Session on Important Attributes of IEB OBE Accreditation

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Course Outcomes (CO)

- **Course Outcomes (CO)** are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course or program.
- **In other words**, course outcomes identify what the learner will know and be able to do by the end of a course or program.
- Ideally **3 to 4 COs** is considered a good practice

Program Outcomes (PO)

- **Program Outcomes (PO)** are short term outcomes (at the point of graduation) describing what students are expected to know and be able to perform.
- BAETE has adopted those Pos.
- These POs are generic for any Engineering program.

Program Outcomes (PO)

PO's	PO Statements	PO Descriptions/Graduate Attribute Profiles
PO1	Engineering Knowledge	Knowledge of mathematics, natural science, engineering **[K1 to K4]**
PO2	Problem Analysis	Identify, formulate, research literature and analyze complex engineering problems **[K1 to K4]**
PO3	Design/Development of Solutions	Design solutions for complex engineering problems and design systems **[K5]**
PO4	Investigation	Investigations of complex problems using research based knowledge and research methods **[K8]**
PO5	Modern Tool Usage	Create, select and apply appropriate tool **[K6]**
PO6	The Engineer and Society	Engineering practice, ethics and the professional responsibility, public safety; economic, social, cultural, environmental and sustainability **[K7]**

Program Outcomes (PO)

PO's	PO Statements	PO Descriptions/Graduate Attribute Profiles
PO7	Environment and Sustainability	Understand and evaluate the sustainability and impact of professional engineering work in societal and environmental contexts. [K7]
PO8	Ethics	Understanding and level of practice [K7]
PO9	Individual Work and Teamwork	Role in and diversity of team, function effectively as an individual, and as a member or leader in a team
PO10	Communication	Level of communication according to type of activities performed
PO11	Project Management and Finance	Level of management required for differing types of activity
PO12	Life-long Learning	Preparation for and depth of continuing learning

CO-PO Mapping

- Each **course outcome (CO's)** should be mapped to achieve the **program outcomes (PO's)**.
- At the beginning of each semester, Module Leaders/Course Teachers will set the **CO-PO mapping** and relationships between the assessment tools (e.g. Midterm, Semester Final)
- At the end of each semester, Module Leaders will calculate the attainment of **CO's** and **PO's**.

Example CO-PO Mapping

Theory Course

Computer Graphics course example

CO1: Explain the working of Input and Output devices for graphics.

CO2: Explain about graphics primitives and work with coordinate spaces, coordinate conversion, and transformations of graphics objects.

CO3: Demonstrate 2D & 3D geometrical transformations using modern tools.

CO4: Explain various 3D projections and current models for surfaces.

CO/PO Mapping

COs	Programme Outcomes(POs)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓											
CO2	✓											
CO3			✓		✓							
CO4		✓										

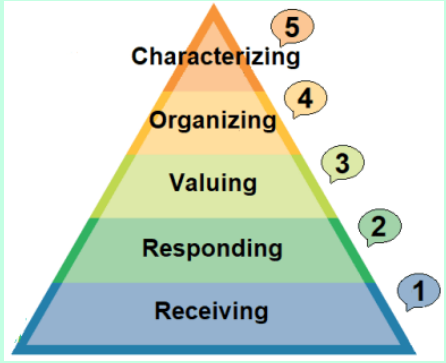
PO1: Engineering Knowledge
PO2: Problem Analysis
PO3: Design of Solutions
PO5: Modern Tool Usage

Bloom's Taxonomy Domains

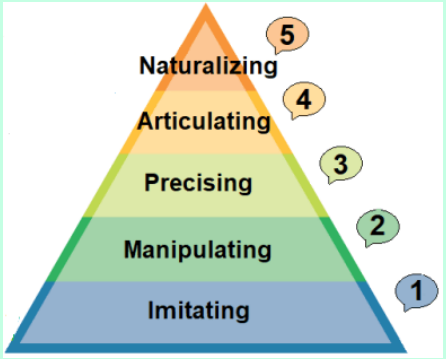
The three domains of boom taxonomy are:

1. The cognitive domain (Knowledge-based)
2. The Affective domain (Emotion-based)
3. The psychomotor domain (Action based)

