ITC-CSCC2021 Plenary Talk
on June 28, 2021 (online)

Trends in Engineering Education and Quality Assurance in the 21st Century

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https://www.facebook.com/makino.mitsunori

My bio

- Born in Japan, in 1964 (2 months after the Olympic game in Tokyo)
- K-12 educated almost in Japan, except Aug.1976-Mar.1981 in Bangkok Thailand
- Study at Waseda University, Tokyo, Japan in 1983-1992 (B.Eng in 1987, M.Eng in 1989, and Dr.Eng in 1992)
- Faculty member of Faculty of Science and Engineering, Chuo University, Tokyo, Japan from 1992 (Assistant Professor in 1992-1995, Associate Professor in 1995-2004, Professor since 2004)
  - Vice dean of the faculty in 2009-2013

At IEICE:

- Fellow member since 2020
- Chair of the circuits and systems technical committee in 2010-2011
- Vice president of the Engineering Sciences Society (ESS) in 2013-2014
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At ITC-CSCC:

- Author/co-author of 45 papers since 1988
- Committee member or advisory member of the international operation & coordination since 1995
- Technical Program co-char of 2002 conference
- General co-chair of 2006 conference

My activity at ITC-CSCC since 1988

#	Conference	Date	Location	Makino's activity as author/co-author	Attendance	role
36th	ITC-CSCC 2021	June 28-30	Jeju, Korea & online		online	Plenary talk speaker
35th	ITC-CSCC 2020	July 3-6	Nagoya, Japan & online		online	member
34th	ITC-CSCC 2019	June 23-26	Jeju, Korea		x	member
33rd	ITC-CSCC 2018	July 4-7	Bangkok, Thailand	3 papers	x	member
32nd	ITC-CSCC 2017	July 2-5	Busan, Korea		x	member
31st	ITC-CSCC 2016	July 10-13	Okinawa, Japan	3 papers	x	member
30th	ITC-CSCC 2015	June 29 – July 2	Seoul, Korea	2 papers	x	member
29th	ITC-CSCC 2014	July 1-4	Phuket, Thailand		x	member
28th	ITC-CSCC 2013	June 30 – July 3	Yeosu, Korea	1 paper	x	member
27th	ITC-CSCC 2012	July 15-18	Sapporo, Japan		x	member
26th	ITC-CSCC 2011	June 19-22	Gyeongju, Korea	1 paper	x	member
25th	ITC-CSCC 2010	July 4-7	Pattaya, Thailand		x	member
24th	ITC-CSCC 2009	July 5-8	Jeju, Korea	5 papers	x	member
23rd	ITC-CSCC 2008	July 6-9	Shimonoseki, Japan		x	member
22nd	ITC-CSCC 2007	July 8-11	Busan, Korea		x	member
21st	ITC-CSCC 2006	July 10-13	Chiang Mai, Thailand		x	General co-chair
20th	ITC-CSCC 2005	July 4-7	Jeju, Korea	1 paper	x	member
19th	ITC-CSCC 2004	July 6-8	Matusima, Japan	1 paper	x	member
18th	ITC-CSCC 2003	July 7-9	Pyeongchang, Korea	1 paper	x	member
17th	ITC-CSCC 2002	July 16-19	Phuket, Thailand	5 papers	x	TPC co-chair
16th	ITC-CSCC 2001	July 10-12	Tokushima, Japan	5 papers	x	member
15th	ITC-CSCC 2000	July 11-13	Busan, Korea	4 papers	x	member
14th	ITC-CSCC 1999	July 13-15	Sado, Japan	4 papers	x	member
13th	ITC-CSCC 1998	July 13-15	Sokcho, Korea	1 paper	x	member
12th	ITC-CSCC 1997	July 14-16	Okinawa, Japan	1 paper	x	member
11th	ITC-CSCC 1996	July 15-17	Seoul, Korea	1 paper	x	member
10th	JTC-CSCC 1995	July 18-20	Kumamoto, Japan		x	member
9th	JTC-CSCC 1994	July 11-13	Gongiu, Korea	4 papers	x	
8th	JTC-CSCC 1993	July 26-28	Nara, Japan			
7th	JTC-CSCC 1992	July 27-28	Gyeongju, Korea	1 paper		
6th	JTC-CSCC 1991	July 22-23	Hiroshima, Japan	1 paper	x	
5th	JTC-CSSC 1990	Dec 10-11	Juju, Korea	2 papers	x	
4th	JTC-CSCC 1989	June 25-26	Sapporo, Japan			
3rd	JTC-CSCC 1988	Nov 4-5	Seoul, Korea	1 paper		
2nd	JTC-CAS 1987	July 21-22	Tokyo, Japan			
1st	JTC-CAS 1986	Oct 23-24	Seoul, Korea			

Nonlinear system analysis, especially homotopy method

45 presented papers at ITC-CSCC/JTC-CSCC

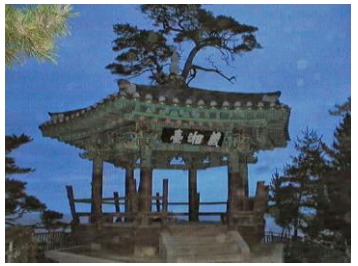
- 1988 Fundamental Theory of Simulating Infinite dimensional Nonlinear Systems
- 1990 Constructive Implicit Function Theorem and Its Applications to Circuit Simulation
- 1990 Computational Complexity of Homotopy Method for Monotone Resistive Circuits
- 1991 A Self-Validating Numerical Method of Solving for Nonlinear circuits
- 1992 A Modified Newton Method with Guaranteed Accuracy based on Rational Arithmetic
- 1994 A Priori Estimation for Calculating Solution of Convex Optimization Problems with Equality Constraints by Newton Type Homotopy Method
- 1996 A Sufficient Condition of A Priori Estimation for Tracing Solution Path of Nonlinear Equations by Homotopy Method
- 1997 An Estimation with Interval Analysis of Region Guaranteeing Existence of a Solution Path in Homotopy Method
- 1998 An Estimation by Interval Analysis for Homotopy Method of Calculating Solutions of Strongly Monotone Resistive Circuit Equations
- 1999 A visual simulation for high frequency electromagnetic wave propagation
- 1999 A Radiosity Method for Interaction between Sky and Objects
- 1999 An Adaptive Space Subdivision Method for Urban Area
- 1999 A Tracing Solution Path Algorithm Using Hyper-Ellipsoid In Homotopy Method
- 2000 A Visualization Method of Gravitational Lensing by Gravitational Sources in Three Dimensional Space
- 2000 A Visual Simulation of Car-Traffic Flow on a Crossing
- 2000 A Simplified Visual Simulation of Urban Space in Consideration with weather and Sunlight
- 2000 A High Quality Mesh Generation for a Surface defined by Linear Lie Algebra
- 2001 A visual Simulation of Motion Blur in Consideration of Optical Flow
- 2001 A Cell Automaton Model for Car-Traffic Flow on an Expressway with Visual Simulation
- 2001 An Illumination Model of Phosphor by Ray Tracing Method
- 2001 A Cell Automaton Model for Pedestrian Flow in Museum with Visual Simulation
- 2002 A Visual Simulation of Volcanic Eruption in the Use of Particle System
- 2002 A High Quality Mesh Generation with Automatic Differentiation for Surfaces Defined by Hamiltonian Lie Algebra
- 2002 An Adaptive Photon Mapping in the Use of Automatic Differentiation
- 2002 An Adaptive Beam Tracing for Visual Simulation of Ray Propagation in Wireless Communications Systems
- 2002 A High Quality Mesh Generation for Surfaces in the Use of Interval Arithmetic
- 2002 A Location System with Bluetooth
- 2003 A Visualization of Tsunami-Tidal Wave-by Soliton Wave in Combination with Particles
- 2004 An Implementation of Hierarchical Data Structure in Visualization of High Frequency Electromagnetic Wave Propagation on the CAVE
- 2005 A Visualization of 3D Lungs Representing Risk of Smoking
- 2009 Definition of Visibility in Three Dimensional Space by CG Technology for Security Cameras/Guards
- 2009 A Visual Alarm System of Surrounding Beep Sounds
- 2009 A CG-Generated Flood-Hazard Map System Using Particle Method with 3D Digital Map
- 2009 A Fast CG Representation of Night Scene on 3D Digital Map Systems
- 2009 A Study-Support System for Cutting Solids in Virtual Space on Autostereoscopic Display and Touch Panel
- 2011 A Visualization of Pedestrian's Visibility in Staircase Leading to Subway Station
- 2013 An Interactive Visualization of High Frequency Electromagnetic Wave Propagation Using Distributed Computing on CAVE System
- 2015 A Cooking Support System using Gesture Recognition
- 2015 An AR-based support system of resume writing
- 2016 A Control Interface of Level of Immersion in VR System
- 2016 An AR-based Hands-on Study System on Fruits and Vegetables for Preschoolers
- 2016 An Interactively Virtual Extended Display on Transparent HMD
- 2018 A posing System of 3D Human Model using Mixed Reality
- 2018 A MR-based Folding Support System of Origami
- 2018 An Eye-gaze Interface for Interaction with Nonplayer Character in VR Space

CG & X-reality (VR, AR & MR) for training, education, visualization, etc.

