Engineering Education Task Force

Michael Conzett, P.E., Chair

ABSTRACT

The Engineering Education Task Force was formed in 2007 (as the Bachelor's Plus 30 Task Force) to address the additional education requirement for initial engineering licensure. As in previous years, the task force represents a wide range of views. It includes NCEES member board members, a consultant from ABET, and resource members from the following societies: American Council of Engineering Companies; American Institute of Chemical Engineers; American Society of Civil Engineers; American Society for Engineering Education; American Society of Mechanical Engineers; American Society of Heating, Refrigerating, and Air-Conditioning Engineers; Institute of Electrical and Electronics Engineers–USA; and National Society of Professional Engineers.

The task force addressed its two charges via e-mail and two face-to-face meetings, the first in December and the second in January.

The task force has two motions for Council action. **Motions begin on page 155.**

TEXT

Charge 1

Continue Charges 3 and 4 from last year. Specifically, continue to develop a program to effectively communicate the Council's position on the need for additional education beyond a bachelor's degree in engineering, using current NCEES communication vehicles and other resources deemed appropriate. Modify, if necessary, the white paper that was developed on the additional education initiative to include a rationale and implementation schedule.

The 2008–09 Engineering Education Task Force was charged with developing a program to communicate the need for additional engineering education and with developing a white paper about the initiative. For the communications charge, it developed a list of target audiences and brainstormed the needed messages. For the white paper, it developed a document that provides an overview of the history of the additional education initiative within NCEES, including Council votes on it during the Annual Meeting. Task force members felt that more work and time needed to be devoted to these two charges to address them thoroughly. Therefore, the task force chair recommended that the two charges be continued in 2009–10.

This year's task force reviewed and discussed the white paper (Appendix C of the 2008–09 task force conference report). Task force members agreed that the paper provided a neutral history of the initiative and did not make a case for it one way or the other. They debated whether the purpose of the paper is to give an objective overview or to make a case for the additional education initiative from the Council's position. After some discussion, they agreed that having the neutral document was important but felt that another document needed to be created to make the case for the additional education requirement.

The task force therefore developed a one-page executive summary that can be refined as needed to fit the audiences who would need to understand the additional education initiative and how it will affect them. At its second meeting, the task force reviewed and refined the proposed messages for these audiences. Appendix A provides the one-page executive summary. Appendices B–L include those tailored versions of this master executive summary. The task force recommends that NCEES staff use these messages in its communications efforts.

In addition, as part of the communications efforts, a detailed Web page was created to provide an in-depth history and timeline of the NCEES additional education initiative. It is available on the NCEES Web site at ncees.org/About_NCEES.php (click on the "Engineering education initiative" link on the left).

Charge 2

Consider alternatives to the current additional education requirement that is set forth in the NCEES Model Law*, Section 130.10 C.1.c (1). Alternative solutions may include the four alternatives (or modifications of them) listed in the 2009 task force report and any other feasible combination of college-level courses, approved industry courses (presumably approved by the clearinghouse), mentored experience, etc., that would allow a candidate for licensure to have the appropriate educational requirements to practice at a professional level. Present the task force's findings and recommendations for action by the Council at the 2010 NCEES Annual Meeting.*

At the 2009 Annual Meeting, the Council passed a resolution for the Engineering Education Task Force to further study alternative solutions to the concept of additional education, including "reform to the bachelor's degree program such that the B.S. degree be modified to contain the appropriate educational requirements to practice at a professional level." In addressing this resulting charge, task force reviewed the alternatives described in its 2009 conference report and agreed to focus on the two alternatives described below. These alternatives are not intended to replace the current *Model Law* and *Model Rules* requirements but would be additional pathways to satisfy the additional education requirement for initial licensure.

During these discussions, the task force felt the need to develop some common ground relative to understanding if EAC/ABET could do anything to help address the issue of education reform at the bachelor's level vis-à-vis licensure. One of the society resources developed a PowerPoint presentation that describes the general process that EAC/ABET uses when accrediting programs. As licensing boards, we need to understand that individuals pursue engineering degrees for reasons other than licensure. Universities have to deal with a lot of other issues and constituents besides those related to licensure. Some members of the task force felt that NCEES needs a policy statement against the cuts in higher education hours and that there should be a focus on what is creating these reductions and the impacts these reductions have. As a result of the PowerPoint presentation, the task force had a much clearer understanding as to the constraints that EAC/ABET faces in accrediting programs. Appendix M provides a copy of the PowerPoint presentation.

Alternative 1

The first alternative is to enable candidates earning a B.S. degree from an ABET-accredited bachelor's program that requires a minimum of 150 credit hours to become licensed. To be eligible, the program must have at least 115 credit hours of math, science, and engineering, with at least 75 of the 115 hours in engineering. The NCEES-established clearinghouse would be responsible for approving whether these programs meet the requirements of this provision.

The rationale for accepting degrees from programs that meet these requirements is that the additional education initiative started as a result of an increasing number of bachelor degree programs that don't provide the body of knowledge required for initial licensure. A bachelor's program with these qualifications is more likely to provide the needed body of knowledge, so it should be accepted in fulfilling the additional education requirement.

The task force also discussed whether this alternative should be incorporated into the *Model Law* and/or *Model Rules*. The task force held two votes related to this. The first was to propose a Council motion to charge UPLG with adding to the *Model Law* general requirements for licensure a program that meets these requirements as a pathway to licensure after 2020. Five task force members voted in favor, and four voted in opposition. The chair was opposed but chose not to have his vote count as an official vote. Of the resources, five voted for this and three against. Those voting against it said the main reason they opposed it is that they like the spirit of it but feel that it should be an exception because a small number of programs would fit this. It therefore should not be a model for state law. The task force will present a motion to charge the UPLG Committee with adding language to *Model Law* 130.10 to incorporate this as a pathway to licensure in 2020.

The second task force vote was whether to present a motion to charge the UPLG Committee with incorporating this path to licensure into the Model Law Engineer 2020 definition within *Model Rules* 210.20, Definitions. Doing so would in essence translate to universal comity because it would receive the MLE 2020 designation as part of an NCEES Record. Most jurisdictions use the NCEES Record to expedite comity applications.

Four task force members voted in favor; five voted in opposition. The chair was against it as well but again did not cast an official vote. Those voting for including this alternative as part of the MLE 2020 definition argued that even though the alternative would include only a small number of programs, it would recognize bachelor's programs that provide the needed breadth. Those against it said that the MLE designation is supposed to be the

gold standard for licensure; if someone follows an acceptable path other than this gold standard, they should be allowed to be licensed as described in *Model Law* 130.10. However, they should not receive the MLE designation. Three resources voted for adding this alternative to *Model Rules* 210.20 B; five voted against it.

Alternative 2

The second alternative the task force discussed is one in which a candidate would earn a B.S. degree from an ABET-accredited program and then complete a prescribed number of technical development units and six years of experience with structured mentoring. Those in favor of this alternative argued that it offers flexibility for the candidate, recognizes the B.S. degree as the degree needed to be an engineer (when combined with experience), formalizes the training and experience aspect of licensure, reinforces the concept of lifelong learning, and starts lifelong learning early in the licensure process.