Cognitive Domain



Affective Domain



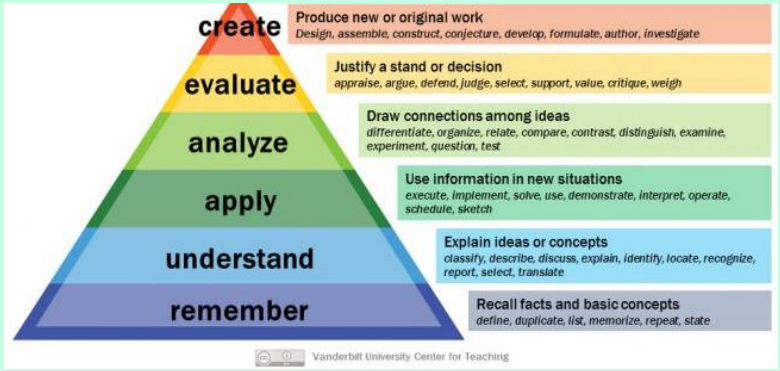
Psychomotor Domain

Bloom's Taxonomy

Cognitive Domain

- The cognitive domain aims to develop the mental skills and the acquisition of knowledge of the individual. It is the Knowledge-based ability to process information in a meaningful way.
- The cognitive domain is further divided into 6 levels.

1. **Remembering**
2. **Understanding**
3. **Applying**
4. **Analyzing**
5. **Evaluating**
6. **Creating**



Bloom's Taxonomy

Cognitive Domain

Level	Bloom's Definition	Action Verbs
Remembering	Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers.	Choose, Define, Find, How, Label, Label, Match, Name, Omit, Recall, Relate, Show, Spell, Tell, What, When, Where, Which, Who, Why
Understanding	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas.	Classify, Compare, Contrast, Demonstrate, Explain, Explain, Illustrate, Infer, Interpret, Outline, Relate, Show, Summarize, Translate
Applying	Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	Apply, Build, Choose, Construct, Develop, Develop, Identify, Interview, Make use of, Model, Organize, Select, Solve, Utilize
Analyzing	Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.	Analyze, Assume, Categorize, Classify, Compare, Compare, Contrast, Discover, Dissect, Distinguish, Divide, Function, Inference, Inspect, List, Motive, Relationships, Simplify, Survey, Take part in
Evaluating	Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.	Agree, Appraise, Assess, Award, Choose, Choose, Conclude, Criteria, Criticize, Decide, Deduct, Determine, Disprove, Estimate, Evaluate, Explain, Importance, Influence, Interpret, Judge
Creating	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.	Adapt, Build, Change, Choose, Combine, Combine, Compose, Construct, Create, Delete, Design, Discuss, Elaborate, Estimate, Formulate, Happen, Imagine, Improve, Invent, Make up

For more action verbs visit: https://cutt.ly/fERy2Eh

Course Outline

Currently In Practice

A **teaching and learning activities** (**TLA's**) enables students to engage with a facilitator to learn the knowledge or skills required to achieve the desired educational outcome.

Teaching and Learning Activities (TLA's):

TLA1	**Interactive discussion using Online/multimedia or whiteboard.**
TLA2	**Group presentation regarding related problems and assigned task.**
TLA3	**Evaluation of class performances to reach each student in a class for every topic.**

Course Outline

Need to Incorporate

CO-PO Mapping along with Blooms Taxonomy Levels: ***According to BAETE Manual (CH-7, 8.2.1)***

Course Code	CO No.	CO Statement	Delivery methods and activities	Corresponding PO No.	Domain/level of learning taxonomy	Level of Knowledge Profile	Assessment tools
CSE112 Computer Fundamentals	CO1	To converse in basic computer terminology	TLA1, TLA2	PO1	L1	K1-K4	Midterm/Final (Direct Method)
	CO2	To formulate opinions about the impact of computers on society	TLA1, TLA2	PO2	L2	K1-K4	Midterm/Final (Direct Method)
	CO3	To possess the knowledge of basic hardware peripherals	TLA1, TLA2	PO3	L3	K5	Midterm/Final (Direct Method)

Example CO-PO Mapping

Aligning with Blooms Taxonomy Level

Computer Graphics course example

Course Code	CO's	CO's Description	Corresponding PO No	Domain/level of learning Taxonomy	Delivery methods	Assessment tools
Computer Graphice	CO1	**Explain** the working procedure of Input and Output raphics.	PO1	L1	TLA1, TLA2	Midterm/Final
	CO2	**Explain** about graphics primitives and work with coordinate spaces, coordinate conversion, and s of graphics objects.		L1	TLA1, TLA2	Midterm/Final
	CO3	e 2D & 3D geometrical transformations n tools.		L2	TLA1, TLA2	Midterm/Final
	CO4	**Explain** various 3D projections and current models for surfaces.	PO2	L1	TLA1, TLA2	Midterm/Final

