

BASIC INFORMATION RELATED TO NBA

Accreditation for Undergraduate Engineering Programme

ACKNOWLEDGEMENTS

- BOOKS AND REFERENCES
- General Manual of Accreditation – NBA
- Manual of Accreditation for Tier I Institutions
- Manual of Accreditation of Tier II Institutions
- Self-Assessment Report (SAR) of Tier I & II Institutions
- Evaluation Guidelines of Tier I & II Institutions
- <https://www.nbaind.org/>
- <https://www.nbaind.org/files/flipbook/GM/#p=1>
- https://www.nbaind.org/files/NBA_UGEngg_Tier_I_Manual.pdf
- https://www.nbaind.org/files/NBA_UGEngg_Tier_II_Manual.pdf
- <https://youtu.be/YvHhPElda0o>
- <https://youtu.be/OnEupgQvSfM>
- https://onlinecourses.swayam2.ac.in/ntr21_ed04/unit?unit=35&lesson=38
- <https://youtu.be/qP8aLfCogLQ>
- PPT from expert Dr. R.V.Ranganath [,rvranganath.civ@bmsce.ac.in](mailto:rvranganath.civ@bmsce.ac.in), BMS College of Engineering, Bangalore-19

INTRODUCTION

- **The National Board of Accreditation (NBA)** was set-up in September 1994 by the AICTE to assess the qualitative competence of the programs offered by technical and professional educational institutions from diploma level to post-graduate level in engineering and technology, management, Pharmacy, architecture and related disciplines, which are approved by appropriate statutory regulatory bodies.
- NBA came into existence as an independent autonomous body with effect from 7th January 2010 with the objectives of assurance of quality and relevance to technical education, especially of the programs in technical disciplines, i.e., Engineering and Technology, Management, Architecture, Pharmacy and Hospitality, etc., through the mechanism of accreditation of programs offered by technical and professional institutions.

Why an NBA is critical

- An engineering college that has NBA accreditation, carries the stamp of recognition for its education quality assurance both at undergraduate and postgraduate level. Colleges are periodically evaluated for stringent NBA accreditation criteria with the purpose that they are on par with international best practices.
- **It is mandated that all engineering colleges have NBA accreditation by 2022.**
- Educational institutions eligible for NBA accreditation can offer courses from diploma level to postgraduate level, in the fields of engineering and technology, computer applications, pharmacy, management, hotel management and catering technology and architecture.
- It is indeed an honor to have the badge of accreditation stamped on your engineering programs. You are sending out a message that your programs have been assessed by experts in the field and found to have met premier quality standards. This is the biggest advantage of NBA program outcomes to both engineering colleges and their students.

Importance of NBA in the international arena

- NBA had become the permanent signatory member of the Washington Accord on 13th June 2014. This Accord is an international agreement between 20 countries and is entered into by authorities, like the NBA, responsible for accrediting engineering degree programs in their own countries.
- This enables Indian graduates from accredited engineering programs to practice in or go for higher education to other Washington Accord countries. This mostly applies to students who have graduated from NBA accredited programs offered by Tier – 1 institutions.
- **Who qualifies to be a Tier 1 engineering institution?**
- There are basically 2 categories for institutions to apply for NBA and the process of accreditation is different for Tier-I and Tier-II institutions.
- **TIER-I:** All IITs, NITs, private universities running Engineering program, all autonomous colleges. These institutions have freedom to design, develop and update curricula and also have complete academic autonomy.
- **TIER-II:** All engineering colleges which are not autonomous and are affiliated to UGC recognized universities.
- Now that we have a better understanding of the NBA Accreditation process, here are the proven NBA accreditation benefits that approved colleges enjoy.