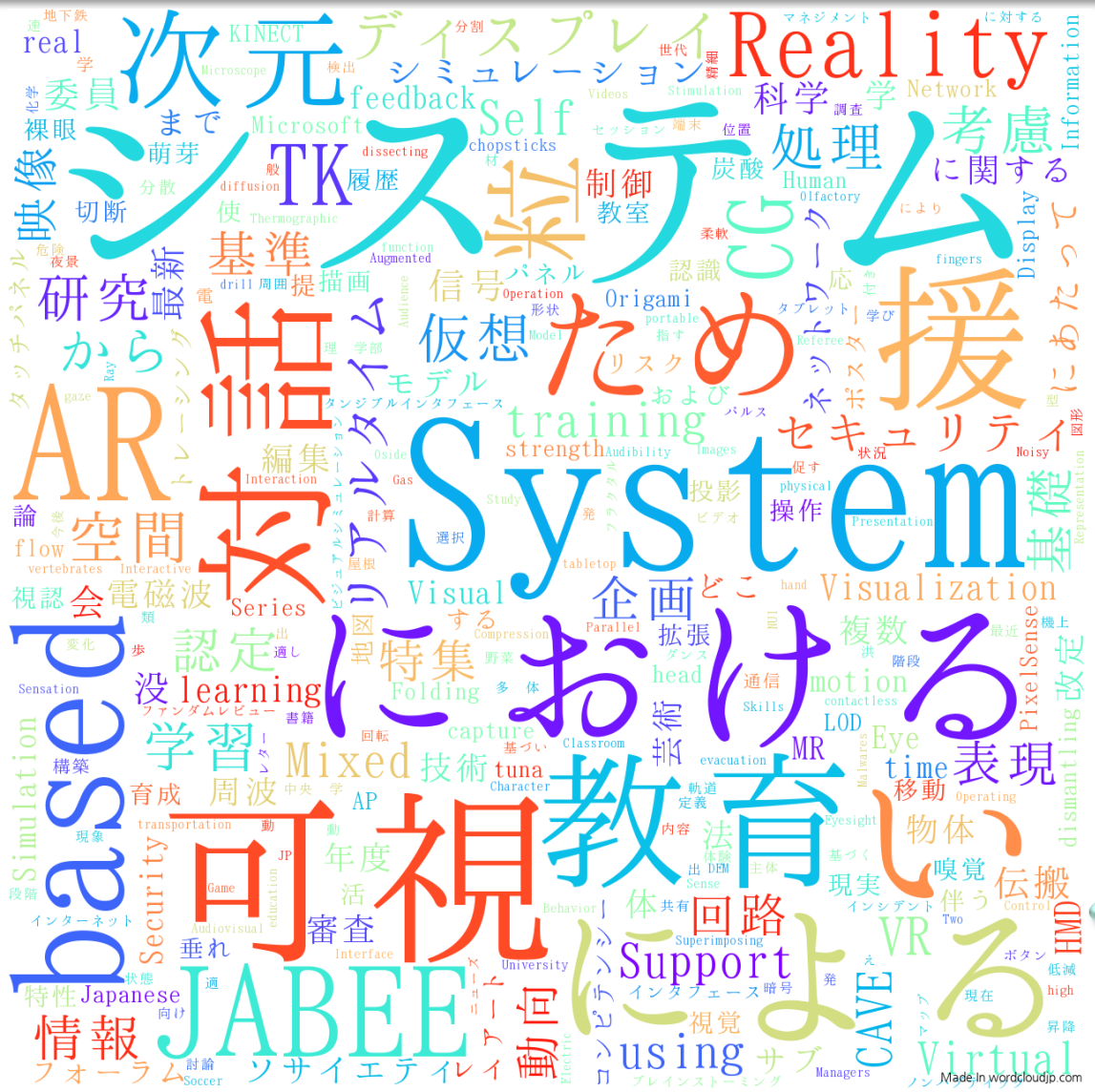
Time is not enough to talk about memories on ITC-CSCC,
so let's proceed to the main topic of my talk!






Word Cloud of my recent 200 presentations



- Accreditation
「認定」
- (Accreditation) Criteria
「(認定)基準」
- Competency
「コンピテンシー」
- Evaluation
「審査」
- (Human resource) development
「(人材)育成」
- JABEE

These keywords relate to the quality assurance of engineering education.

Addition to My bio
from viewpoint of the quality assurance of engineering education

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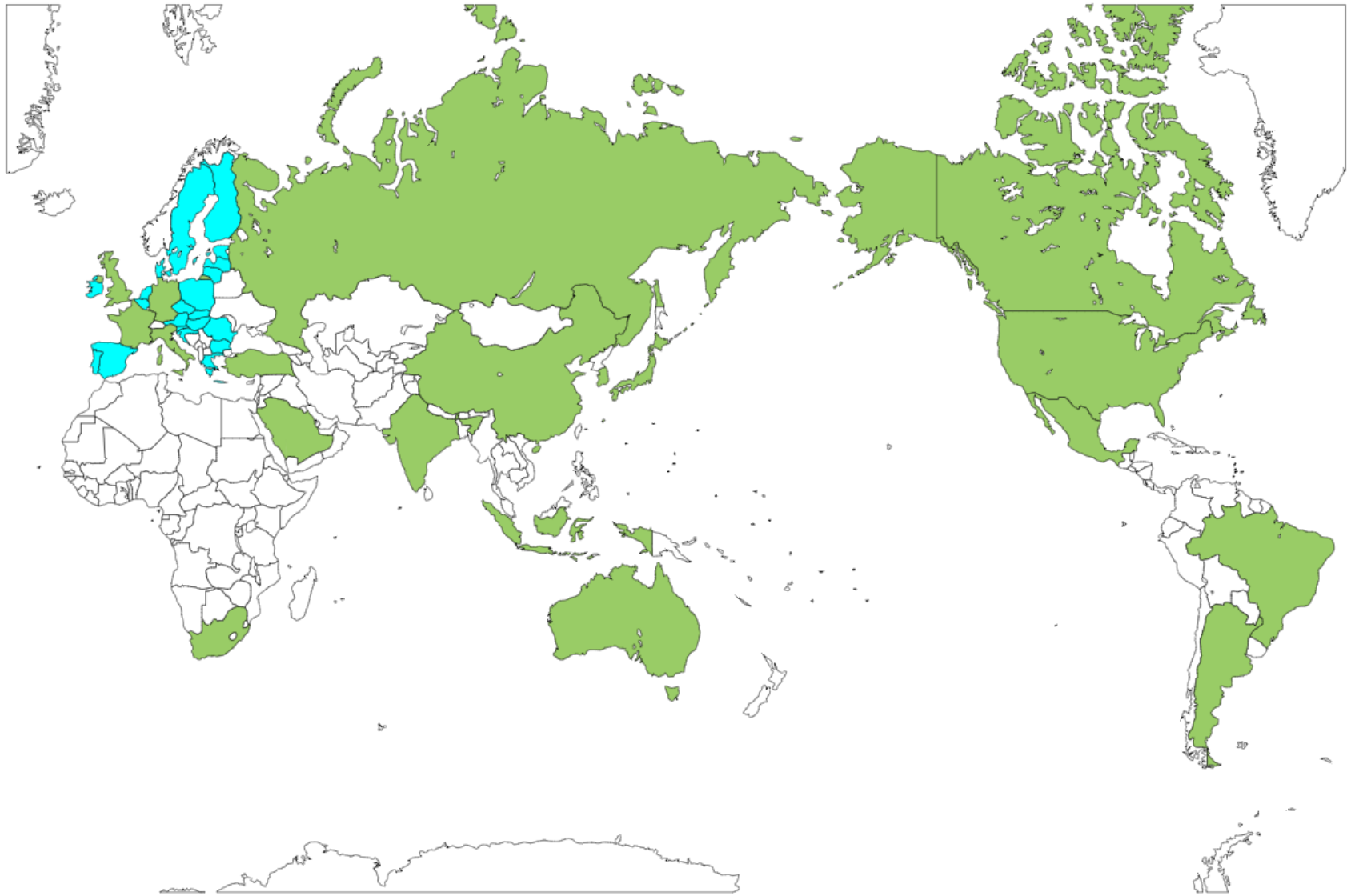
at JABEE, which is named after “Japan Accreditation Board of Engineering Education”, and a signatory member of the Washington Accord:

- Chair of the Criteria Committee
- Director in JABEE

Quiz: What do the colored countries/regions compose?



