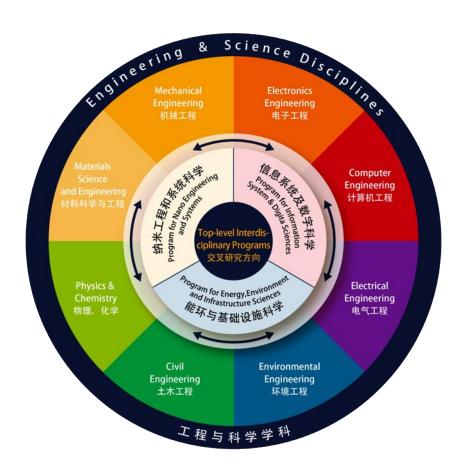




4.2 Cultivation for Cross-disciplinary Innovation



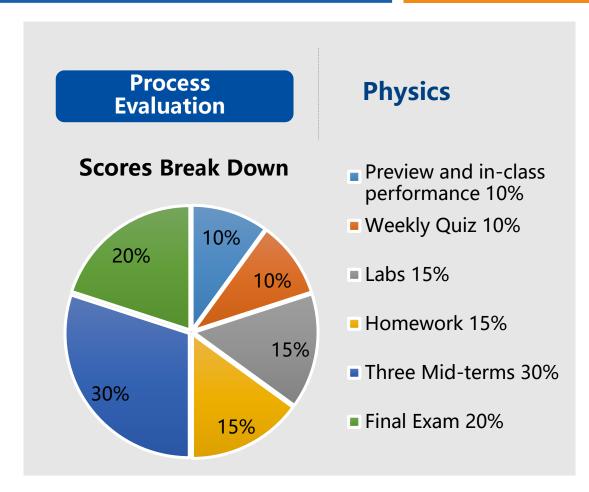
- Break the boundary of traditional majors and subjects, no longer set up the departments and institutes
- Build cross-disciplinary research center
- Set up the engineering crossdisciplinary innovation class for senior year students



4.3 Features in Cultivation



- Cross-discipline education
- Enhance the interaction between faculties and students
- Evaluate during the whole process
- Extend the vision of engineering
- Combine the theory and practice



4.4 Features of the Curriculum



- ☐ Engineering classes and learning from the very first day
- ☐ Joint courses that converge disciplines throughout the program in every term
- ☐ Cross-discipline advanced courses to provide a broad perspective
- ☐ Design project transcends several disciplines
- Ongoing creativity, entrepreneurship and leadership learning and opportunities



1) Engineering courses from the very beginning



ENG 100 – Engineering Orientation

ECE 110 – Introduction to Electronics

ECE 120 – Introduction to Computing

CEE 195 – About Civil Engineering

ME 170 – Computer Aided Design









ENG100-Engineering Orientation



Operated by Prof. Philip Krein, and, Prof. Li Erping, talents from both academy and industry are invited to come and give seminars to students

Seminars provide students with deep insight in the future direction of research and industry



Ivan Racheff Professor, UIUC



Associate Professor, UIUC



Professor, UIUC



Vice President, National University of Singapore



Professor, Simon Fraser University, Canada



Former President of the IEEE Power Electronics Society



Professor, UIUC



Professor, ZJU



CEE195-About Civil Engineering



- Co-taught by eight UIUC professors in civil engineering from different fields such as structure, transportation, environment, geotechnics, water resources, etc.
- Students will take on-site visit to various civil projects and learn knowledge from the field.



Professor



James M. LaFave Benito J. Mariñas Yanfeng Ouyang Professor Professor





Ximing Cai Professor



Wen-Tso Liu Professor



Erol Tutumluer Professor



B F Spencer, Jr Professor



Liang Y. Liu Associate Professor









- Smart city, smart infrastructure
- Data mining, machine learning
- Informatics system and digital science
- Engineering and system science
- Energy and environment





3) Cross-disciplinary Design Courses



■ ENG 4xx – Multidisciplinary Engineering Design Project

ME 170/SE 101 Introduction to Computer-Aided

Design

ME/TAM 270 Design for Manufacturability
ENG 490 Multidisciplinary Senior Design

Project

ENG 491 Team Design Projects

■ Innovation、Enterprise、 Leadership

TE 250 -- From Idea to Enterprise
TE 333 -- Creativity, Innovation, Vision

TE 250 From Idea to Enterprise
TE 333 Creativity, Innovation, Vision

SE 400 Engineering Law



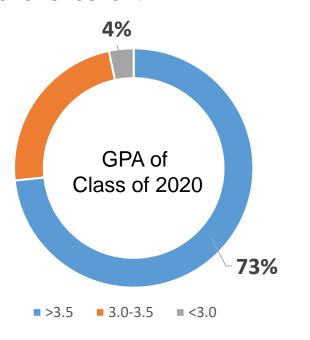


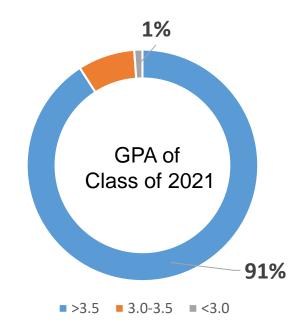




■ Cumulative GPA of Class of 2020 and 2021

According to UIUC evaluation, 70% students' GPA is higher than 3.5 and reach the level of excellent