Those opposed to this alternative were concerned about ensuring that the education is of sufficient rigor and at the level expected; how achievement of the learning outcomes would be assessed; and whether the mentoring would be consistent and verifiable and would actually achieve the minimal expectations in all cases.

Courses such as one-week intensive industry courses could count toward the educational requirement, while continuing education courses as they mostly are today (not necessarily with rigor and assessment) would not. The task force created a new term—assessed learning days—to describe this coursework and to highlight that these educational experiences are different from college courses and continuing education courses. The task force discussed the number as 30 but felt that there needed to be much more study before determining the required amount of assessed learning days.

The task force came to a consensus that this alternative is very different from the current *Model Law/Rules* language and that the group would not be able to flesh out the details within the amount of time it had to conduct its work this year. They agreed that the Council needed to weigh in on the concept before moving forward on it. The task force held two votes related to this. The first was, "Do you support the concept as presented today?" Four task force members voted yes, and six voted no. The chair was also opposed to the concept. Of the resources, four voted yes, and four voted no.

Though a majority of the task force was not for this concept, it did agree that the decision on whether to pursue this concept further should be made by the Council at the Annual Meeting. Seven task force members voted for presenting this as Council motion, and three voted against it. The chair was also for presenting the motion. Six resources voted for doing this, and two voted against it. The task force will therefore present Motion 2 for the appropriate committee to be charged with further studying this concept.

Clearinghouse update

In 2009, the Council passed a motion for NCEES to further develop a national clearinghouse that would carry out the activities associated with implementing the master's or equivalent education requirement for engineering licensure. NCEES staff has been charged with doing this, and the task force received an update from the executive director. The concept is broader than the task force originally envisioned because it considers initiatives other than just the additional education requirement, including the possible move to computer-based testing and the definite move to an examinee management system in October 2010. The task force provided feedback and suggestions.

Respectfully submitted, the **Engineering Education Task Force:**

Michael Conzett, P.E., Chair

Members
Carmine Balascio, Ph.D., P.E.
Regina Dinger
Craig Fredeen, P.E.
Kathy Gustin Williams, P.E.
Howard (Skip) Harclerode II, P.E.
Roger Helgoth, DEE, P.E.
Patty Mamola, P.E.
James Milligan, Ph.D. P.E.
Jon Nelson, P.E.
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Consultant
William Clark, P.E. (ABET)

Society resources
Richard Hayter, Ph.D, P.E. (ASHRAE)
Robert Luna, Ph.D., P.E. (ASME)
Craig Musselman, P.E. (NSPE)
James Nelson, Ph.D., P.E. (ASEE)
William Parrish, Ph.D., P.E. (AIChE)
William Stout, P.E. (ACEC)
Nicholas Textor, P.E. (ASCE)
Gregg Vaughn, Ph.D., P.E. (IEEE-USA)

Board liaison
Dale Jans, P.E.

Staff liaison
Keri Anderson

MOTIONS

Mr. President, I request the privilege of the floor to make the following motions on behalf of the Engineering Education Task Force.

1. Move that the UPLG Committee be charged with incorporating the following language into the *Model Law*.

Model Law

130.10 General Requirements for Licensure

Education, experience, and examinations (as described in *Model Rules*) are required for licensure as a professional engineer or professional surveyor.

C. Professional Engineer or Professional Surveyor – To be eligible for admission to the examination for professional engineers or professional surveyors, an applicant must be of good character and reputation and shall submit five references acceptable to the board with his or her application for licensure, three of which references shall be professional engineers or professional surveyors having personal knowledge of the applicant's engineering or surveying experience.

1. As a Professional Engineer – The following shall be considered as minimum evidence satisfactory to the board that the applicant is qualified for licensure as a professional engineer.

c. Licensure by Examination (Effective January 1, 2020) – The following individuals shall be admitted to an 8-hour written examination in the principles and practice of engineering and, upon passing such examination and providing proof of graduation, shall be licensed as a professional engineer, if otherwise qualified:

(1) An engineer intern who satisfies one of the following education and experience requirements:

(a) Following the bachelor's degree, an acceptable amount of coursework resulting in a master's degree in engineering from an institution that offers EAC/ABET-accredited programs, or the equivalent, and with a specific record of 3 years or more of progressive experience on engineering projects of a grade and a character which indicate to the board that the applicant may be competent to practice engineering

(b) Following a master's degree in engineering from an EAC/M-ABET-accredited program, a specific record of 3 years or more of progressive experience on engineering projects of a grade and a character which indicate to the board that the applicant may be competent to practice engineering

(c) Following the bachelor's degree, an acceptable amount of coursework as defined in NCEES *Model Rules* Section 230.10 D from approved course providers and a specific record of 4 years or more of progressive experience on engineering projects of a grade and a character which indicate to the board that the applicant may be competent to practice engineering

(d) <u>Following a bachelor's degree from an EAC/ABET-accredited program that has a minimum of 150 semester credit hours, of which at least 115 are in math, science, and engineering combined and at least 75 of the 115 are in engineering, a specific record of 4 years or more of progressive experience on engineering projects of a grade and a character which indicate to the board that the applicant may be competent to practice engineering</u>

(2) An engineer intern with a doctorate in engineering acceptable to the board and with a specific record of 2 years or more of progressive experience on engineering projects of a grade and a character which indicate to the board that the applicant may be competent to practice engineering

(3) An individual with a doctorate in engineering acceptable to the board and with a specific record of 4 years or more of progressive experience on engineering projects of a grade and a character which indicate to the board that the applicant may be competent to practice engineering

The Board of Directors endorses Motion 1.

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2. Move that the appropriate committee be charged with further studying the following concept as a possible alternate pathway to the educational requirement for engineering licensure:

   Recognizing the need to develop knowledge, skills, and attitudes beyond the baccalaureate and before licensure and recognizing that significant learning can occur outside the classroom, the following is proposed as an alternate pathway to licensure.

   Upon graduating with a B.S. degree in engineering from an EAC/ABET-accredited program, the applicant, during a six-year period of progressive engineering experience before ~~taking the PE exam~~ licensure, would be required to

   - Take courses totaling X (task force discussed 30) assessed learning days (ALD) of continuing education in areas germane to professional practice and that support and enhance capability in the applicant's technical area of practice.
   - Participate in a structured mentoring program amounting to at least 36 hours/year of interaction with a licensed P.E. mentor in the 3 years prior to application to sit for the principles and practice exam. The mentoring interaction is to be documented in a mentoring logbook that becomes part of the applicant's dossier.

   The mentoring program shall be structured to provide assurance that the individual has attained the appropriate body of knowledge for professional practice necessary for the individual's engineering discipline or practice area.

   For the additional coursework, either credit or noncredit courses will be accepted, but the applicant would be required to demonstrate successful completion and that the content of the coursework was of sufficient content and rigor to meet the above requirements. Acceptable demonstration of content and rigor would include: (1) university courses; (2) continuing education courses offering ALDs (or equivalent credit units but not amounting to less than 1 ALD); (3) industrial in-house specialty courses designated as acceptable by the candidate's mentor; and (4) other courses meeting accreditation standards of nationally recognized authorities (including NCEES).

