Trends and Challenges in Korean Chemical Engineering Education

KAIST
Chemical & Biomolecular Engineering
Jae W. Lee, Department Head
2017. 10. 03

Current State of Chemical Engineering in Korea

Number of Dept. of Chemical Engineering and related fields in Korea

- Number of University in Korea ≒ 350
- Number of Dept. of Chemical Engineering ≒ 80 ≒ 23%
- Number of Dept. of Industry Chemistry ≒ 10 ≒ 3%
- Number of Dept. of Nano-related Engineering ≒ 30 ≒ 9%
- Number of Dept. of Energy-related Engineering ≒ 60 ≒ 17%
- Number of Dept. of Environmental-related Engineering ≒ 100 ≒ 29%

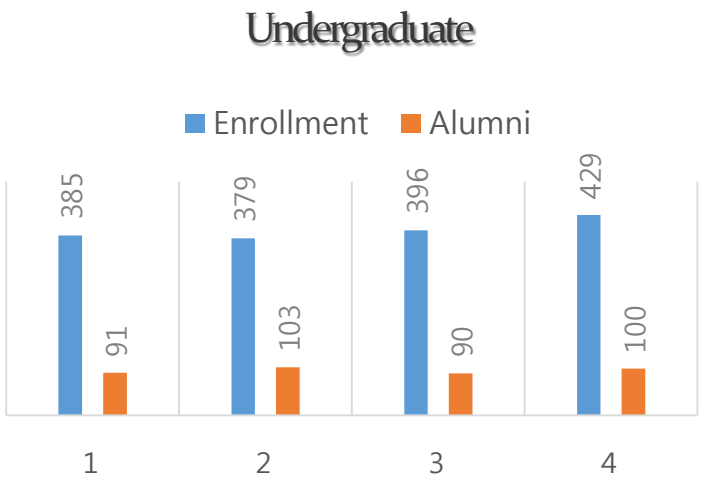
Approximated % and average # of professors with non-ChemE (or similar) degrees

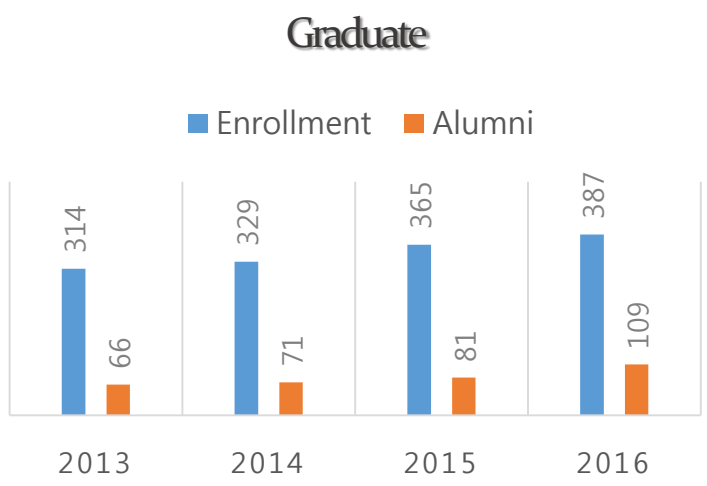
	# of Prof. in ChemE	# (%) of Prof. with ChemE	# (%) of Prof. with Chem	# (%) of Prof. with Bio	# (%) of Prof. with Other
Seoul National University	32	27 (84.4)	3 (9.4)	1 (3.1)	1 (3.1)
KAIST	24	20 (83.3)	1 (4.2)	1 (4.2)	2 (8.3)
POSTECH	24	20 (83.3)	3 (12.5)	0 (0.0)	1 (4.2)
Yonsei University	20	18 (90.0)	1 (5.0)	0 (0.0)	1 (5.0)
Korea University	23	22 (95.7)	1 (4.3)	0 (0.0)	0 (0.0)

Current State of Chemical Engineering in KAIST

Number of CBE Students in KAIST

Category			2013	2014	2015	2016
Undergraduate	Enrollment (2 - 4th Yr)		385	379	396	429
	Graduated		91	103	90	100
Graduate	Enrollment	MS	112	108	116	138
		PhD	202	221	249	249
	Graduated	MS	38	42	42	58
		PhD	28	29	39	51



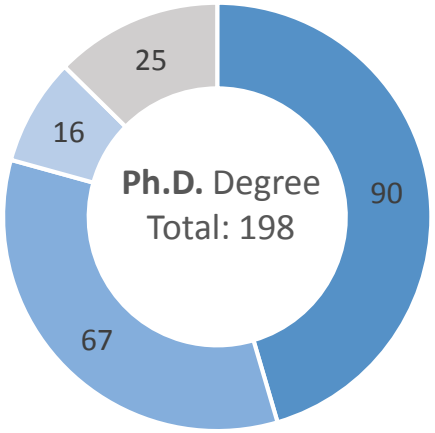


Admission: more applications than available table of organization (T/O)