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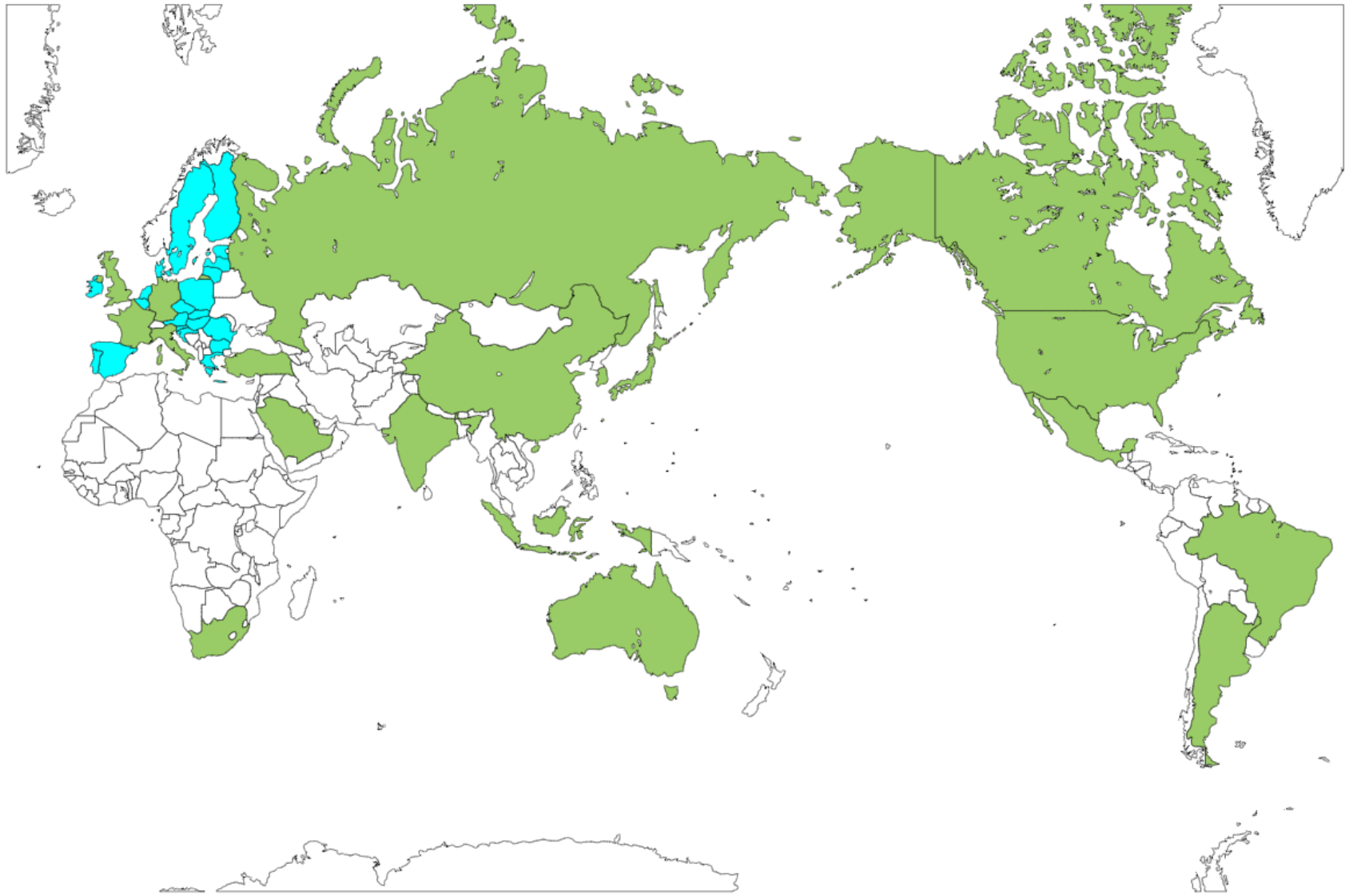
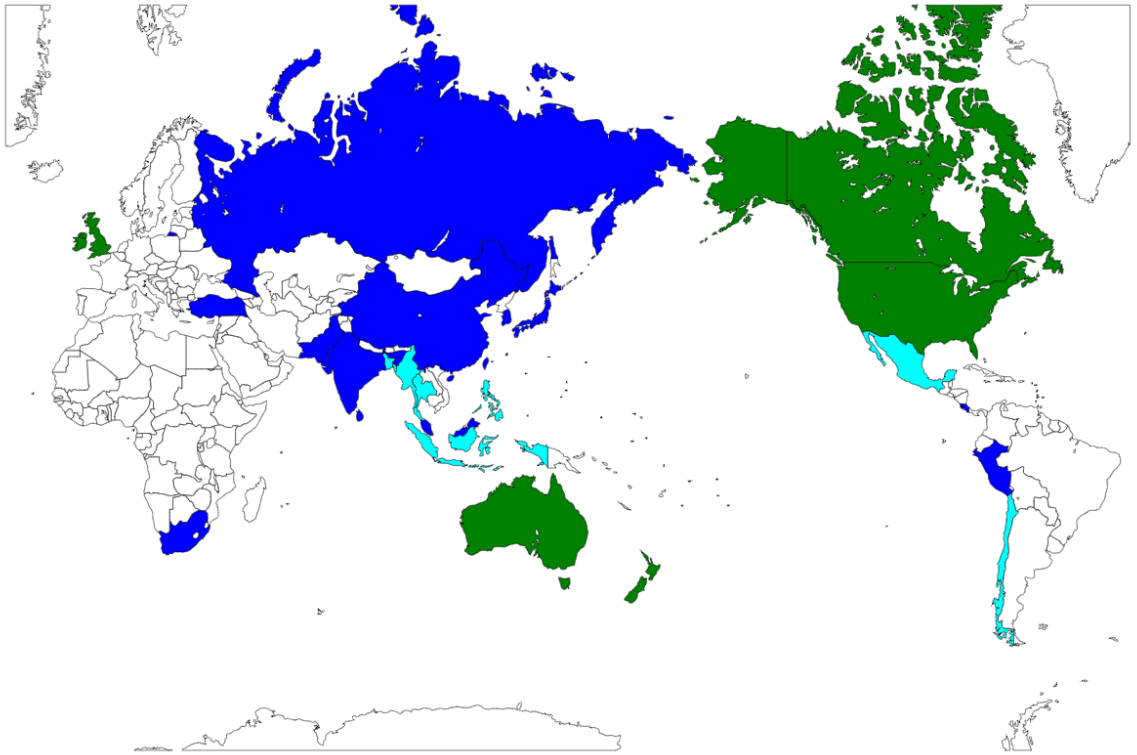


G20 (Group of twenty)

Argentina	Japan
Australia	Korea
Brazil	Mexico
Canada	Russia
China	Saudi Arabia
France	South Africa
Germany	Turkey
India	U. K.
Indonesia	U. S. A.
Italy	EU