NBA Accreditation Benefits and Significance Attached

1. Validates quality standards

- Accreditation for an engineering program signifies to students that the program outcomes of NBA approved colleges has met stringent quality standards. These rules out the necessity of students having to conduct detailed analysis of their own to evaluate an institution and its programs when making a decision on college admission.
- This is borne out by the fact that NBA accredited engineering colleges usually have higher student enrolments.
- It is an indicator to aspiring students of the college's level of commitment to excellence. Students also benefit from the process of continuity in improvement of quality that is a part of the NBA's approach to promote excellence in technical education.

2. Fosters trust in the institution

- Accreditation makes it necessary that institutions go all-out to meet and maintain their high standards. This in turn increases trust and confidence in them among the public and also helps to boost accountability. This helps potential students and their families to place a certain level of trust on the institution for which the accreditation is received. After all, the future career goals depend on the education they receive.

3. Improves student performance

- Students getting their degree from a college that has its programs given the stamp of quality can be confident about the education they have received. An NBA accredited program uses **Outcome Based Education OBE** to measure students on 3 criteria – knowledge, skills and attitude. Also, the facilities and curriculum ensure the student is employment ready when they graduate.

4. Helps in SWOT analysis and bettering outcomes

- Accreditation helps engineering institutions to do a SWOT analysis i.e. evaluate their strengths, weaknesses and opportunities / threats. While a SWOT is a good starting point for evaluation, it helps the college understand where it currently stands and how it should move forward. As a result, the college gets insight into how to improve its programs on a continuous basis. You can enhance the quality of your programs such that it sets you apart from other engineering colleges.

5. Provides basis for fund-raising

- Helps institutions in securing necessary funds from the government. With funding increasingly linked to performance and outcomes, accreditation would help engineering colleges to avail performance-linked funding and incentives.
- A college that has attained a Category 1 status is a big achievement not only for credibility of its NBA program outcomes but also for the many opportunities it opens up. Category 1 technical colleges are given the autonomy to include new programs, open learning centres, increase student intake both at local and global level. Category 1 accredited colleges can more easily tie-up with Global universities for twinning programs as well as apply for research grants.