Remember → Remember → Understand → Remember

Engineering Knowledge → Problem Analysis → Modern Tools → Problem Analysis

Knowledge Profile

An engineering program that aims to attain the above mentioned POs must ensure that its curriculum encompasses all the attributes of the Knowledge Profile (K1 – K8)

K's		Attribute
K1	Natural Sciences	A systematic, theory-based understanding of the natural sciences applicable to the discipline
K2	Mathematics	Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline
K3	Engineering Fundamentals	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
K4	Specialist Knowledge	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline

Knowledge Profile

An engineering program that aims to attain the abovementioned POs must ensure that its curriculum encompasses all the attributes of the Knowledge Profile (K1 – K8)

K's	Keyword	Attribute
K5	Engineering Design	Knowledge that supports engineering design in a practice area
K6	Engineering Practice	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
K7	Comprehension	Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability
K8	Research Literature	Engagement with selected knowledge in the research literature of the discipline

Example

Engineering Knowledge

Specialist Knowledge

Q1.	**Explain about graphics primitives and work with coordinate spaces, coordinate conversion, and transformations of graphics objects.**	**PO1**	**K1-K4**

Complex Engineering Problems

Means if we consider a problem as CEP then we must have to bring P1 and at least one P's among P2-P7

Complex Engineering Problems have characteristic P1 and some or all of P2 to P7

K's	Attribute	Statement
P1	Depth of knowledge required	Resolved with **forefront in-depth** engineering knowledge which allows a fundamentals-based, first principles analytical approach.
P2	Range of conflicting requirements	Involve **wide-ranging or conflicting** technical, engineering and other issues.
P3	Depth of analysis required	Have **no obvious solution** and require abstract thinking, originality in analysis to formulate suitable models.
P4	Familiarity of issues	Involve **infrequently encountered** issues
P5	Extent of applicable codes	**Beyond codes** of practice
P6	Extent of stakeholder involvement	Involve **diverse groups of stakeholders** with widely **varying needs**.
P7	Interdependence	Are **high level problems** including many **component** parts or sub-problems.

Complex Engineering Activities

Complex activities mean (engineering) activities or projects that have some or all of the following characteristics listed below

A's	Attribute	Statement
A1	Range of resources	**Diverse resources** (people, money, equipment, materials, information and technologies).
A2	Level of interaction	Require resolution of significant problems arising from interactions between **wide ranging or conflicting** technical, engineering or other issues.
A3	Innovation	Involve creative use of engineering principles and **research-based** knowledge in novel ways.
A4	Consequences to society and the environment	Have **significant consequences** in a range of contexts, characterized by **difficulty** of prediction and mitigation.
A5	Familiarity	Can extend beyond previous experiences by applying **principles-based** approaches.

Mapping of PO's, K's, P's and A's

Currently In Practice

Course Code	Program Outcomes												Knowledge Profile								Complex Engineering Problems							Complex Engineering Activities				
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	K1	K2	K3	K4	K5	K6	K7	K8	P1	P2	P3	P4	P5	P6	P7	A1	A2	A3	A4	A5
	K1-K4		K5	K4	K6	K7	K7	K7													PO1 - PO7							P10				
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Investigation	Modern Tool Usage	The Engineer and Society	Environment and Sustainability	Ethics	Individual Work and Teamwork	Communication	Project Management and Finance	Life-long Learning	Science	Mathematics	Engineering Fundamentals	Engineering Specialization	Engineering Design	Technology	Society	Research	Depth of knowledge required	Range of conflicting Requirements	Depth of analysis required	Familiarity of issues	Extent of applicable codes	Diverse Group	Interdependence	Range of resources	Level of Interaction	Innovation	Consequences	Familiarity
PHY 113	√	√	√										√	√							√							√				√
CSE 134	√	√	√	√	√										√	√	√				√	√	√		√			√	√	√		√
CSE 221	√	√	√	√												√	√	√			√	√			√		√	√	√			√
STA 221	√	√	√	√									√	√							√	√	√									√
CSE 223	√	√	√	√											√	√						√		√				√	√	√	√	√
CSE 225	√	√	√	√	√										√	√					√	√		√						√	√	√
CSE 235	√	√	√	√	√									√			√				√				√		√					

Thank You