   For the mentoring program, the applicant would be required to meet with and document structured mentoring hours with one or more senior P.E.s in his/her firm or P.E.s practicing in the applicant's desired area of practice. Alternately, the candidate could participate in a mentoring program offered by his/her technical or professional society.

   The Board of Directors endorses Motion 2.

Preamble:

Licensed professional engineers (P.E.s) have a duty in their practice to protect the public health, safety, and welfare. NCEES is an organization that consists of licensing boards that regulate the practice of engineering and surveying in the various jurisdictions across the country (states and territories). NCEES develops and maintains the *Model Law* and *Model Rules*, which represent a consensus of the licensing boards as to what the requirements should be for obtaining and maintaining a license to practice engineering and surveying. These models are intended to be used as a guide by licensing jurisdictions as they consider modifications to their law and rules.

The fundamental issue:

NCEES has concluded that the current baccalaureate degree, which is now the educational standard for engineering licensure, is becoming insufficient to accommodate the body of knowledge required for practice as a P.E. The technological revolution of the 20th and 21st centuries and the ever-increasing need for engineers to address more complex issues have increased the demands placed on today's practicing engineers.

NCEES has therefore set a goal to make a strong system of licensing engineers even stronger by increasing the minimum engineering education required to practice as a P.E. It believes that expanding the education requirement will better prepare P.E.s to meet professional demands and will significantly enhance their careers. NCEES also believes that expanding the education requirement will promote greater proficiency in the practice of professional engineering for the public good.

Background:

Changes to the qualifications for licensure have been under consideration by NCEES for a number of years. Some societies representing the engineering profession are in favor of strengthening the educational qualifications, and some are opposed. Through a process of deliberation and debate over a three-year period, a majority of the NCEES member boards voted to strengthen the educational requirements for licensure by amending the *Model Law* and *Model Rules*.

The current NCEES *Model Law* requires persons applying for professional licensure beginning January 1, 2020, to have additional education beyond the baccalaureate degree prior to becoming licensed. Such requirements would become effective when jurisdictions individually adopt these *Model Law* provisions.

The educational expectations of the *Model Law* after 2020 can be achieved through one of the following pathways:

1. A baccalaureate degree from an EAC/ABET-accredited program plus a master's degree in engineering from an institution that offers EAC/ABET programs;
2. A baccalaureate degree from an EAC/ABET-accredited program plus 30 additional credits of acceptable coursework from approved course providers; or
3. A baccalaureate degree plus a master's degree from an EAC/ABET-accredited program.

NCEES has set 2020 as the goal for the requirement to become effective for those seeking their first license. A minimum 8-year transition period subsequent to adoption by a jurisdiction is recommended to allow jurisdictions and prospective licensees to prepare for the new requirement.

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The fundamental issue:

NCEES has concluded that the current baccalaureate degree, which is now the educational standard for engineering licensure, is becoming insufficient to accommodate the body of knowledge required for practice as a P.E. The technological revolution of the 20th and 21st centuries and the ever-increasing need for engineers to address more complex issues have increased the demands placed on today's practicing engineers.

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Action required:

Each jurisdiction is encouraged to consider adopting the educational provisions of the *Model Law* and *Model Rules*. Consistency of the adopted provisions among jurisdictions is important to facilitate multijurisdictional licensure. It is also important for P.E.s who are duly licensed prior to a jurisdiction's effective date to be exempt from these new requirements.

Licensure boards are also encouraged to mobilize board members to become volunteers in the NCEES Speakers' Bureau.

Background:

Changes to the qualifications for licensure have been under consideration by NCEES for a number of years. Some societies representing the engineering profession are in favor of strengthening the educational qualifications, and some are opposed. Through a process of deliberation and debate over a three-year period, a majority of the NCEES member boards voted to strengthen the educational requirements for licensure by amending the *Model Law* and *Model Rules*.

The current NCEES *Model Law* requires persons applying for professional licensure beginning January 1, 2020, to have additional education beyond the baccalaureate degree prior to becoming licensed. Such requirements would become effective when jurisdictions individually adopt these *Model Law* provisions.

The educational expectations of the *Model Law* after 2020 can be achieved through one of the following pathways:

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3. A baccalaureate degree plus a master's degree from an EAC/ABET-accredited program.

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Comments for licensing boards:

To provide consistency in the administration of the proposed requirements, NCEES is evaluating the development of a national clearinghouse to provide the following services:

- Review and approve education providers and courses
- Assist individual applicants in planning for and complying with the education requirements
- Provide licensure boards with a defendable verification that individuals have met the additional education requirements

This clearinghouse would facilitate implementation and administration of these changes on behalf of jurisdictions.

NCEES is developing a plan to communicate the new requirements to the various stakeholders in licensure. Licensing boards are encouraged to interact with regional, state, and/or local chapters of interested engineering societies before and during the implementation of the new requirements.

In the event the new requirements are considered by a legislature for implementation, for comity purposes the licensing board should stay involved in the process to maintain language that is not significantly different from the language of the NCEES models. In the event there are significant differences in the final language adopted by a jurisdiction's legislature, the licensing board should communicate the differences to other jurisdictions via NCEES.

Preamble: Licensed professional engineers (P.E.s) have a duty in their practice to protect the public health, safety, and welfare. NCEES is an organization that consists of licensing boards that regulate the practice of engineering and surveying in the various jurisdictions across the country (states and territories). NCEES develops and maintains the *Model Law* and *Model Rules*, which represent a consensus of the licensing boards as to what the requirements should be for obtaining and maintaining a license to practice engineering and surveying. These models are intended to be used as a guide by licensing jurisdictions as they consider modifications to their law and rules.

The fundamental issue: NCEES has concluded that the current baccalaureate degree, which is now the educational standard for engineering licensure, is becoming insufficient to accommodate the body of knowledge required for practice as a P.E. The technological revolution of the 20th and 21st centuries and the ever-increasing need for engineers to address more complex issues have increased the demands placed on today's practicing engineers.

NCEES has therefore set a goal to make a strong system of licensing engineers even stronger by increasing the minimum engineering education required to practice as a P.E. It believes that expanding the education requirement will better prepare P.E.s to meet professional demands and will significantly enhance their careers. NCEES also believes that expanding the education requirement will promote greater proficiency in the practice of professional engineering for the public good.

Action required: Volunteers who are part of the NCEES network of speakers should

- Stay informed about current and proposed legislation in a jurisdiction through their state board of licensure
- Stay informed about updates to *Model Law* provisions concerning additional engineering education through ncees.org
- Inform engineering students about the expectation of future additional educational requirements for professional licensure
- Use the most up-to-date version of the Speakers Kit as it is modified to include information about the additional education requirements
- Encourage engineering students to seriously consider obtaining a graduate degree in engineering
- Take an active role in advising engineer interns about professional development by being a mentor

Background: Changes to the qualifications for licensure have been under consideration by NCEES for a number of years. Some societies representing the engineering profession are in favor of strengthening the educational qualifications, and some are opposed. Through a process of deliberation and debate over a three-year period, a majority of the NCEES member boards voted to strengthen the educational requirements for licensure by amending the *Model Law* and *Model Rules*.