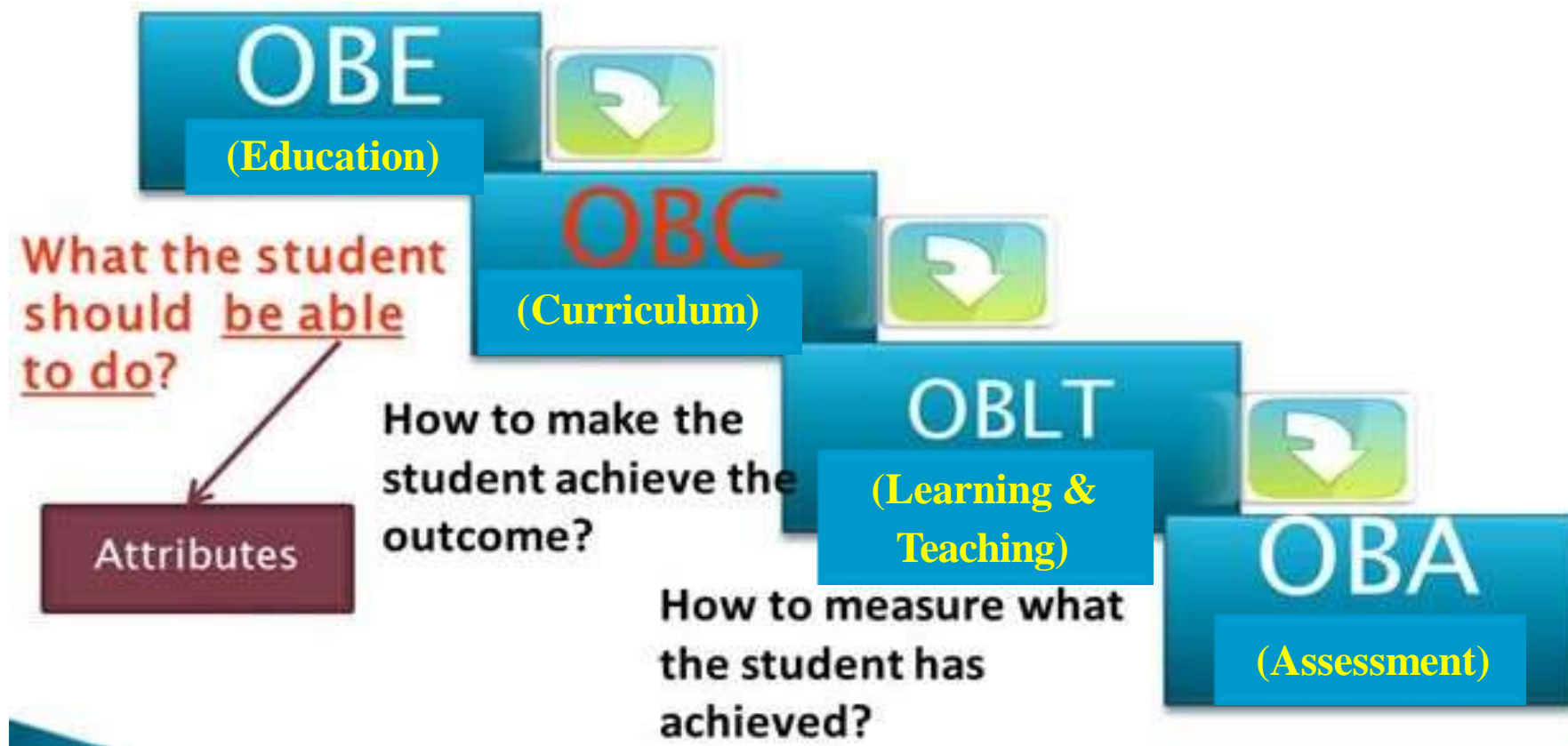
6. Edge in the job market

- The advantages of NBA accreditation to students include enhanced chances of career success. One of the biggest NBA accreditation benefits is that more companies will find it advantageous to take part in your college's placement programs.
- Students armed with quality education passing out of accredited colleges are more likely to find appropriate employment. Potential employers accord more value to degrees from accredited programs secure in the knowledge that the candidate has been taught at an institution that has met and maintained strong quality measures aligned to industry.