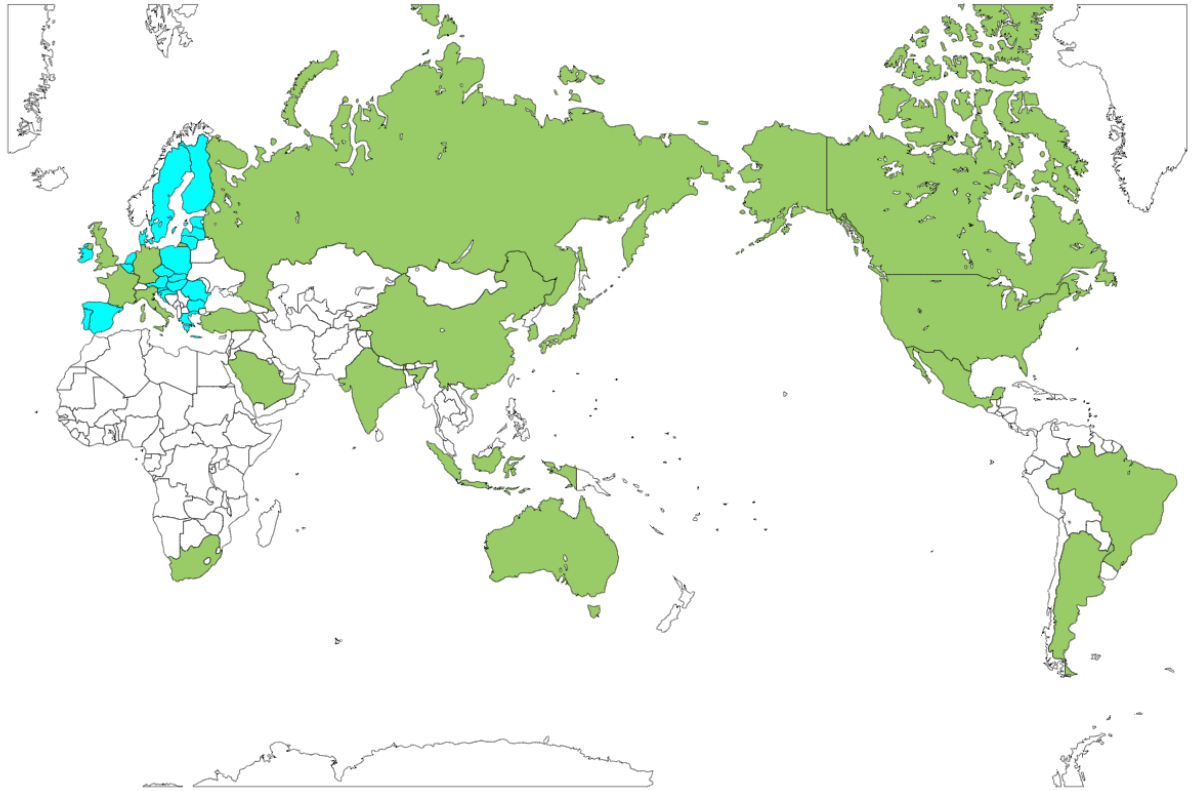
Well, how about this?

??????????????????????



Green: Founders
Blue: Signatory members
Sky blue: Provisional members

G20 (Group of twenty)



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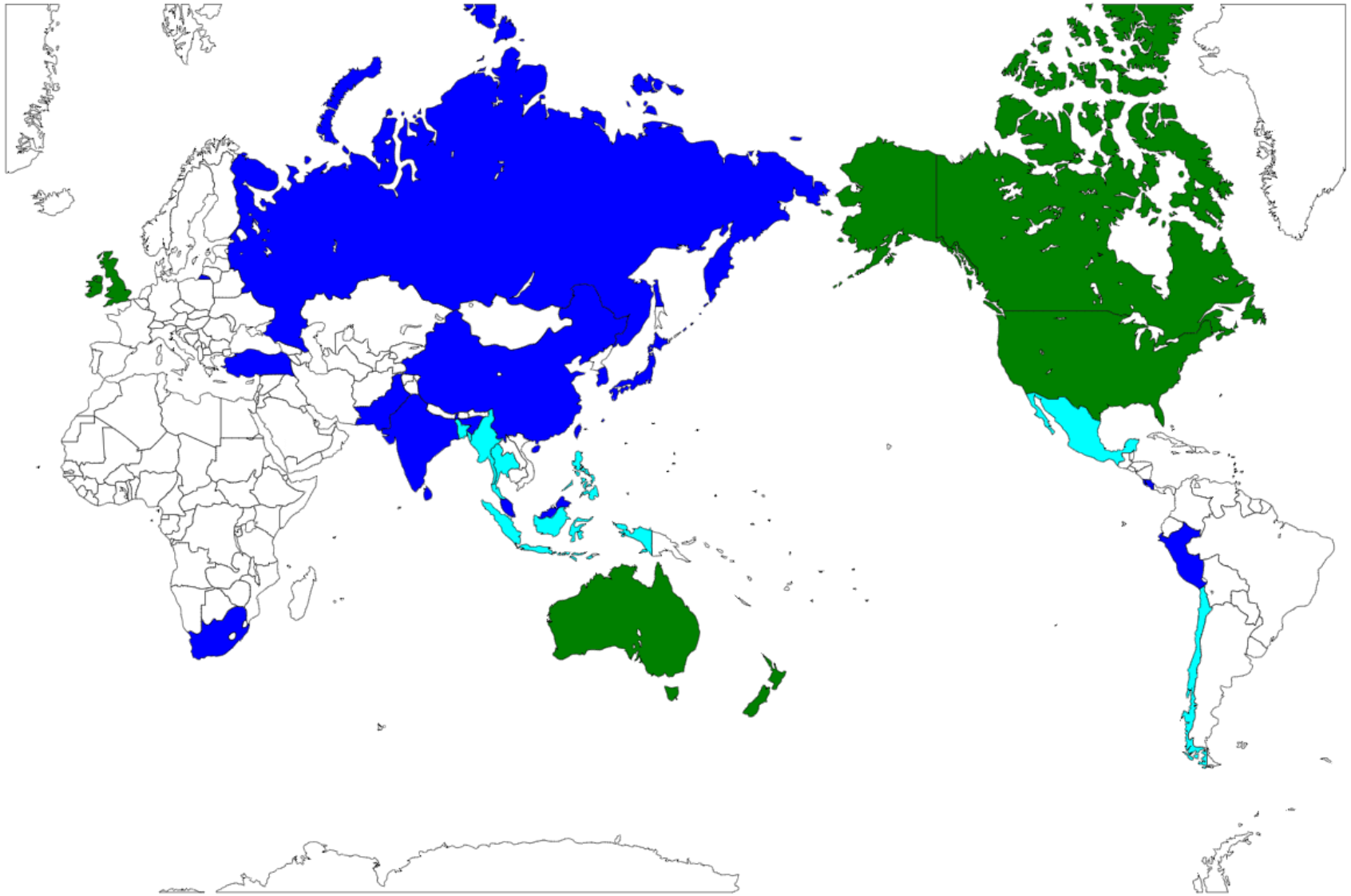
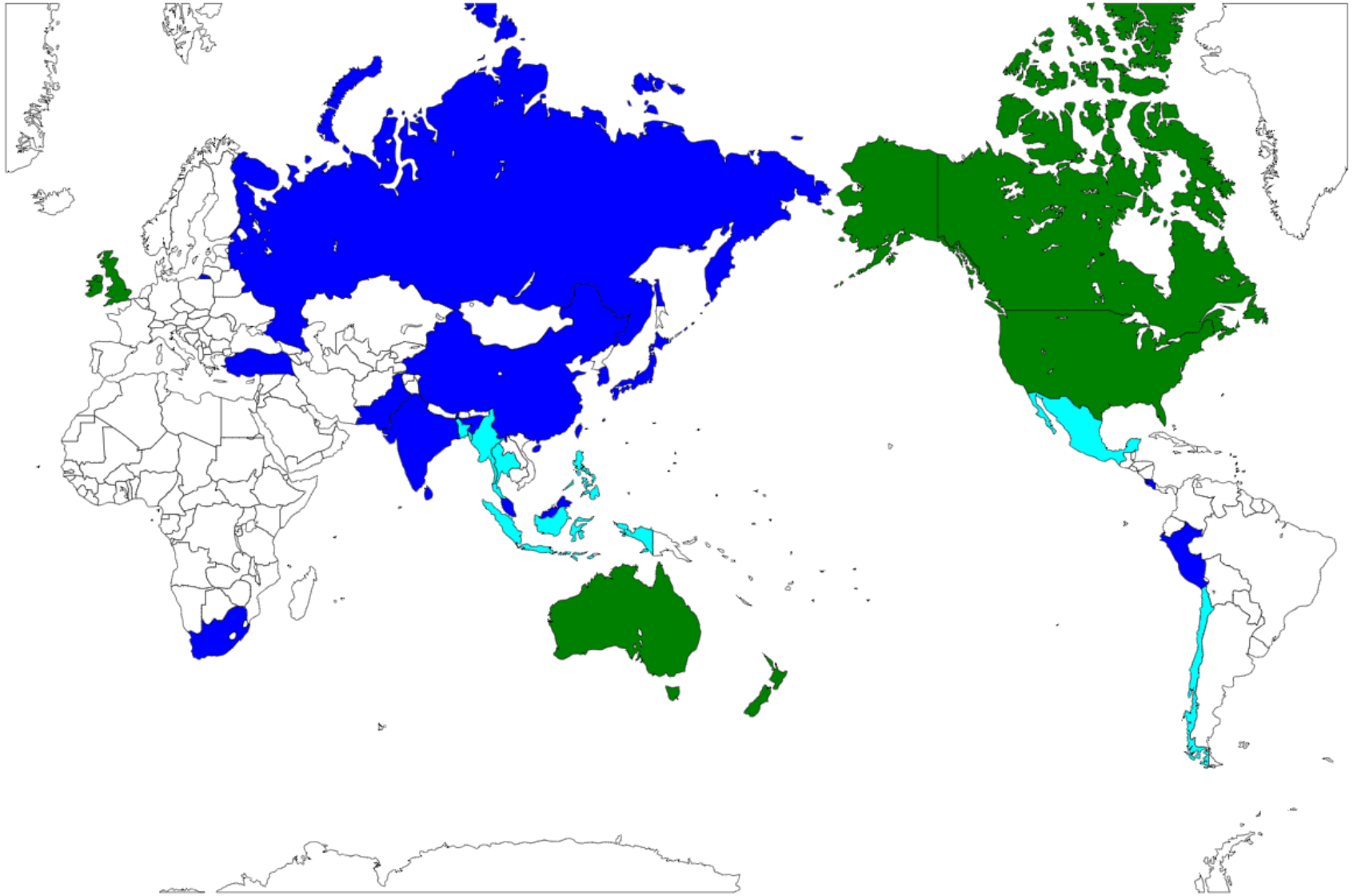