The current NCEES *Model Law* requires persons applying for professional licensure beginning January 1, 2020, to have additional education beyond the baccalaureate degree prior to becoming licensed. Such requirements would become effective when jurisdictions individually adopt these *Model Law* provisions.

The educational expectations of the *Model Law* after 2020 can be achieved through one of the following pathways:

1. A baccalaureate degree from an EAC/ABET-accredited program plus a master's degree in engineering from an institution that offers EAC/ABET programs;
2. A baccalaureate degree from an EAC/ABET-accredited program plus 30 additional credits of acceptable coursework from approved course providers; or

3. A baccalaureate degree plus a master's degree from an EAC/ABET-accredited program.

NCEES has set 2020 as the goal for the requirement to become effective for those seeking their first license. A minimum 8-year transition period subsequent to adoption by a jurisdiction is recommended to allow jurisdictions and prospective licensees to prepare for the new requirement.

Comments for NCEES volunteers:

Licensed engineers who frequently speak to engineering students about professional licensure are urged to inform students enrolled in engineering programs about the possible future requirement for additional education to become a licensed professional engineer. It is important that the NCEES volunteer inform the engineering student that this requirement may or may not be applicable in the state where they chose to be licensed; nevertheless, it is important that students be made aware of it.

Appendix D
Key Messages to Engineering Educators, Recipients of the NCEES FE as an Outcomes Assessment Tool Reports, and Career Guidance Counselors

Preamble:

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The fundamental issue:

NCEES has concluded that the current baccalaureate degree, which is now the educational standard for engineering licensure, is becoming insufficient to accommodate the body of knowledge required for practice as a P.E. The technological revolution of the 20th and 21st centuries and the ever-increasing need for engineers to address more complex issues have increased the demands placed on today's practicing engineers.

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Action required:

Engineering educators, university contacts who receive the NCEES FE as an outcomes assessment reports, and college/university guidance counselors are urged to inform and encourage students enrolled in their respective engineering programs about the future requirements to become a licensed professional engineer. Colleges and universities should use communication vehicles that they already use for other student notices. When advising students about curricular and career matters, engineering faculty members should also advise students about these requirements.

Background:

Changes to the qualifications for licensure have been under consideration by NCEES for a number of years. Some societies representing the engineering profession are in favor of strengthening the educational qualifications, and some are opposed. Through a process of deliberation and debate over a three-year period, a majority of the NCEES member boards voted to strengthen the educational requirements for licensure by amending the *Model Law* and *Model Rules*.

The current NCEES *Model Law* requires persons applying for professional licensure beginning January 1, 2020, to have additional education beyond the baccalaureate degree prior to becoming licensed. Such requirements would become effective when jurisdictions individually adopt these *Model Law* provisions.

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3. A baccalaureate degree plus a master's degree from an EAC/ABET-accredited program.

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Comments for educators, FE contacts, and guidance counselors:

Over the next several years, NCEES will develop additional details about the future education requirements. It is important to stay current with these developments, which will be communicated through news releases and posted on ncees.org.

This education requirement will affect only students who desire or may desire to become a licensed engineer in the future. Universities will be key providers of courses—both traditional bricks-and-mortar classes and distance-education ones—that will help fulfill the additional education requirement. All institutions with EAC/ABET-accredited programs will be automatically allowed to provide courses.

Preamble: Licensed professional engineers (P.E.s) have a duty in their practice to protect the public health, safety, and welfare. NCEES is an organization that consists of licensing boards that regulate the practice of engineering and surveying in the various jurisdictions across the country (states and territories). NCEES develops and maintains the *Model Law* and *Model Rules*, which represent a consensus of the licensing boards as to what the requirements should be for obtaining and maintaining a license to practice engineering and surveying. These models are intended to be used as a guide by licensing jurisdictions as they consider modifications to their law and rules.

The fundamental issue: NCEES has concluded that the current baccalaureate degree, which is now the educational standard for engineering licensure, is becoming insufficient to accommodate the body of knowledge required for practice as a P.E. The technological revolution of the 20th and 21st centuries and the ever-increasing need for engineers to address more complex issues have increased the demands placed on today's practicing engineers.

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Action required: Engineering students who are considering licensure now or may consider it in the future should

- Request information about the educational requirements for professional licensure from their college or university career development office or from their state licensing board. Another good source of information is ncees.org.
- Apply to their state's engineering licensing board to take the FE exam
- Take the FE exam as soon as permissible by their licensing board—either their senior year or soon after graduation while their engineering coursework is still fresh
- Earn a degree in engineering from an EAC/ABET-accredited program
- Ask their college or university to identify courses taken in excess of degree requirements
- Consider obtaining a graduate degree in engineering

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2. A baccalaureate degree from an EAC/ABET-accredited program plus 30 additional credits of acceptable coursework from approved course providers; or
3. A baccalaureate degree plus a master's degree from an EAC/ABET-accredited program.

NCEES has set 2020 as the goal for the requirement to become effective for those seeking their first license. A minimum 8-year transition period subsequent to adoption by a jurisdiction is recommended to allow jurisdictions and prospective licensees to prepare for the new requirement.

Comments for students:

Licensed engineers enjoy the professional benefits that accompany this distinction of the P.E. designation. P.E.s are more likely to rise to management positions more quickly and, in most cases, earn a higher salary. They also enjoy far more career options.

It is important that engineering students who desire or may desire to become licensed as a professional engineer in the future to be aware of the possible future requirements for additional engineering education for initial licensure. It is expected that when the new education requirements are implemented, they will not be applied retroactively to P.E.s who were duly licensed prior to the effective date of such changes within their local jurisdiction. This will help assure that eligibility for licensure in other jurisdictions (comity licensure) will be maintained.

Preamble: Licensed professional engineers (P.E.s) have a duty in their practice to protect the public health, safety, and welfare. NCEES is an organization that consists of licensing boards that regulate the practice of engineering and surveying in the various jurisdictions across the country (states and territories). NCEES develops and maintains the *Model Law* and *Model Rules*, which represent a consensus of the licensing boards as to what the requirements should be for obtaining and maintaining a license to practice engineering and surveying. These models are intended to be used as a guide by licensing jurisdictions as they consider modifications to their law and rules.

The fundamental issue: NCEES has concluded that the current baccalaureate degree, which is now the educational standard for engineering licensure, is becoming insufficient to accommodate the body of knowledge required for practice as a P.E. The technological revolution of the 20th and 21st centuries and the ever-increasing need for engineers to address more complex issues have increased the demands placed on today's practicing engineers.

NCEES has therefore set a goal to make a strong system of licensing engineers even stronger by increasing the minimum engineering education required to practice as a P.E. It believes that expanding the education requirement will better prepare P.E.s to meet professional demands and will significantly enhance their careers. NCEES also believes that expanding the education requirement will promote greater proficiency in the practice of professional engineering for the public good.