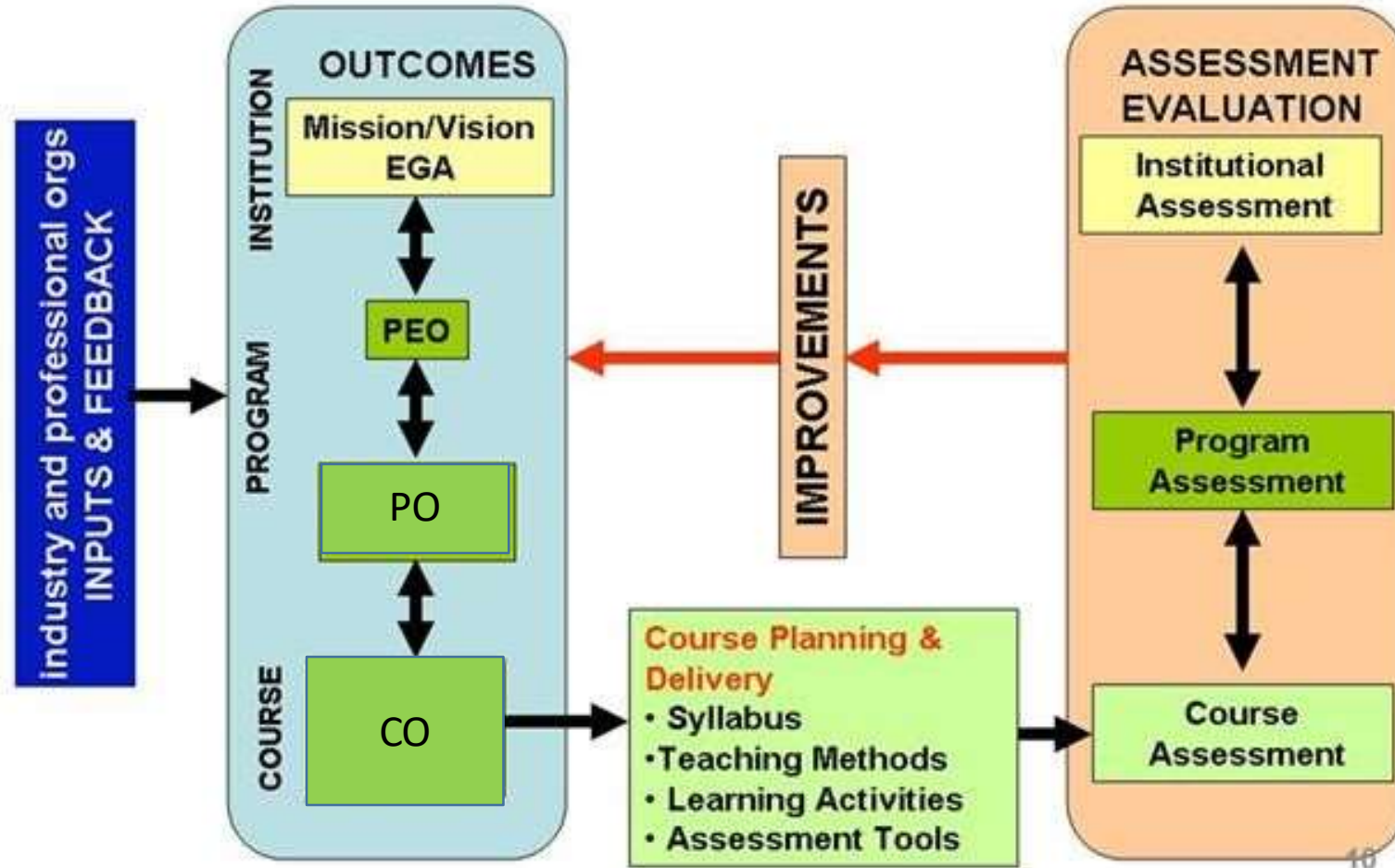
7. Better mobility going forward

- NBA's membership of the Washington Accord provides us with the opportunity to benchmark the quality of undergraduate engineering education offered by India with that of other member countries. It encourages and makes possible ease of mobility of engineering graduates and professionals at international level.

Outcome Based Education (OBE) for Outcome Based Accreditation



The OBE Framework



Outcome based Education

- OBE is a process that involves the restructuring of curriculum, assessment and reporting practices in education to reflect the achievement of high order learning and mastery rather than accumulation of course credits.
- That System of Education in which first we set future Objectives / Outcomes for Students, Graduates and Alumni / Employer, then we assess and evaluate them, and on the basis of evaluation results we continuously improve it.
- Objectives / Outcomes for:
 - Students => CLOs
 - Graduates => PLOs
 - Alumni / Employer => PEOs

LEARNING OUTCOMES

1. COGNITIVE - thinking, knowledge.
2. PSYCHOMOTOR - doing, skills.
3. AFFECTIVE - feeling, attitude.

- specify what learners NEW BEHAVIOURS will be after a learning experience
- state the knowledge, skills and attitudes students will gain
- begin with an action verb which is measurable.