Green: Founding 6 signatories
Blue: Other 15 signatories
Sky blue: 7 Provisional member
as of May 2021

Washington Accord, non-governmental accreditation bodies for (higher) engineering education



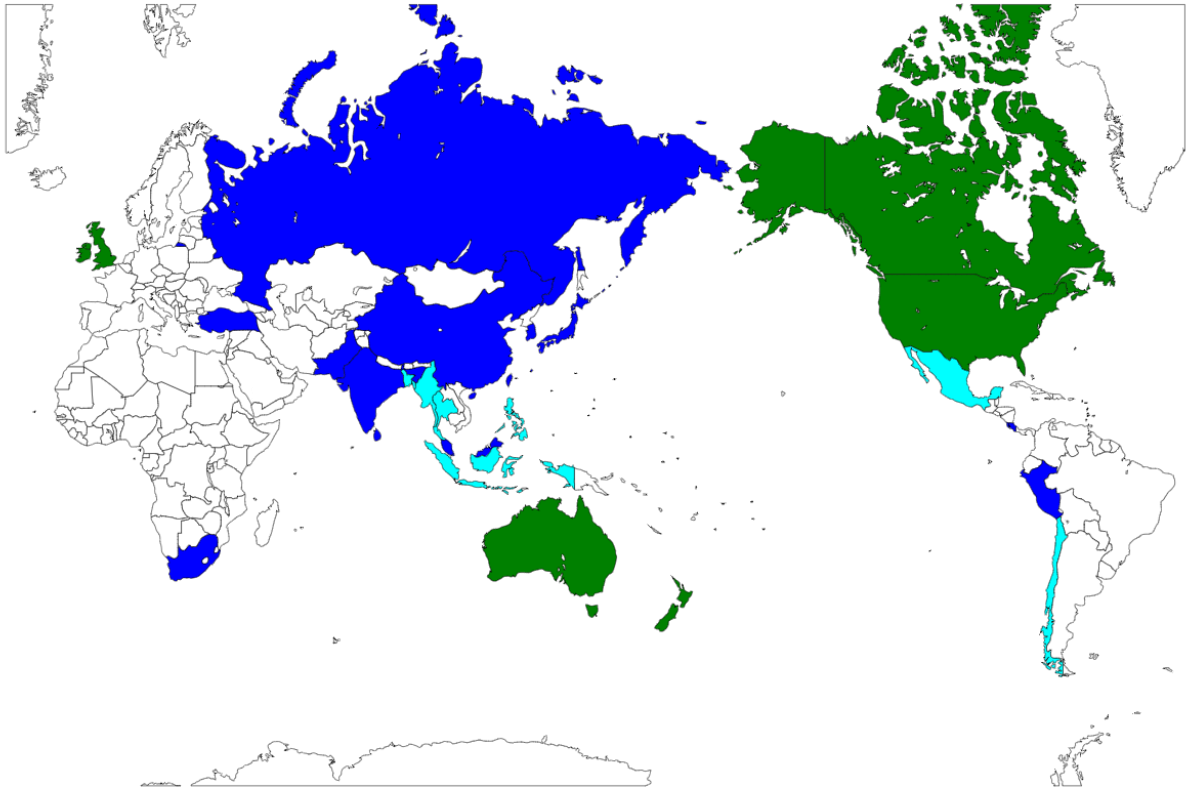
Green: Founding 6 signatories from: Ireland, USA, UK, Australia, Canada, New Zealand

Blue: Other 15 signatories from Japan, Korea, Russia, Malaysia, China, South America, Hong Kong, Taiwan, Singapore, Sri Lanka, India, Turkey, Costa Rica, Pakistan, Peru

Sky blue: 7 Provisional member from:
Chile, Thailand, Bangladesh, Mexico, Philippines, Myanmar, Indonesia

as of May 2021

WA members of accreditation bodies



Signatories

Qualifications accredited or recognized by other signatories are recognized by each signatory as being substantially equivalent to accredited or recognized qualifications within its own jurisdiction.

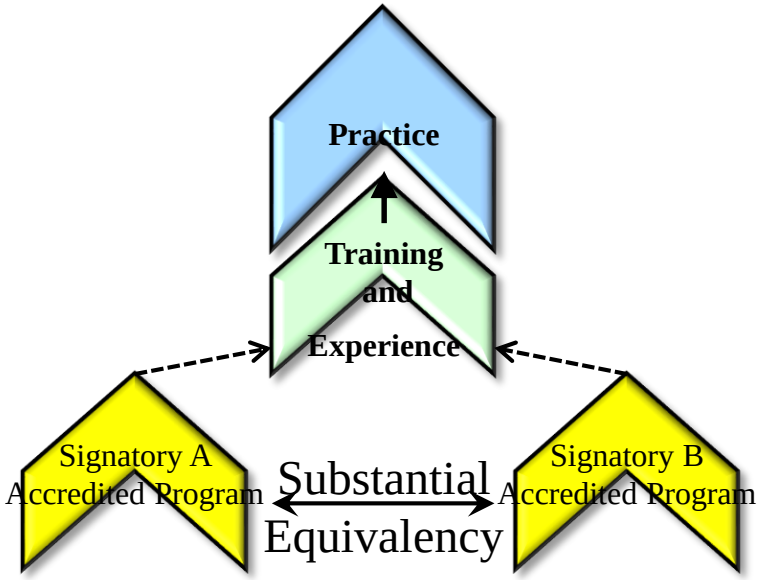
- Korea - Represented by Accreditation Board for Engineering Education of Korea (ABEEK) (2007)
- Russia - Represented by Association for Engineering Education of Russia (AEER) (2012)
- Malaysia - Represented by Board of Engineers Malaysia (BEM) (2009)
- China - Represented by China Association for Science and Technology (CAST) (2016)
- South Africa - Represented by Engineering Council South Africa (ECSA) (1999)
- New Zealand - Represented by Engineering New Zealand (EngNZ) (1989)
- Australia - Represented by Engineers Australia (EA) (1989)
- Canada - Represented by Engineers Canada (EC) (1989)
- Ireland - Represented by Engineers Ireland (EI) (1989)
- Hong Kong China - Represented by The Hong Kong Institution of Engineers (HKIE) (1995)
- Chinese Taipei - Represented by Institute of Engineering Education Taiwan (IEET) (2007)
- Singapore - Represented by Institution of Engineers Singapore (IES) (2006)
- Sri Lanka - Represented by Institution of Engineers Sri Lanka (IESL) (2014)
- Japan - Represented by JABEE (2005)
- India - Represented by National Board of Accreditation (NBA) (2014)
- United States - Represented by Accreditation Board for Engineering and Technology (ABET) (1989)
- Turkey - Represented by Association for Evaluation and Accreditation of Engineering Programs (MÜDEK) (2011)
- United Kingdom - Represented by Engineering Council United Kingdom (ECUK) (1989)
- Costa Rica - Represented by Colegio Federado de Ingenieros y de Arquitectos de Costa Rica (CFIA) (2020)
- Pakistan - Represented by Pakistan Engineering Council (PEC) (2017)
- Peru - Represented by Instituto de Calidad y Acreditacion de Programas de Computacion, Ingenieria y Tecnologia (ICACIT) (2018)