Action required: Candidates who pass the FE exam and engineer interns should

- For those who have passed the FE exam: Complete their bachelor's degree in engineering and submit the transcript to the licensing board where they took the FE exam to complete their application to become an engineer intern
- Work with their advisor to identify and document courses taken in excess of degree requirements
- Set themselves on a path of lifelong learning
- Consider obtaining a graduate degree in engineering
- Take advantage of continuing education opportunities offered by their employer or profession, and document them
- Find a mentor in their engineering discipline who is a professional engineer
- Document work experience—projects worked on and their role on the project
- Become licensed as soon as possible
- Stay up-to-date about continuing licensure developments through ncees.org and state licensure boards

Background: Changes to the qualifications for licensure have been under consideration by NCEES for a number of years. Some societies representing the engineering profession are in favor of strengthening the educational qualifications, and some are opposed. Through a process of deliberation and debate over a three-year period, a majority of the NCEES member boards voted to strengthen the educational requirements for licensure by amending the *Model Law* and *Model Rules*.

The current NCEES *Model Law* requires persons applying for professional licensure beginning January 1, 2020, to have additional education beyond the baccalaureate degree prior to becoming licensed. Such requirements would become effective when jurisdictions individually adopt these *Model Law* provisions.

The educational expectations of the *Model Law* after 2020 can be achieved through one of the following pathways:

1. A baccalaureate degree from an EAC/ABET-accredited program plus a master's degree in engineering from an institution that offers EAC/ABET programs;

2. A baccalaureate degree from an EAC/ABET-accredited program plus 30 additional credits of acceptable coursework from approved course providers; or
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Comments for examinees who passed the FE and for engineer interns:

It is expected that when the new education requirements are implemented, they will not be applied retroactively to P.E.s who were duly licensed prior to the effective date of such changes within their local jurisdiction. This will help assure that eligibility for licensure in other jurisdictions (comity licensure) will be maintained.

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Action required:

Licensed professional engineers should

- Stay informed about current and proposed legislation in a jurisdiction through their state board of licensure
- Stay informed about updates to *Model Law* provisions concerning additional engineering education through ncees.org
- Take an active role in advising engineer interns about professional development by being a mentor

In jurisdictions where the new requirements are instituted, licensees and engineering societies should play an important role in the development of educational guidelines and infrastructure to assist their members in satisfying any new requirements.

Background:

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Comments for professional engineers:

Licensed professional engineers play an important role with the initiation and consideration of the new requirements by their legislatures. At the state level, licensees and their professional societies can interact with their legislatures to initiate the implementation of the proposed changes or to express their position on any of the proposed changes in the event they are initiated by others. Consistency of the adopted provisions among jurisdictions is important to facilitate multijurisdictional licensure.

It is expected that when the new education requirements are implemented, they will not be applied retroactively to P.E.s who were duly licensed prior to the effective date of such changes within their local jurisdiction. This will help assure that eligibility for licensure in other jurisdictions (comity licensure) will be maintained.

Preamble:

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NCEES has therefore set a goal to make a strong system of licensing engineers even stronger by increasing the minimum engineering education required to practice as a P.E. It believes that expanding the education requirement will better prepare P.E.s to meet professional demands and will significantly enhance their careers. NCEES also believes that expanding the education requirement will promote greater proficiency in the practice of professional engineering for the public good. Other learned professions—architects, CPAs, physicians—have already increased the required education requirement for licensure. The engineering profession needs to do the same to ensure the continued protection of the health, safety, and welfare of the public.

Action required:

Each jurisdiction is encouraged to consider adopting the educational provisions of the *Model Law* and *Model Rules*. Consistency of the adopted provisions among jurisdictions is important to facilitate multijurisdictional licensure. It is also important for P.E.s who are duly licensed prior to a jurisdiction's effective date to be exempt from these new requirements.

With regard to legislation,

- As the legislation is being drafted, the NCEES *Model Law* should be used as the model. Enacting similar legislation from state to state will encourage comity among licensing jurisdictions.
- Legislators are encouraged to consider using the state licensing boards as a resource when drafting the legislation; they are knowledgeable about the NCEES *Model Law* language. The boards should also be given the authority to work out the details of the rules once the law is enacted.

Background:

Changes to the qualifications for licensure have been under consideration by NCEES for a number of years. Some societies representing the engineering profession are in favor of strengthening the educational qualifications, and some are opposed. Through a process of deliberation and debate over a three-year period, a majority of the NCEES member boards voted to strengthen the educational requirements for licensure by amending the *Model Law* and *Model Rules*.

The current NCEES *Model Law* requires persons applying for professional licensure beginning January 1, 2020, to have additional education beyond the baccalaureate degree prior to becoming licensed. Such requirements would become effective when jurisdictions individually adopt these *Model Law* provisions.

The educational expectations of the *Model Law* after 2020 can be achieved through one of the following pathways:

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Comments for state legislators:

State legislators have a significant responsibility to implement laws that protect the public—their state constituents. For the new *Model Law* education requirements for engineering licensure to be implemented, state legislative action is required. Once the law is passed in a state, that jurisdiction's engineering licensing board will begin the process of rule-making needed to implement the education requirement.

With legislative implementation and adoption, the state licensing board will be required to stay involved in the process to maintain language that is not significantly different from the language of the NCEES *Model Law*. This action will maximize the ability for a state's licensees to achieve comity and become licensed in other states. Graduates in this state may not receive reciprocity by other states if other states adopt the additional education requirement but their state does not. By adopting the new requirements, a state will achieve compliance with the NCEES *Model Law*.

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The fundamental issue:

NCEES has concluded that the current baccalaureate degree, which is now the educational standard for engineering licensure, is becoming insufficient to accommodate the body of knowledge required for practice as a P.E. The technological revolution of the 20th and 21st centuries and the ever-increasing need for engineers to address more complex issues have increased the demands placed on today's practicing engineers.

NCEES has therefore set a goal to make a strong system of licensing engineers even stronger by increasing the minimum engineering education required to practice as a P.E. It believes that expanding the education requirement will better prepare P.E.s to meet professional demands and will significantly enhance their careers. NCEES also believes that expanding the education requirement will promote greater proficiency in the practice of professional engineering for the public good.

Action required:

Each jurisdiction is encouraged to consider adopting the educational provisions of the *Model Law* and *Model Rules*. Consistency of the adopted provisions among jurisdictions is important to facilitate multijurisdictional licensure. It is also important for P.E.s who are duly licensed prior to a jurisdiction's effective date to be exempt from these new requirements.

Background:

Changes to the qualifications for licensure have been under consideration by NCEES for a number of years. Some societies representing the engineering profession are in favor of strengthening the educational qualifications, and some are opposed. Through a process of deliberation and debate over a three-year period, a majority of the NCEES member boards voted to strengthen the educational requirements for licensure by amending the *Model Law* and *Model Rules*.