5.2 Research Training, Internship and Competition









Mathematical Contest In Modeling^e Certificate of Achievement

Be It Known That The Team Of

Yifan Chen Chao Xu Enyi Jiang

With Faculty Advisor

Thomas Honold

ZJU-UIUC Institute

Was Designated As Meritorious Winner











Students team join the summer research camp

First price in structural design contest of Chinese university



5.2 Research Training, Internship and Competition



- Organize visits and internships in industry and in laboratories during summer break
- Alibaba Group Holding Limited
- Huawei Technologies CO., LTD.
- Jinko Solar Holding Co., Ltd.
- Eaton Corporation
- Merck Sharp & Dohme Corp.
- Chint Group
- TDG HOLDING CO.,LTD.













5.3 Extracurricular Activities









Defense for Student Research





5.3 Extracurricular Activities





Regular seminars given by professors from overseas





Face to face communication with masters





Understand traditional heritage and celebrate holidays with oversea students



5.4 Communication between Faculties and Students











5.5 Parent Day











The First Residential College Based Campus in Mainland

Residential College to support the whole-person education



Professor Lap-Chee Tsui 1st **Residential College Dean**

- Famous geneticist14th Vice-Chancellor and **President of the University of Hong Kong**

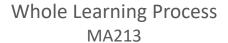


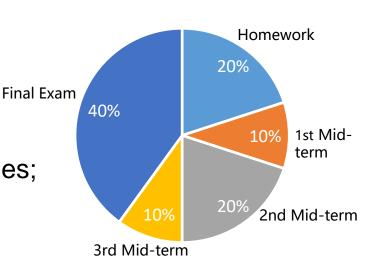


6.1 Measures for Quality Assurance



- Early feedback from faculties and students;
- Course evaluation in the end of semester;
- Biweekly faculty lunch meeting;
- Academic advising system;
- Assessment for whole learning process;
- Policies and guidelines for teaching activities;
- Class observation



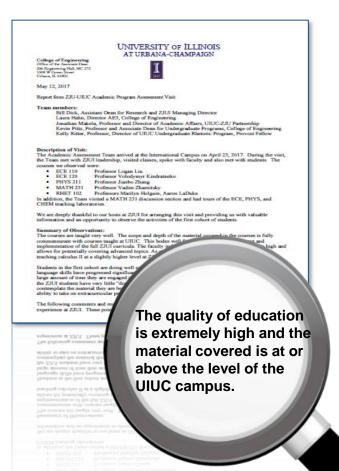


6.2 Teaching Assessment from UIUC





In April 2017, UIUC preformed a teaching assessment on ZJUI and positive feedback was received. This bodes well for the continued development and implementation of the full ZJUI curricula.



6.4 Comments from class of 2020





My life in ZJUI is fantastic. Our institute encourage us to try to realize our idea. It will be one of the most important experience in my whole life.



I think we have the access to a global opportunity within our daily class. In everyday class, we get professional knowledge in a non-conventional way.



ZJUI is value to me because it uses a different idea in teaching compared with the traditional Chinese way: we are encouraged to communicate more with the professor; we also have discussions where we can learn more from each other.



Zhao Junhan

During the first in ZJUI institute, the most precious gift I got is the ability of how to think critically and learn by myself. We have quite amount of inquiry-based courses. Thanks to these classes, we can get some projects and try best to solve them individually or in group.

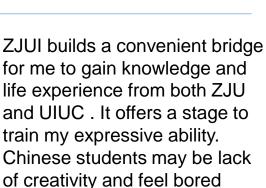
6.4 Comments from class of 2021





ZJUI is the most suitable and perfect college that I can ever imagine. It has the superior-quality education resources provided by ZJU, and meanwhile has the top international Engineering faculties offered by UIUC.

under traditional teaching style, but it will never happen in ZJUI.





ZJUI gives me the chance to find the balance between my ability and my interests.



Ji Huangchang

ZJUI is a place where I have opportunity to enjoy the international education. In ZJUI, I can learn knowledge both from Chinese and US universities.



Feng Yue





校区区位

交通

海宁常住人口60多万, 距浙大紫金港校区50公里; 距杭州萧山国际机场80公里; 距上海虹桥机场120公里。

海宁文化璀璨、人文荟萃、经济繁荣,被誉为"鱼米之乡、丝绸之府、皮革之都"。 名胜古迹众多、风景优美,世界闻名的"海宁潮"更是天下奇观。





北: 徐志摩湿地公园1500亩

中: 国际校区1484亩

南: 鹃湖公园3000亩





◆ 推进校园建设

一期建设,2016年8月完工

建筑面积: 约11万方

二期建设,2017年9月完工

建筑面积:约29万方









