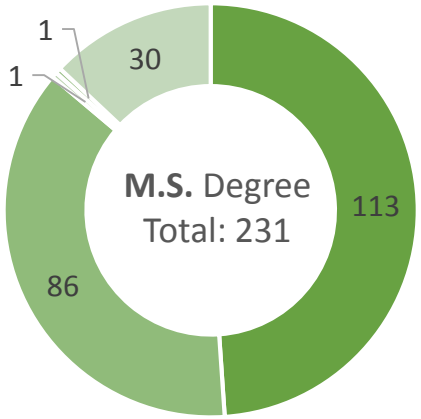
Job Market

Career Status after Graduation

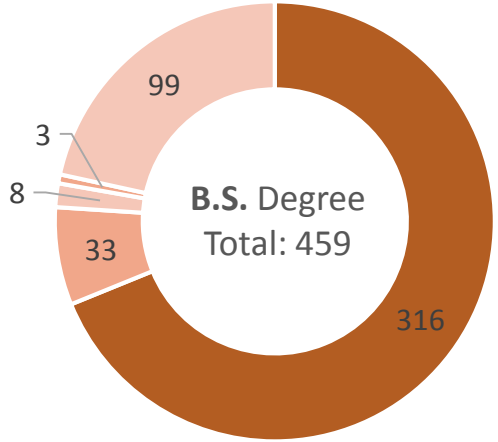
(Collected from 2012/8-2017/2)



- Industry
- Educational Inst.
- Government Org.
- Etc.



- Student
- Industry
- Educational Inst.
- Government Org.
- Etc.



- Student
- Industry
- Military Service
- Government Org.
- Etc.

Summary Outlook

Demand for ‘chemical engineers’ in the industry keeps increasing…

KAIST
고려대학교 KOREA UNIVERSITY
서울대학교 SEOUL NATIONAL UNIVERSITY
아주대학교
연세대학교 YONSEI UNIVERSITY
전남대학교 CHONNAM NATIONAL UNIVERSITY
충북대학교 CHUNGBUK NATIONAL UNIVERSITY
POSTECH
한국교통대학교
UNIST Ulsan National Institute of Science and Technology
DGIST
KU KONKUK UNIVERSITY

etc.

SAMSUNG
SK 이노베이션
LG Chem
한화케미칼
S-OIL 에쓰-오일
posco
LOTTE CHEMICAL 롯데케미칼
GS 칼텍스
Hyundai Oilbank

etc.

Research Areas

Energy & Environmental Systems


D. Koh


J. H. Kim


J. H. Lee


J. W. Lee

Biotechnology


Y. S. Kim


Y. C. Kim


H. G. Park


S. Y. Lee

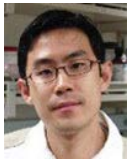

Y. K. Chang


K. J. Jeong

Catalysis


S. B. Park


H. J. Lee


M. K. Choi

Nanomaterials


D. H. Kim


S. H. Kim


D. C. Lee


S. G. Im

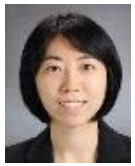

H. T. Jung


E. S. Cho

Soft Materials (Polymer)


B. J. Kim


H. T. Kim


S. Li


O. O. Park


S. Y. Choi

Course Offerings in KAIST

Undergraduate Course Offerings (Representative)

Broad Education

Fundamentals:

- Introduction to Chemical and Biomolecular Engineering (CBE)
- Industrial Organic Chemistry
- CBE Analysis
- Chemical Engineering Thermodynamics
- Introduction to Numerical Methods for CBE
- Physical Chemistry for CBE
- Molecular Reaction Engineering
- Separation Processes
- Fluid Mechanics
- Heat and Mass Transfer
- CBE Capstone Design Project

Experiments:

- Molecular Engineering Laboratory
- CBE Laboratory

Specialized Research Topics

Energy & Environmental Systems:

- Process Simulation and Control
- Techniques of Process and Product Design
- Introduction to Environmental Engineering

Nano Materials & Catalysis:

- Nanochemical Technology

Soft Materials:

- Introduction to Macromolecular Engineering
- Electrochemical Principles for CBE

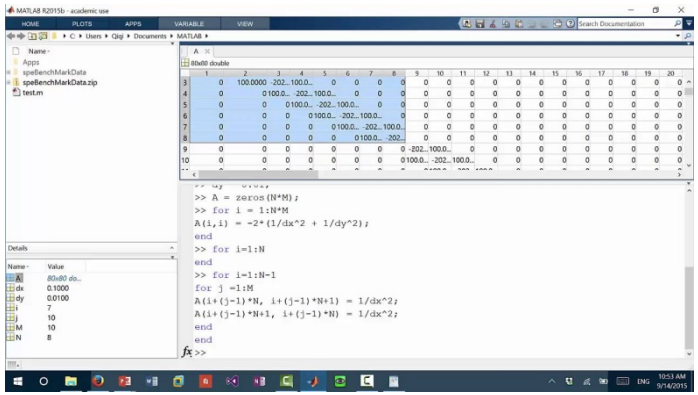
Biotechnology:

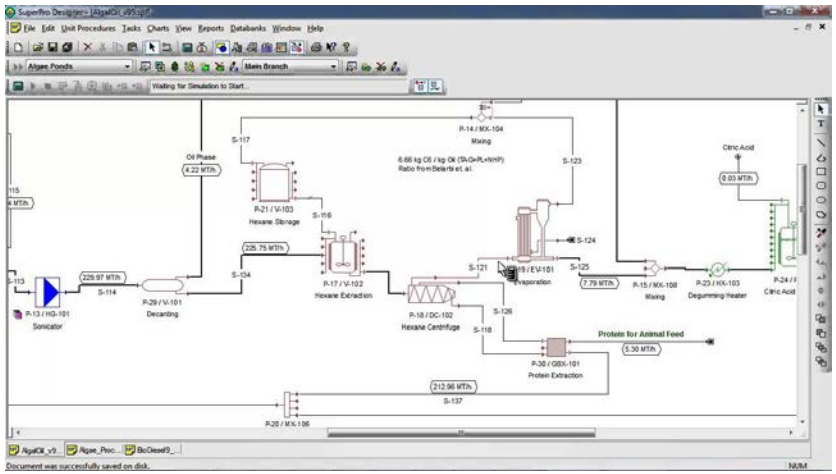
- Biomolecular Engineering
- Biochemical Engineering
- Bioinformatics
- Biorefineries for Fuels and Chemicals

Utilization of Calculation and Simulation Tools

CBE 206. Introduction to Numerical Methods for Chemical and Biomolecular Engineering

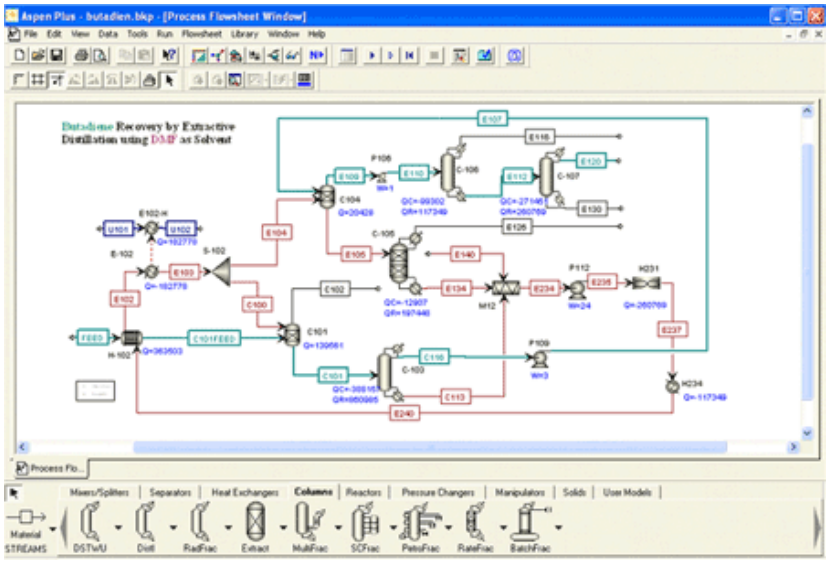
MATLAB®





CBE 441. Techniques of Process and Product Design

Aspen Plus®



CBE 442. Chemical and Biomolecular Engineering Capstone Design Project

SuperPro Designer®

Course Offerings in KAIST

Graduate Course Offerings (Representative)

Broad Education

Fundamentals:

- Scientific Writing
- Research Methodology for Chemical and Biomolecular Engineers
- Problem Solving in CBE
- Engineering Applied Mathematics
- Numerical Method for Chemical Engineers
- Design of Reaction System
- Introduction to Interfacial Engineering
- Mass Transfer

Specialized Research Topics

Energy & Environmental Systems:

- Rate-controlled Separation Process
- Multiphase Reactor Engineering
- Advanced Process Control
- Process Optimization • Energy Engineering

Nano Materials:

- Thin Film Nanotechnology • Microfluidics
- Organic Nano-Structured Materials

Soft Materials:

- Introduction to Macromolecular Engineering
- Electrochemical Principles for CBE
- Polymer Fluid Dynamics

Catalysis:

- Introduction to Catalysis Engineering
- Catalysis for Renewables
- Theory of Catalysis • Design of Catalysis

Biotechnology:

- Metabolic Engineering
- Nucleic Acid Engineering

THANK YOU