Provisional signatories

- Chile - Represented by Agencia Acreditadora Colegio De Ingenieros De Chile S A (ACREDITA CI) (2018-)
- Thailand - Represented by Council of Engineers Thailand (COET) (2019-)
- Bangladesh - Represented by The Institution of Engineers Bangladesh (IEB) (2016-)
- Mexico - Represented by Consejo de Acreditación de la Enseñanza de la Ingeniería (CACEI) (2016-)
- Philippines - Represented by Philippine Technological Council (PTC) (2016-)
- Myanmar - Represented by Myanmar Engineering Council (MEngC) (2019-)
- Indonesia - Represented by Indonesian Accreditation Board for Engineering Education (IABEE) (2019-)

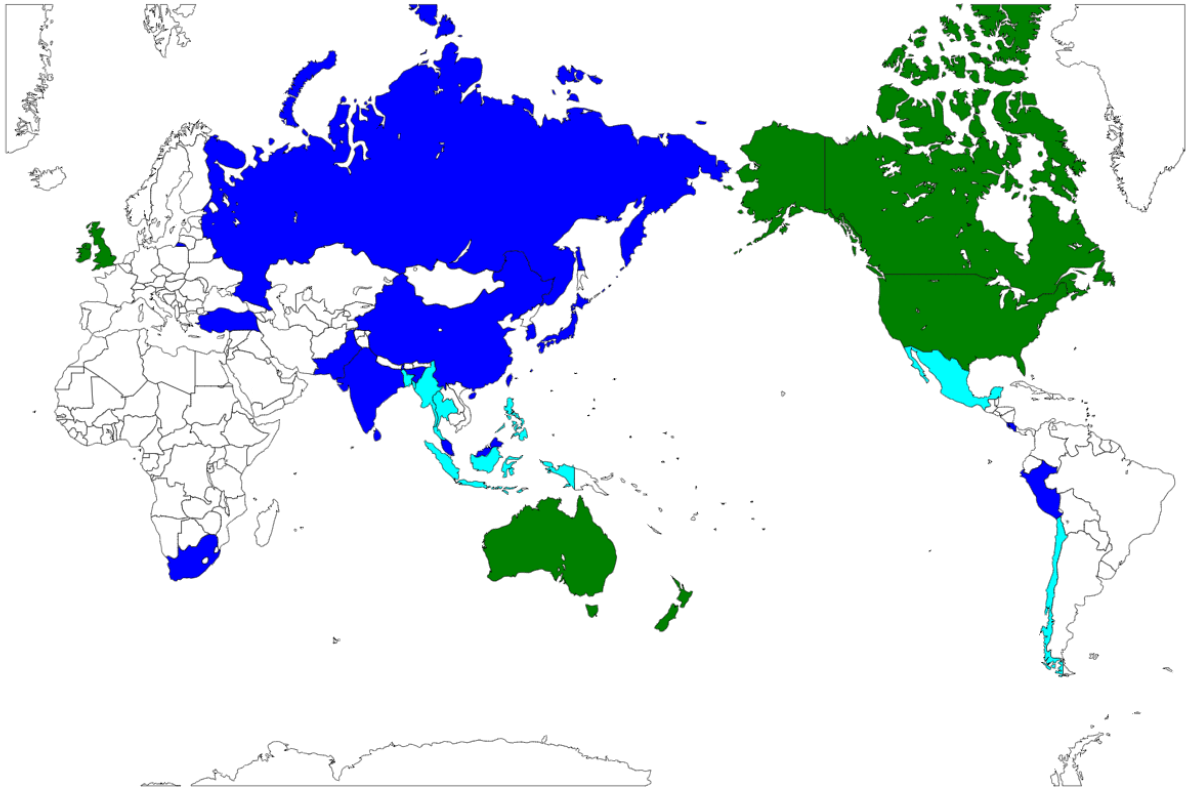
Washington Accord…toward “global” mobility

- WA established in 1989 by 6 accreditation bodies for engineering education in Australia, Canada, UK, Ireland, New Zealand and USA.
- Accreditation bodies (of WA signatories) accredit educational programs with “similar” criteria.
- They recognizes substantial equivalency of accredited programs under the accord.
- They discuss continuously about better accreditation principle.



Applied to educational programs means that two programs, while not meeting a single set of criteria, are both acceptable as preparing their respective graduates to enter formative development toward registration.

WA members of accreditation bodies



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Provisional signatories

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Bologna Process

https://ec.europa.eu/education/policies/higher-education/bologna-process-and-european-higher-education-area_en

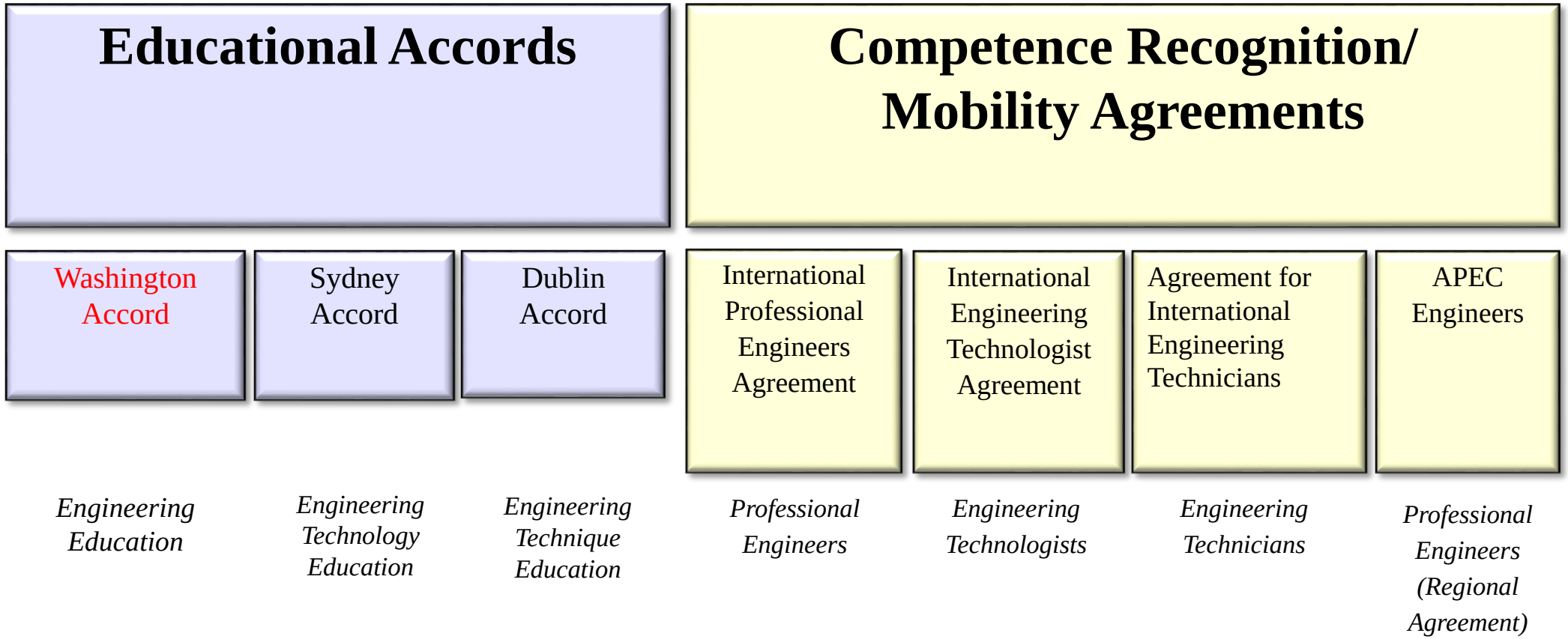
- the mechanism promoting intergovernmental cooperation between 48 European countries in the field of higher education

more than 27 EU countries

- all participating countries agreed to:
  - introduce a three-cycle higher education system consisting of bachelor's, master's and doctoral studies
  - ensure the mutual recognition of qualifications and learning periods abroad completed at other universities
  - implement a system of quality assurance, to strengthen the quality and relevance of learning and teaching

http://www.ehea.info/Upload/image/Map_Ministerial_Conferences_574832.png

International Engineering Alliance http://www.ieagreements.org/



Advantages to be graduates from programs accredited by WA signatories, as the mutual recognition of the substantial equivalency

Hong Kong

- Being a graduate from accredited program is a pre-requisite for the registration for Professional Engineers. Programs accredited by WA signatories are considered as equivalent.