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Comments for lobbyists:

Lobbyists have significant ability to inform and educate legislators on important issues that come before the legislature. Many times, new issues represent a concern not well researched. The engineering education matters related to what is sufficient for licensed engineering practice has been studied and examined for nearly a decade. The practice of engineering and the maintenance of high standards is a key ingredient in state economic development through the implementation of sound engineering projects and protecting the public health and safety and the promotion of the public welfare. NCEES has concluded that additional education is necessary for licensing. It is important that legislature lobbyists recognize the benefit to their states if their legislator acts in a timely fashion on this issue. Allowing the state's licensing board adequate time to educate and implement the rules that accompany the new law will place a state in a favorable position for comity and for maintaining high standards of the profession of engineering.

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The fundamental issue: NCEES has concluded that the current baccalaureate degree, which is now the educational standard for engineering licensure, is becoming insufficient to accommodate the body of knowledge required for practice as a P.E. The technological revolution of the 20th and 21st centuries and the ever-increasing need for engineers to address more complex issues have increased the demands placed on today's practicing engineers.

NCEES has therefore set a goal to make a strong system of licensing engineers even stronger by increasing the minimum engineering education required to practice as a P.E. It believes that expanding the education requirement will better prepare P.E.s to meet professional demands and will significantly enhance their careers. NCEES also believes that expanding the education requirement will promote greater proficiency in the practice of professional engineering for the public good.

Action required: Employers should work directly with their state licensure board and legislature to ensure the adoption of language consistent with the *Model Law* and *Model Rules* by 2012 and that the new requirements become effective at least 8 years after adoption. They should also work through technical, professional, and industry associations to achieve this goal.

Consistent law, rules, and effective dates will facilitate multijurisdictional licensure for a jurisdiction's professional engineers. In the interest of comity licensure, it is important that all states to adopt these requirements in a relatively short amount of time.

Employers should identify outside course providers and modify in-house educational courses so that they meet the rules for intellectual rigor and learning assessment. Only programs meeting these requirements will be counted toward the additional 30 credit hours. NCEES is evaluating the establishment of a national clearinghouse to approve providers and courses.

Background: Changes to the qualifications for licensure have been under consideration by NCEES for a number of years. Some societies representing the engineering profession are in favor of strengthening the educational qualifications, and some are opposed. Through a process of deliberation and debate over a three-year period, a majority of the NCEES member boards voted to strengthen the educational requirements for licensure by amending the *Model Law* and *Model Rules*.

The current NCEES *Model Law* requires persons applying for professional licensure beginning January 1, 2020, to have additional education beyond the baccalaureate degree prior to becoming licensed. Such requirements would become effective when jurisdictions individually adopt these *Model Law* provisions.

The educational expectations of the *Model Law* after 2020 can be achieved through one of the following pathways:

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NCEES has set 2020 as the goal for the requirement to become effective for those seeking their first license. A minimum 8-year transition period subsequent to adoption by a jurisdiction is recommended to allow jurisdictions and prospective licensees to prepare for the new requirement.

Comments for employers:

Employers should initiate efforts to enable employees seeking licensure during their full-time employment to obtain the needed additional education while at the same time minimizing the related cost and potential disruption.

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Action required:

NCEES has no authority to impose the requirements of the *Model Law* or *Model Rules* on any jurisdiction (states and territories). Adding the requirements in the laws and rules of any jurisdiction is up to that jurisdiction's legislature and licensing board. Engineering societies can play an important role with the initiation and consideration of the new requirements by legislatures as follows:

- At the national level, societies should support their regional, state, and local chapters via position statements and other information. They should communicate to their members about the need for the changes and encourage discussion.
- At the state level, societies should interact with their legislatures to initiate the implementation of the proposed changes or express their position on any of the proposed changes in the event they are initiated by others. They should communicate to their members about the need for the changes and encourage discussion. State-level societies should also interact with their jurisdiction's licensure board to maintain open communication and encourage dialogue about the education initiative.
- In jurisdictions where the new requirements are instituted, engineering societies should play an important role in the development of educational guidelines and programs to assist their members in satisfying any new requirements.

Background:

Changes to the qualifications for licensure have been under consideration by NCEES for a number of years. Some societies representing the engineering profession are in favor of strengthening the educational qualifications, and some are opposed. Through a process of deliberation and debate over a three-year period, a majority of the NCEES member boards voted to strengthen the educational requirements for licensure by amending the *Model Law* and *Model Rules*.

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Comments for societies:

To provide consistency in the administration of the proposed requirements, NCEES is evaluating the development of a national clearinghouse to provide the following services:

- Review and approve education providers and courses (these could include industry and engineering society courses)
- Assist individual applicants in planning for and complying with the education requirements
- Provide licensure boards with a defendable verification that individuals have met the additional education requirements

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Information that should be communicated to the public:

- Engineers who provide services to the public are required to be licensed to practice as professional engineers.
- Each state has laws and rules that govern the licensing of professional engineers in the state.
- All 50 states, the District of Columbia, and several U.S. territories have licensing boards that oversee the licensing of professional engineers.
- As members of NCEES, state licensing boards work together to achieve common goals in the licensing of the practice of engineering and surveying.

- Licensed engineers are foremost required to safeguard the public health, safety, and welfare through the practice of engineering.
- To be licensed, engineers need to have a foundational education, meet several years of qualifying experience, and must pass examinations.
- The engineering education system in the United States has long been regarded as one of the best in the world. The new engineering requirement will make it even better.
- Well-educated engineers are the key to economic development and quality of life.

THE UNIVERSITY OF TEXAS AT TYLER
COLLEGE OF ENGINEERING & COMPUTER SCIENCE

An Overview of ABET Accreditation

What is ABET Accreditation and How Does It Work?

An Information Presentation for the Engineering Education Task Force
December 2009

THE UNIVERSITY OF TEXAS AT TYLER
COLLEGE OF ENGINEERING & COMPUTER SCIENCE

QUIZ: Engineering Accreditation Is:

- An instrument for torturing engineering department heads and deans.
- A tool for faculty to leverage more resources from their university.
- A certification of institutional and departmental quality.
- The profession's mechanism for ensuring that engineers are academically prepared for professional practice.

THE UNIVERSITY OF TEXAS AT TYLER
COLLEGE OF ENGINEERING & COMPUTER SCIENCE

ABET's Mission

ABET serves the public through the promotion and advancement of applied science, computing, engineering, and technology education. ABET will:

- Accredit educational programs.
- Promote quality and innovation in education.
- Consult and assist in the development and advancement of education worldwide in a financially self-sustaining manner.
- Communicate with our constituencies and the public regarding activities and accomplishments.
- Anticipate and prepare for the changing environment and the future needs of constituencies.
- Manage the operations and resources to be effective and fiscally responsible.