•LEARNING OUTCOMES MUST BE

Understandable

Measurable

Achievable

Participant-oriented

Vision and Mission Statements

- Statements help in defining aspirations and to remain focused
- Should be written in a simple language, easy to communicate and should define objectives which present near future of the Institute
- Vision statement is dream of where one wants the Institute to be and inspires all the stake holders
- Mission statements are actionable statements that guide the stake holders to act

How to formulate Vision and Mission Statements

- Bottoms up approach
- Involve all stakeholders
- Discussion, Brain storming
- Gap analysis or SWOT analysis
- Challenges before the institute

- What are the immediate and long term goals
- Evolve Vision and Mission statements based on these discussions
- Strategic plan

Vision and Mission

Institution :BMSCE



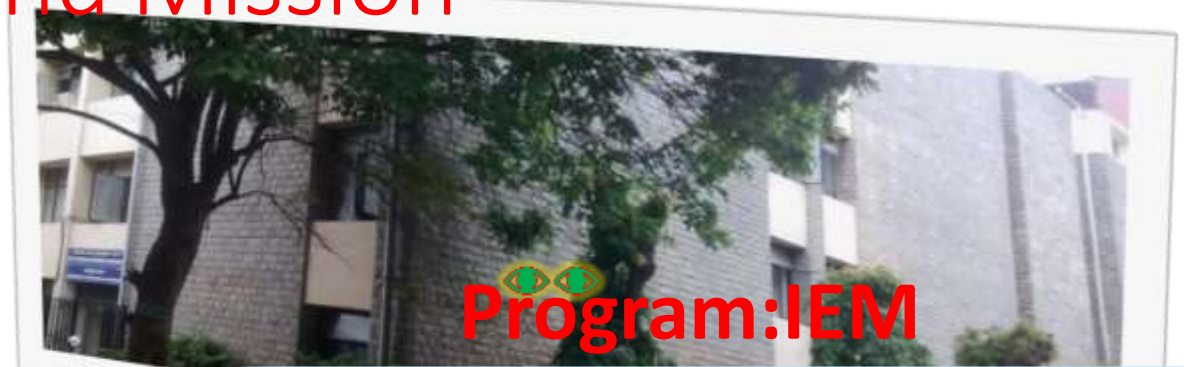
VISION

Promoting the prosperity of mankind by augmenting human resource capital through quality technical education & training



MISSION

Accomplish excellence in the field of technical education through education, research and service needs of society



Program:IEM

VISION

To emerge as an excellent center for imparting quality higher education and generating highly proficient technical manpower to adopt to the constantly changing global scenario with professional and ethical values

MISSION

- Providing excellent education in curricular, co- curricular and extra-curricular activities to students.
- Facilitating to continue their education through research activities.
- Catering to the needs of the Industry and society.
- Nurturing and mentoring students to acceptance by stake holders

Requirement of OBE

- Each program must formulate program outcomes that foster attainment of the program objectives.
- There must be processes to produce these outcomes and an assessment process, with documented results, that demonstrates that these program outcomes are being measured and indicates the degree to which the outcomes are achieved.
- There must be evidence that the results of this assessment process are applied to the further development of the program.

Approach in implementing OBE

- Modify existing curricular (rather than start from scratch)
- Revise Course Content Structure
- Introduce Innovative Delivery Methods
- Introduce Innovative Assessment Evaluation Tools
- Introduce System of Data Evidence Collection
- Continuous Quality Improvement

Program Outcomes

- POs are statements about the knowledge, skills and attitudes (attributes) the graduate of a formal engineering program should have.
- Profile of the Graduates reached through POs - Target
- POs are defined by Accreditation Agencies of the country (NBA in India)
- Defining these is the Starting Point

Program Outcomes (POs)

- 1. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of **complex engineering** problems.
- 2. Problem Analysis:** Identify, formulate, review research literature, and analyze **complex engineering** problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/Development of Solutions:** Design solutions for **complex engineering problems** and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
- 4. Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Conti...

- 5. Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling **to complex engineering** activities with an understanding of the limitations.
- 6. The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Conti...