Malaysia

- Only graduates from programs accredited by BEM (Board of Engineers Malaysia) and by WA signatories are eligible for PE examination.
- For Malaysian students wishing to study engineering in Japan, Malaysian Government scholarship is granted to only who are enrolled in JABEE programs.

Australia

- Assessment of application for permanent residence as an engineer is simpler for graduates from programs accredited by WA signatories.

USA

- For FE (Fundamentals of Engineering), some states consider graduates from programs accredited by WA signatories as equivalent to ABET graduates.

Japan

- Four Indonesian programs accredited outside Japan by JABEE will be regarded as equivalent to programs accredited in Japan, and graduates will be able to register as Assistant Professional Engineers (announced in the Official Gazette on March 31, 2021).

2019 Ranking of Secondary Industry Employment Population

1. China
2. India
3. United States
4. Indonesia
5. Russia
6. Brazil
7. Pakistan
8. Japan
9. Vietnam
10. Mexico
11. Bangladesh
12. Germany
13. Thailand
14. Philippines
15. Egypt
16. Turkey
17. Iran
18. Korea
19. Nigeria
20. Italy
21. United Kingdom
22. Poland
23. France
24. Ethiopia
25. Colombia
26. Ukraine
27. Taiwan
28. Uzbekistan
29. Malaysia
30. Spain
31. Argentina
32. Myanmar
33. South Africa
34. Canada
35. Saudi Arabia
36. Algeria
37. Peru
38. Congo
39. Cambodia
40. Ghana
41. Romania
42. Nepal
43. Australia
44. Sri Lanka
45. Morocco
46. Burkina Faso
47. UAE
48. North Korea
49. Iraq
50. Czech
51. Chile

2020 GDP Ranking of countries/regions

1. United States
2. China
3. Japan
4. Germany
5. United Kingdom
6. India
7. France
8. Italy
9. Canada
10. Korea
11. Russia
12. Brazil
13. Australia
14. Spain
15. Mexico
16. Indonesia
17. The Netherland
18. Switzerland
19. Turkey
20. Saudi Arabia
21. Taiwan
22. Iran
23. Poland
24. Sweden
25. Belgium
26. Thailand
27. Nigeria
28. Austria
29. Ireland
30. Israel
31. Argentina
32. Philippines
33. Norway
34. Egypt
35. UAE
36. Denmark
37. Hong Kong
38. Vietnam
39. Singapore
40. Malaysia
41. Bangladesh
42. South Africa
43. Columbia
44. Finland
45. Pakistan
46. Chile
47. Romania
48. Czech
49. Portugal
50. New Zealand
51. Peru

Outcomes based assessment of educational program

- WA signatories require educational programs to assure their quality in education based on graduates' outcomes with sustainability.

- IEA publishes the graduate attributes and professional competency for WA, SA & DA. http://www.ieagreements.org/IEA-Grad-Attr-Prof-Competencies.pdf
- Graduates of engineering schools should equip both of "Engineering Knowledge" and "Graduate Attributes".

IEA (Engineering) Knowledge Profile & Graduate Attributes

Knowledge profile:

1. Natural sciences
2. Mathematics, numerical analysis, statistics, formal aspects of computer and information science
3. Engineering fundamentals
4. Engineering specialist knowledge
5. Knowledge supporting engineering design
6. Knowledge of engineering practice
7. Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline
8. Engagement with selected knowledge in the research literature of the discipline

Graduate Attributes

1. Engineering Knowledge
2. Problem Analysis
3. Design/development of solutions
4. Investigation
5. Modern Tool Usage
6. The Engineer and Society
7. Environment and Sustainability
8. Ethics
9. Individual and Team work
10. Communication
11. Project Management and Finance
12. Life Long Learning

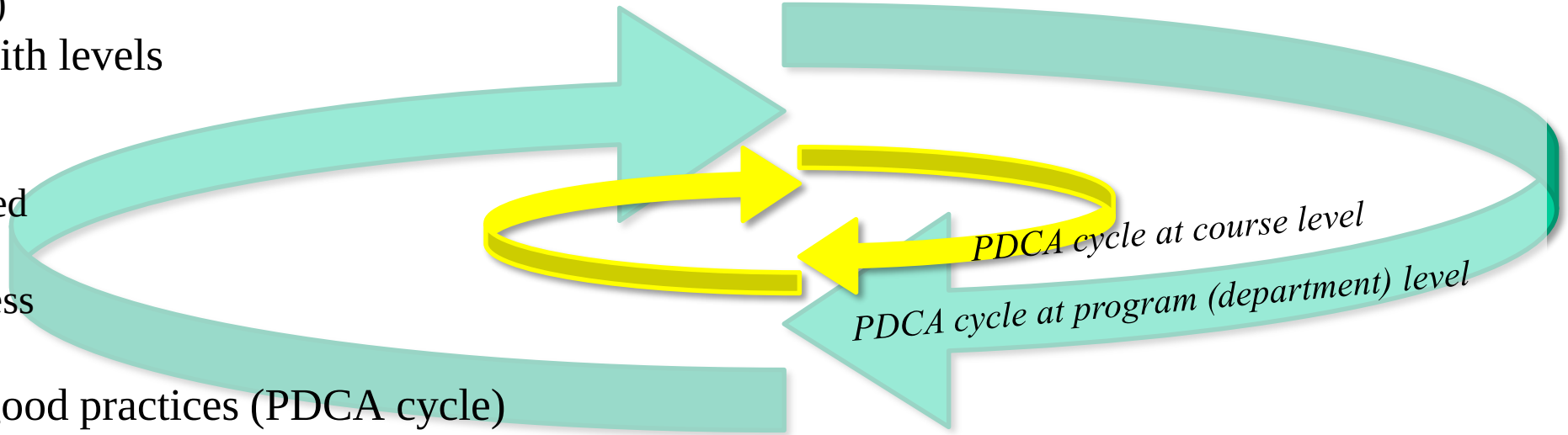
Rubric-based competency development program in Chuo University

Rubric-based Competency Development Project in Faculty of Science and Engineering, Chuo University

- Kick-off: Summer, 2008
- National Project “Good Practice in Higher Education” from autumn 2009 to March 2012
- Goal:
  - Clarification of graduate attributes (competencies) of Faculty of Science and Engineering, Chuo University
  - Development of systematic curriculum and teaching method of the competencies
- Project leader: Mitsunori Makino
- Leading department: Information and System Engineering (Computer Engineering)
- Awards / Recognition
  - Best 30 Courses in Japan which develop fundamental competency towards member of society, awarded by METI (Mar. 2014)
  - Education Award, awarded by Japanese Society for Engineering Education (Aug. 2013)

Procedure of Competency Development in Chuo Univ.