THE UNIVERSITY OF TEXAS AT TYLER
COLLEGE OF ENGINEERING & COMPUTER SCIENCE

ABET's Structure

- 30 Member Societies (including NCEES, NSPE, ASEE)
- Board of Directors (5 Officers and 45 Directors)
- 4 Commissions:
  - Engineering Accreditation Commission (EAC)--66 nominees
  - Technology Accreditation Commission (TAC)
  - Computing Accreditation Commission (CAC)
  - Applied Science Accreditation Commission (ASAC)
- Program Evaluators – PEVs (>1500 active)
  - Recruited, trained, and managed by the societies

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  - Applied Sc
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Each Commission has its own Accreditation Criteria

More centralized training through PAVE (Partnership to Advance Volunteer Excellence)

An Information Presentation for the Engineering Education Task Force

THE UNIVERSITY OF TEXAS AT TYLER
COLLEGE OF ENGINEERING & COMPUTER SCIENCE

Accredited Programs

- Engineering Accreditation Commission
  - 1,873 programs accredited
  - at 383 institutions
- Applied Science Accreditation Commission
  - 76 programs accredited
  - at 57 institutions
- Technology Accreditation Commission
  - 675 programs accredited
  - at 233 institutions
- Computing Accreditation Commission
  - 314 programs accredited
  - at 257 institutions

An Information Presentation for the Engineering Education Task Force

THE UNIVERSITY OF TEXAS AT TYLER
COLLEGE OF ENGINEERING & COMPUTER SCIENCE

ABET-EAC Baccalaureate Level

General Criteria

1. Students
2. Program Educational Objectives
3. Program Outcomes
4. Continuous Improvement
5. Curriculum
6. Faculty
7. Facilities
8. Institutional Support
9. Program Criteria

An Information Presentation for the Engineering Education Task Force

THE UNIVERSITY OF TEXAS AT TYLER
COLLEGE OF ENGINEERING & COMPUTER SCIENCE

ABET-EAC Baccalaureate Level

General Criteria

1. Students
2. Program Educational Objectives
3. Program Outcomes
4.
5.
6.
7.
8.
9.

(a) Math, science, & engineering	(g) Communication
(b) Design & conduct experiments	(h) Broad education
(c) Design	(i) Life-long learning
(d) Multi-disciplinary teams	(j) Contemporary issues
(e) Solve problems	(k) Engineering tools
(f) Professional & ethical responsibility	

An Information Presentation for the Engineering Education Task Force

THE UNIVERSITY OF TEXAS AT TYLER
COLLEGE OF ENGINEERING & COMPUTER SCIENCE

ABET-EAC Baccalaureate Level

General Criteria

1. Students
2. Program Educational Objectives
3. Program Outcomes
4. Continuous Improvement
5. Curriculum
6. Faculty
7. Facilities
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9. Program Criteria

Defines the curriculum in broad terms. It does not specify the number of credit hours or specific courses.

An Information Presentation for the Engineering Education Task Force

THE UNIVERSITY OF TEXAS AT TYLER
COLLEGE OF ENGINEERING & COMPUTER SCIENCE

ABET-EAC Baccalaureate Level

General Criteria

1. Students
2. Program Educational Objectives
3. Program Outcomes
4. Continuous Improvement
5. Curriculum
6. Faculty
7. Facilities
8. Institutional Support
9. Program Criteria

Subject to the approval (twice) of –
1. Criteria Committee of ABET-EAC
2. ABET-EAC at large
3. ABET Board of Directors

An Information Presentation for the Engineering Education Task Force

THE UNIVERSITY OF TEXAS AT TYLER
COLLEGE OF ENGINEERING & COMPUTER SCIENCE

ABET-EAC Program Criteria

Discipline-specific program criteria (if any exist)

- Provide specificity for interpreting curricular and faculty criteria ONLY for a given discipline
- Developed by the lead professional society
- Subject to the approval of
  - Criteria Committee of ABET-EAC
  - ABET-EAC at large
  - ABET Board of Directors

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ABET-EAC Master's Level Criteria

- Fulfill baccalaureate-level general criteria
- Fulfill program criteria appropriate to the master's level specialization area
- One year of study beyond baccalaureate level
- Apply advanced level knowledge in a specialized area of engineering related to the program area
- Subject to the approval of . . .

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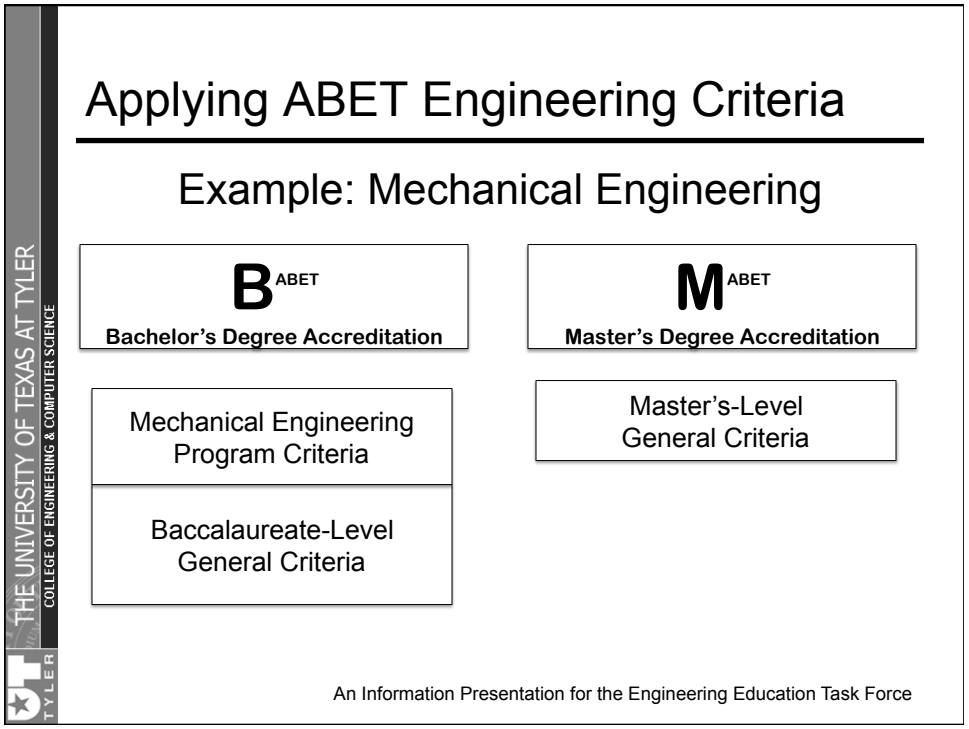
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Applying ABET Engineering Criteria
Example: Mechanical Engineering
B ABET
Bachelor's Degree Accreditation
M ABET
Master's Degree Accreditation
Mechanical Engineering Program Criteria
Baccalaureate-Level General Criteria
Master's-Level General Criteria
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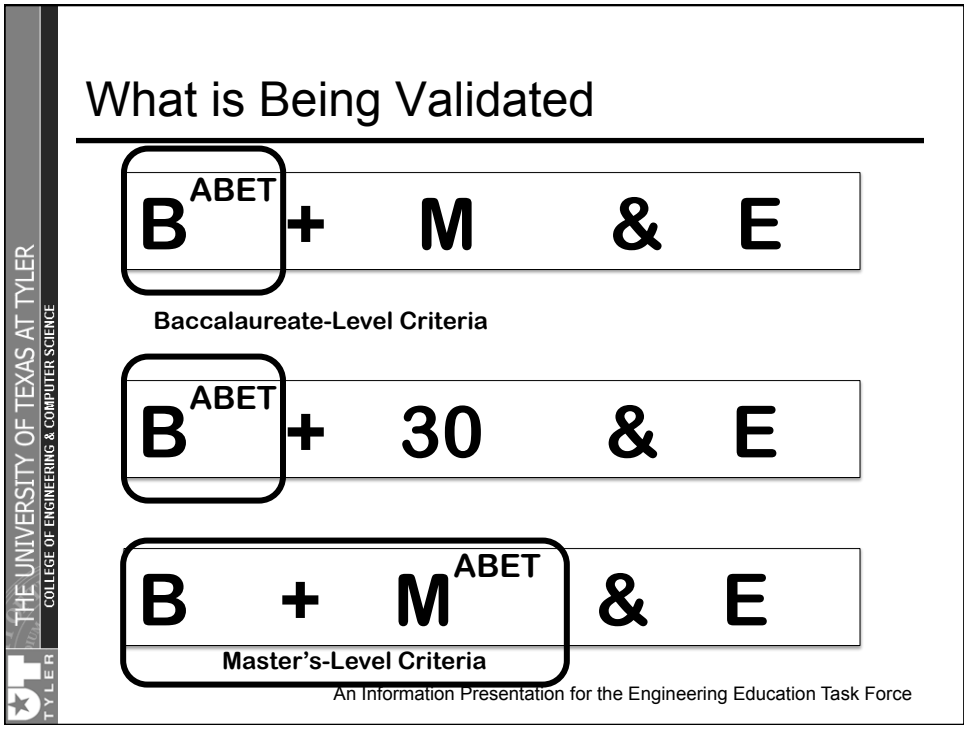
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What is Being Validated
B ABET + M & E
Baccalaureate-Level Criteria
B ABET + 30 & E
B + M ABET & E
Master's-Level Criteria
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Example: CE Timeline for Change