- 9. Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- 12. Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

WA - Graduate Attributes and NBA- Program Outcomes

Washington Accord Attributes	NBA Program Outcomes.
<p>1. Engineering knowledge, Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.</p>	<p>1. Engineering knowledge, Apply the knowledge of mathematics, science, engineering fundamentals, and engg. specialization to the solution of complex engineering problems</p>
<p>2. Problem Analysis, Identify, formulate, research literature and analyze <i>complex</i> engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences</p>	<p>2. Problem Analysis, Identify, formulate, research literature, and analyze engineering problems to arrive at substantiated conclusions using first principles of mathematics, natural, and engineering sciences.</p>

Source: NBA learning resources

Attainment of P01 to P05

PO 1-5

- PO1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of **complex engineering problems**.
- PO2. **Problem analysis:** Identify, formulate, review research literature, and analyze **complex engineering problems** reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- PO 3 **Design/development of solutions:** Design solutions for **complex engineering problems** and design system components, processes to meet the specifications with consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to **complex engineering activities** with an understanding of the limitations.

Why place these POs in one Basket?

- The Statements show that one part *{That of (**complex**) Engineering Problem CEP}* is common to all.



- *Though, individually each PO deals with a different aspect of CEP. Recognizing this commonality makes the discussion easier.*

Complex Engineering Problem-CEP

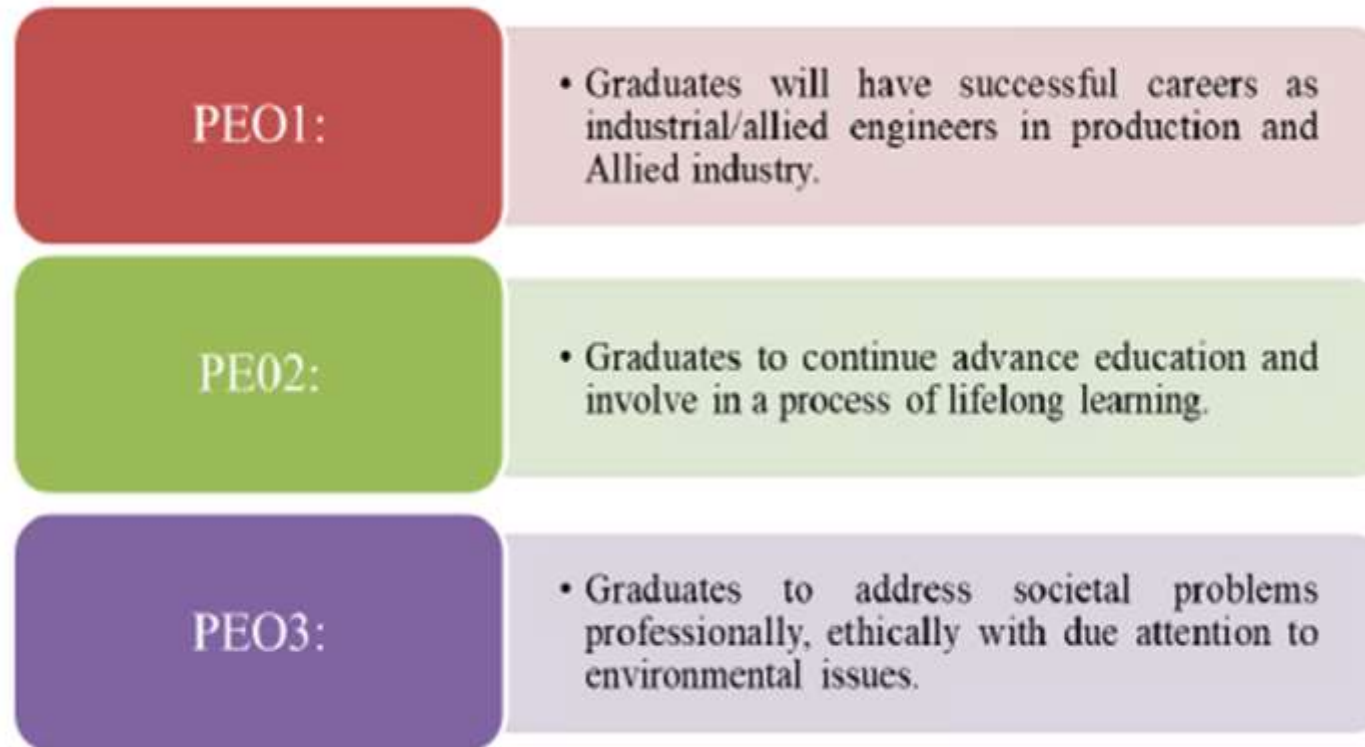
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1. Problems not the kind generally encountered at the ends of text book chapters. (These often test if the contents of the chapter have been understood)
2. These are problems that have not been completely framed and leave at least a few* choices for the student to make.
3. Problems may require use of laws of physics, or bring in some mathematical tools in which the problem can be framed.