1. Definition of Educational Goal
2. Definition of competencies as graduate attributes
   a. Communication ability (listening ability, reading comprehension, descriptive writing ability, ability to make proposals & discussion ability)
   b. Problem-solving ability (problem discovery, problem analysis, logical thinking, executing plans & verification)
   c. Knowledge acquisition ability (learning, application ability & information gathering ability)
   d. Organized behavior capabilities (balancing ability, role recognition, independence, cooperation, & initiative)
   e. Creative ability (conceptual ability, reasoning ability, ability to feel emotion & desire to explore)
   f. Self-realization ability (goal setting, schedule management, self-control, stress control & achievement orientation)
   g. Specialization (Basic academic ability, mathematics/natural sciences, information technology foundation, specialized knowledge & accuracy)
3. Detailed competencies with levels
   i. Problematic
   ii. Awaiting
   iii. Standard, to be expected
   iv. Original
   v. Excellent, exemplariness
4. Application to courses
5. Sharing information on good practices (PDCA cycle)

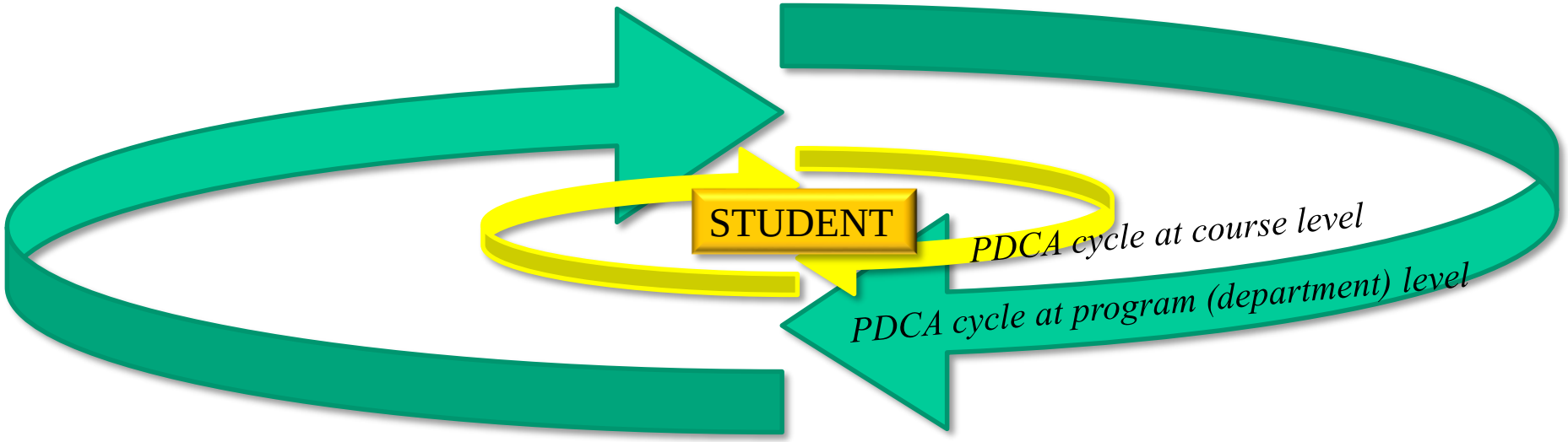


Chuo-U rubric-based competency

- Define the image of human resources to be cultivated, and specifically and step-by-step define what skills have been improved and should be improved in the future, and guarantee the level of achievement of graduates.
- For each of the 36 keywords in the 8 categories (including the "expertise" competency of each department), 6 levels are established, and typical student behavior is defined for each category.
- In the Department of Information System and Engineering, competencies are linked to the three policies and the curriculum map, and the types and levels of competencies expected to be cultivated/expressed in each subject are set, which are used as indicators for course instructors to design classes and check achievement levels (outcomes).

Two points for applying rubric to course assessment

1. Define the dimensions and scales which can be checked in the course. Then descriptor at each level can be described according to supposed students' action.
2. If necessary, revise course which encourages students' "awareness" and "innovation."



Definition of evaluation rubrics for students' performance

- From the table of students' performance, choose major performances related to the course outcome. The selected ones must be able to observed on all students in the course.
- Considering the level of course outcomes, define evaluation rubrics about the selected performance.

Assessment sheet for a project course at poster session & demonstration (throught observation and interview)

中央大学理工学部　情報工学科　画像・映像　コンテンツ演習　プレゼンテーション評価

チーム名：
タイトル：

他者と比べ特によくできている◎、
できている○、
できていない×
で回答ください

評価カテゴリー	評価項目（★は必須項目）	設問	回答欄
チーム評価 ポスター	★メッセージ伝達	工夫した点や課題に対する自分達の考察などメンバーのメッセージ（主張）が書かれていましたか？そのメッセージが伝わりましたか？	
	分かり易さ	わかり易く作られていましたか？説明を受けなくても要点がわかるようになっていますか？ （表示すべき項目（目的・提案・結果・考察等）がカバーされている？その配置は適切？）	
	資料の見栄え	見栄えは良かったですか？（資料の色使いは適切？文字が小さすぎない？） 図表や絵などうまく取り入れていますか？	
	★出典	【質問例：　記載された情報の出所は？どうやって調べたか？】 ネットで集めた情報等をそのまま載せるのではなく、出典が明らかな情報を取得し、その出典を明記していますか？	

中央大学理工学部　情報工学科　画像・映像　コンテンツ演習　プレゼンテーション評価

他者と比べ特によくできている◎、
できている○、
できていない×
で回答ください

評価カテゴリー	評価項目（★は必須項目）	設問	メンバー名 ①	②	③	④	⑤
個別評価 プレゼンテーション	★事前準備	（事前に練習をしたかどうか訊ねてください） 事前に十分な練習を行い、その成果が現れていますか？					
	★取り組み姿勢	まじめに取り組んでいましたか？　服装や話す際の態度など好感が持てましたか？					
	★能動性	聞かれたら応えるのではなく、自らメッセージを伝えることができていましたか？					
	★質疑応答	質問の意図を正しく把握し、適切な質疑応答ができていましたか？					

Rubric for assessment of undergraduate research, ISE Department

- Score 95
  The student attends almost every seminar with a high level of quality and quantity of research and presentation. In addition to the seminars (including workshops organized by the department), the students are actively engaged in independent research. In their graduation theses, students write about the background, purpose, methods, characteristics, and evaluation of their research at a high level, based on their high level of writing and logical skills. In their presentations, they correctly and effectively present the background, objectives, methods, characteristics, and evaluation considerations of their research, and answer questions appropriately. Overall, this is an outstanding research activity and can serve as a model for other students.
- Score 85
  The student's absences from seminars are limited, and the student conducts research and makes presentations at a level higher than that instructed by the supervising professor. They engage in research independently and actively to some extent outside of seminars, but not to the extent that they can serve as a model for other students. In their graduation theses, based on their ability to write correctly and logically, they express their thoughts on the background, purpose, methods, characteristics, and evaluation of their research in an orderly manner. In the presentation, the student correctly presents the background, objectives, methods, characteristics, and evaluation considerations of his/her own research, and answers questions appropriately. Overall, the student's research activities were good, and although not outstanding, it could be a standard that other students should be expected to meet.
- Score 75
  The student generally attends seminars and conducts research and presentations at a level equal to or higher than that instructed by the supervising professor. Students show initiative in their research outside of seminars, but do not go beyond what is instructed. In the graduation thesis, the student correctly describes the background, purpose, methods, characteristics, evaluation and discussion of the research, and logically expresses his/her own ideas. In the presentation, the student correctly describes the background, purpose, means, characteristics, and evaluation considerations of his/her own research, and generally answers questions appropriately.
- Score 65
  The student generally attends the seminar, and conducts research and makes presentations in accordance with the instructions of the supervisor in terms of both quality and quantity. They also conduct research outside of seminars to the extent instructed. In the graduation thesis, the student writes about the minimum necessary research background, objectives, methods, characteristics, evaluation and discussion, etc., using normal descriptive and logical skills. In his presentation, he described his research background, objectives, methods, characteristics, and evaluation considerations, but he was not very clear or logical, and his responses to questions and answers were somewhat inaccurate. Overall, the research activities did not exceed the scope of the instructions, and should not be disclosed to other students.
- Not-passed
  There were many absences from unsuccessful seminars, and the reasons for these absences were unclear. Students fail to follow the instructions of their supervisors in research and presentations in seminars and in research activities outside of seminars, and as a result, may have a negative impact on other students. The graduation thesis fails to meet the required quantity and quality of content (background, objectives, methods, characteristics, evaluation and discussion, etc.), and the presentation and question-and-answer session are very inaccurate. Overall, the research activity is sluggish or contains many errors.

For assurance of educational quality through achieving graduate attributes

- Competency development is becoming mandatory in higher education in Japan as well as global (engineering) education.
- Combination of the rubric-based competency development with engineering education seems positive result from our project.
- How do we promote the rubric-based competency development to wide area of engineering education ?
  - Understanding of importance
  - Re-organization of courses, if necessary

This educational activity is also innovative “engineering research” for me,
i.e., it is the a series of problem finding/specification, solution formulation, implementation and evaluation.

Seeing is believing

A year stay at UIC as a visiting scholar in 2003-2004 has influenced on my R&D and domestic/international activities in engineering education.

(@UIC Engineering EXPO 2003, on Apr. 22, 2003

Thank you for your attention!

Your interests/comments/suggestions
would be appreciated for our activities!

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