January 2004	***First Edition of BOK Published***
Spring 2004 – Spring 2005	**Develop new criteria; internal staffing**
Summer 2005	**Briefing to Criteria Committee of EAC**
Fall 2005 – Spring 2006	**Briefings to stakeholders**
Summer 2006	***Approved by Criteria Committee of EAC***
Summer 2006	**Approved by ABET-EAC (1st reading)**
Fall 2006	**Approved by ABET BOD (1st reading)**
Fall 2006 – Spring 2006	***Public Review***
Summer 2007	**Approved by Criteria Committee of EAC**
Summer 2007	**Approved by ABET-EAC (2nd reading)**
Fall 2007	**Approved by ABET BOD (2nd reading)**
Fall 2008 – Spring 2009	***First Reviews Under New Criteria***

ABET-Accredited Master's Programs

- Only 32 ABET-accredited master's programs
- ABET's policy for over 50 years stated: "Engineering Programs may be accredited at either the baccalaureate or master's level. A program may be accredited at only one level in a particular curriculum at a particular institution."
- Why did the prohibition exist for so long?

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Dual-Level Ban Lifted

Engineering News Record
7 April 2008

EDUCATION

Dual Accreditation Ban Lifted in Vote

After decades of debate over its continuing purpose in modern engineering education, a ban on accreditation of university bachelor's- and master's-level engineering programs at the same institution is now ancient history. Board members of the profession's key accrediting body voted on March 29 to lift the prohibition. Schools could seek program accreditation in the 2009-10 academic year.

"It's perplexing how the ban got in. It has been a huge problem."
— MICKEY WILHELM, UNIVERSITY OF LOUISVILLE, KY.

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SUMMARY: Accreditation Criteria

- The profession's mechanism for ensuring that engineers are academically prepared for professional practice.
- Are a primary means of translating good ideas into meaningful change.
- Can be appropriately aligned with an engineering discipline's body of knowledge.
- Supports the validation of *Model Law* either
  - Partially (through B^{ABET}) or
  - Fully (through M^{ABET}).

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Select the TRUE Statements

1. ABET stands for the "Accreditation Board for Engineering & Technology"
2. ABET has a large staff and most are engineers or engineering educators.
3. ABET's primary mission is to support engineering licensure.
4. ABET's policies are controlled by the three "big" societies.
5. ABET accredits universities and their departments.
6. Institutional data provided to ABET is in the public domain.

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Select the TRUE Statements

7. The EAC baccalaureate-level general criteria specifies a minimum total credit hours for an engineering degree.
8. The EAC baccalaureate-level general criteria specifies certain courses that must be taken by ALL engineering students.
9. The EAC baccalaureate-level general criteria requires that engineering design courses must be taught by PE's or individuals who have design experience.
10. The EAC baccalaureate-level general criteria specifies that "engineering students must be able to explain the importance of professional licensure."

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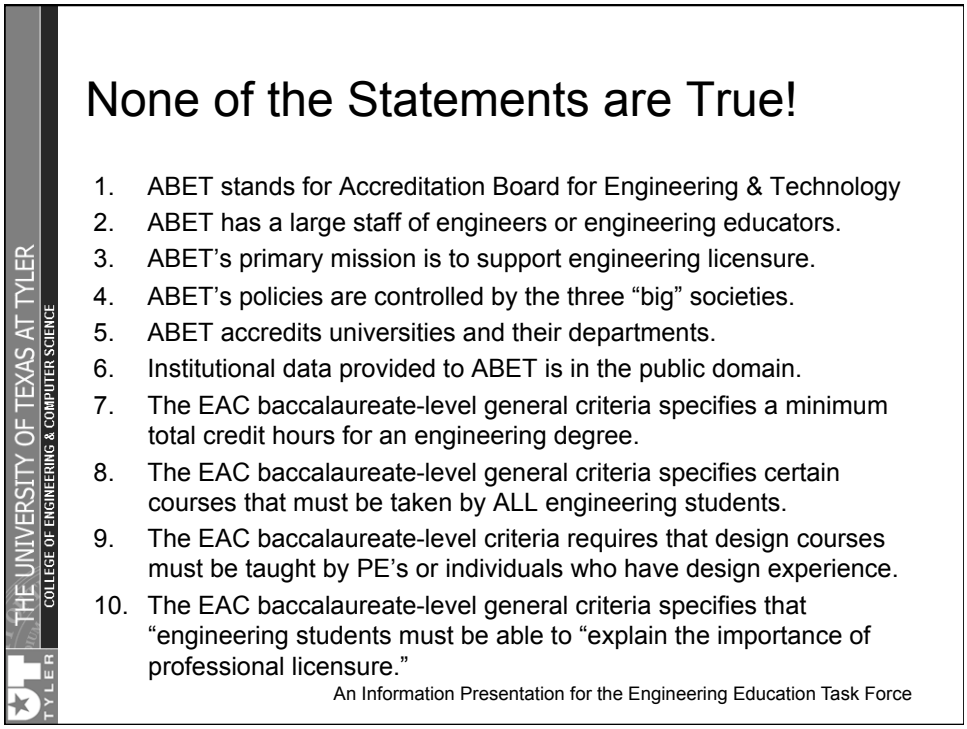

None of the Statements are True!

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