Program Educational Objective-PEO

- The educational objectives of an engineering degree program are the statements that describe the expected achievements of graduates in their career, and also in particular, what the graduates are expected to perform and achieve during the **first few years after graduation**.
- The PEOs, may be guided by global and local needs, vision of the Institution, long term goals etc.
- For defining the PEOs the faculty members of the program must continuously work with all Stakeholders: Local Employers, Industry, Students and the Alumni

IEM: PEO



PROGRAM SPECIFIC OUTCOMES (PSO)

These outcomes are specific to a program in addition to NBA defined POs,

Example: IEM have PSOs as:

Course Outcomes (COs)

- “Statements of observable student actions that serve as evidence of the **K**nowledge, **S**kills and **A**ttitudes acquired in a course”.
- Each course is designed to meet (about 6) Course Outcomes
- The Course Outcomes are stated in such a way that they can be actually measured.
- POs are attained through program specific Core Courses

Course Outcomes

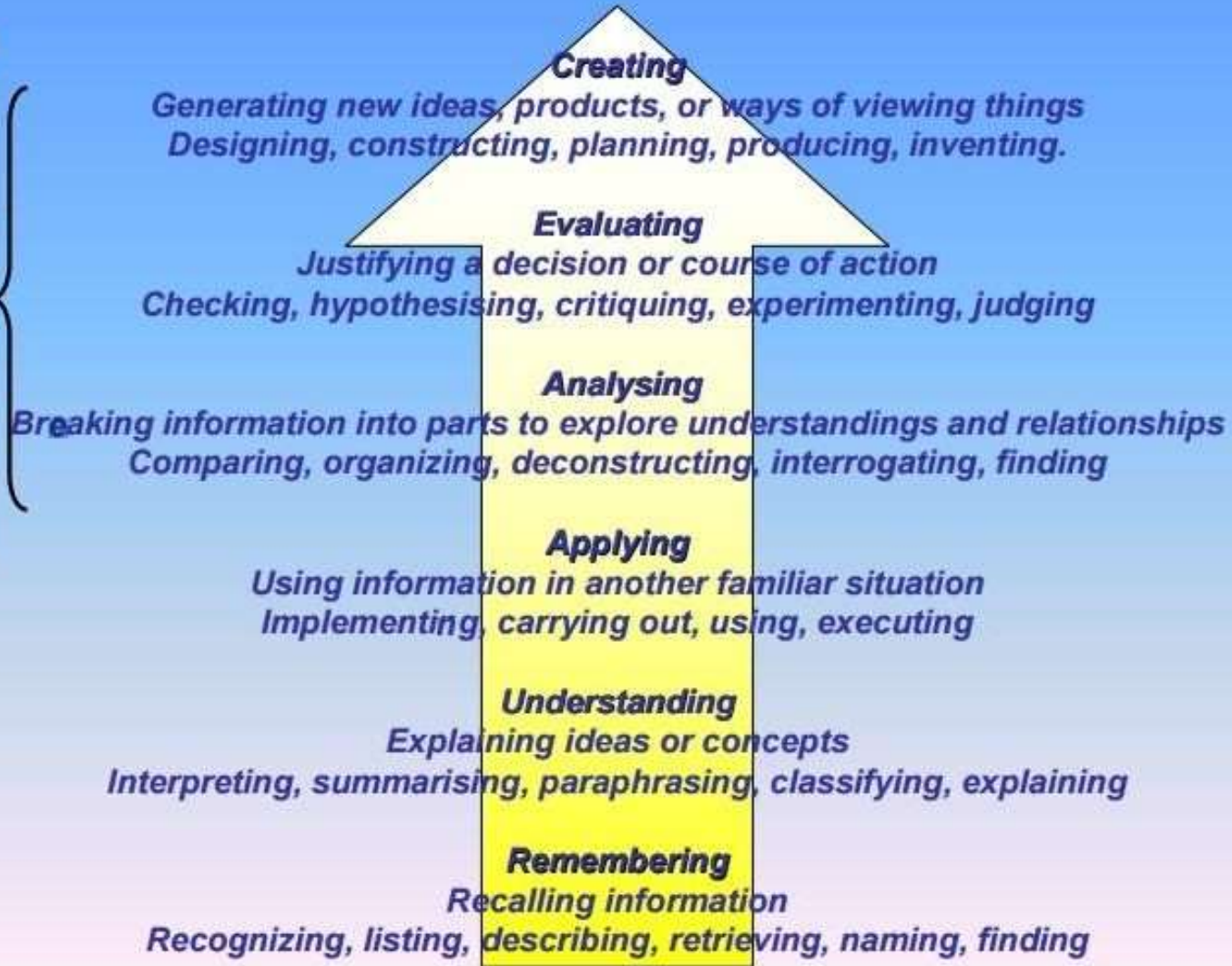
Engineering Physics (Not a Good Example)

- CO1:** **Understand** the knowledge of basic quantum mechanics, to set up one-dimensional Schrodinger's wave equations and its application to few physical problems.
- CO2:** **Understand** the fundamental aspects of crystallography, able to recognize various planes in a crystal and have knowledge of structure determination using x-rays.
- CO3:** **Understand** the role of free electrons in determining the properties of metals, the concept of Fermi energy, and the domain formation in ferromagnetic materials.
- CO4:** **Understand** the basic laser physics, working of lasers, holography and principle of propagation of light in optical fibers.
- CO5:** **Understand** the theory of free, damped and forced vibrations of a particle and also the concept of resonance and its applications in ESR & NMR.

What level of BLOOM,s Taxonomy you want your students to achieve?

BLOOM'S REVISED TAXONOMY

Higher-order thinking



Retrieved from: <http://www.kurwongbss.qld.edu.au/thinking/Bloom/blooms.htm>

Comparison

Bloom's Levels	Program Outcomes	
Remember (K1)		
Understand (K2)		
Apply (K3)	Apply Knowledge	Engineering Knowledge: <i>Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems</i>
Analyze (K4)	Problem Analysis	Problem Analysis: <i>Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences</i>
Evaluate (K5)	Design/Development of Solutions	Design/Development of Solutions: <i>Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.</i>

Structure of Course Outcomes:

Course Outcome statement may be broken down into two main components:

- **An action word** that identifies the performance to be demonstrated;
- **Learning statement** that specifies what learning will be demonstrated in the performance;

Examples of good action words to include in course outcome statements:

- Compile, identify, create, plan, revise, analyze, design, select, utilize, apply, demonstrate, prepare, use, compute, discuss, predict, assess, compare, rate, critique, outline, or evaluate

Course Title: Mechanics of Materials

Course Outcomes: Example

At the end of the course, student is able to:

Action Verb

1. **Apply** laws of physics (eg..Hook's law, etc.,) to compute different types of response (stress and deformation) in the given materials. (PO 1)
2. **Analyse** structural elements for different force systems to compute design parameters (BM and SF) (PO2)
3. **Design** compression elements using engineering principles to resist any given loads. (PO3)
4. **Conduct** experiments to validate physical behaviour of materials/components.(PO4)
5. **Prepare** laboratory reports on interpretation of experimental results (P10)

Learning Statement