K.D.K. COLEGE OF ENGINEERING

DEPARTMENT
OF
ELECTRICAL ENGINEERING

ASSESSMENT & ATTAINMENT

MANUAL

2021-22

INDEX

KDK COLLEGE OF ENGINEERING, NAGPUR

Vision of the Institute

"Service to the Society through Quality Technical Education"

Mission of the Institute

We, at KDKCE shall work continuously to achieve,

M1 Academic Excellence in Engineering and Technology through Complete Dedication to All Round Growth of Young Students.

M2 Enable the Students to Develop into Outstanding Professionals with Technical Competence and Managerial Skills.

M3 Fulfill the Expectance of the Society and Industry with High Ethical Standards for Developing Sustainable Solutions.

Vision of the Department

"To Impart Quality Technical Education for Developing Competent Electrical Engineers Capable of accepting Challenges of the Modern Society"

Mission of the Department

M1 To Provide an Adoptive Academic Environment with a Continuous Motivation to Budding Electrical Engineers for Making them Academically Excellent and Technically Competent having Good Managerial Skills to Fulfill the Expectations of Industries for Developing Sustainable Solutions.

M2 To Work for All Round Growth of Students having Good Moral Values in a Dedicated Manner.

M3 To Inculcate a Sense of Responsibility among the Students for Well Being of the Society.

*"**Vision and Mission statement** -- Mission statements are essentially the means to achieve the vision of the institution. For example, if the vision is to create high-quality engineering professionals, then the mission could be to offer a well-balanced programme of instruction, practical experience, and opportunities for overall personality development. Vision is a futuristic statement that the institution would like to achieve over a long period of time, and Mission is the means by which it proposes to move toward the stated Vision."*

PROGRAM EDUCATIONAL OBJECTIVES, PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES AS PER ABET

Program Educational Objectives (PEOs): Program educational objectives are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve.

Program Outcomes (POs): Program outcomes describe what students are expected to know and would be able to do by the time of graduation. These relate to the skills, knowledge, and behaviors that students acquire as they progress through the program.

Program Specific Outcomes (PSOs): Program Specific Outcomes are statements that describe what the graduates of a specific engineering program should be able to do.

Graduates Attributes (GAs) form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. The GAs are exemplars of the attributes expected of a graduate of an accredited programme.

STATEMENTS OF PEO's, PO's AND PSO's

Program Educational Objectives (PEO)

PEO 1	Graduates of Electrical Engineering shall have sound technical knowledge and all round personalities ready to pursue high level career in industries and academics.
PEO 2	Graduates of Electrical Engineering shall have broad based trainings to cater to the requirements of modern electrical industries and ready for working as electrical consultants.
PEO 3	Graduates of Electrical Engineering shall have sensitivity towards global environmental issues and sustainable developments through use of renewable energy sources.

Programme Outcomes

Electrical Engineering graduates will be able to:

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.

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.

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 life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

The Department of Electrical Engineering will prepare the graduate students to have:-

1. Technical and managerial skills necessary for design, application, installation, manufacturing, testing, operation and/or maintenance of electrical systems.
2. Knowledge of information technology skills including design, research and analysis of electrical CAD drawings towards lifelong learning.

BLOOM'S TAXONOMY

In 1956, Benjamin Bloom with collaborators Max Englehart, Edward Furst, Walter Hill, and David Krathwohl published a framework for categorizing educational goals: *Taxonomy of Educational Objectives*. Familiarly known as Bloom's Taxonomy, this framework has been applied by generations of K-12 teachers and college instructors in their teaching. The framework elaborated by Bloom and his collaborators consisted of six major categories: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. The categories after Knowledge were presented as "skills and abilities," with the understanding that knowledge was the necessary precondition for putting these skills and abilities into practice. While each category contained subcategories, all lying along a continuum from simple to complex and concrete to abstract, the taxonomy is popularly remembered according to the six main categories.

The Original Taxonomy (1956)

Here are the authors' brief explanations of these main categories in from the appendix of *Taxonomy of Educational Objectives*

- **Knowledge** "involves the recall of specifics and universals, the recall of methods and processes, or the recall of a pattern, structure, or setting."
- **Comprehension** "refers to a type of understanding or apprehension such that the individual knows what is being communicated and can make use of the material or idea being communicated without necessarily relating it to other material or seeing its fullest implications."
- **Application** refers to the "use of abstractions in particular and concrete situations."
- **Analysis** represents the "breakdown of a communication into its constituent elements or parts such that the relative hierarchy of ideas is made clear and/or the relations between ideas expressed are made explicit."
- **Synthesis** involves the "putting together of elements and parts so as to form a whole."
- **Evaluation** engenders "judgments about the value of material and methods for given purposes."

The Revised Taxonomy (2001)

A group of cognitive psychologists, curriculum theorists and instructional researchers, and testing and assessment specialists published in 2001 a revision of Bloom's Taxonomy with the title *A Taxonomy for Teaching, Learning, and Assessment*. This title draws attention away from the somewhat static notion of "educational objectives" (in Bloom's original title) and points to a more dynamic conception of classification. The authors of the revised taxonomy underscore this dynamism, using verbs and gerunds to label their categories and subcategories (rather than the nouns of the original taxonomy). These "action words" describe the cognitive processes by which thinkers encounter and work with knowledge:

- **Remember**
  - Recognizing
  - Recalling
- **Understand**
  - Interpreting
  - Exemplifying
  - Classifying
  - Summarizing
  - Inferring
  - Comparing
  - Explaining
- **Apply**
  - Executing
  - Implementing
- **Analyze**
  - Differentiating
  - Organizing
  - Attributing
- **Evaluate**
  - Checking
  - Critiquing
- **Create**
  - Generating
  - Planning
  - Producing

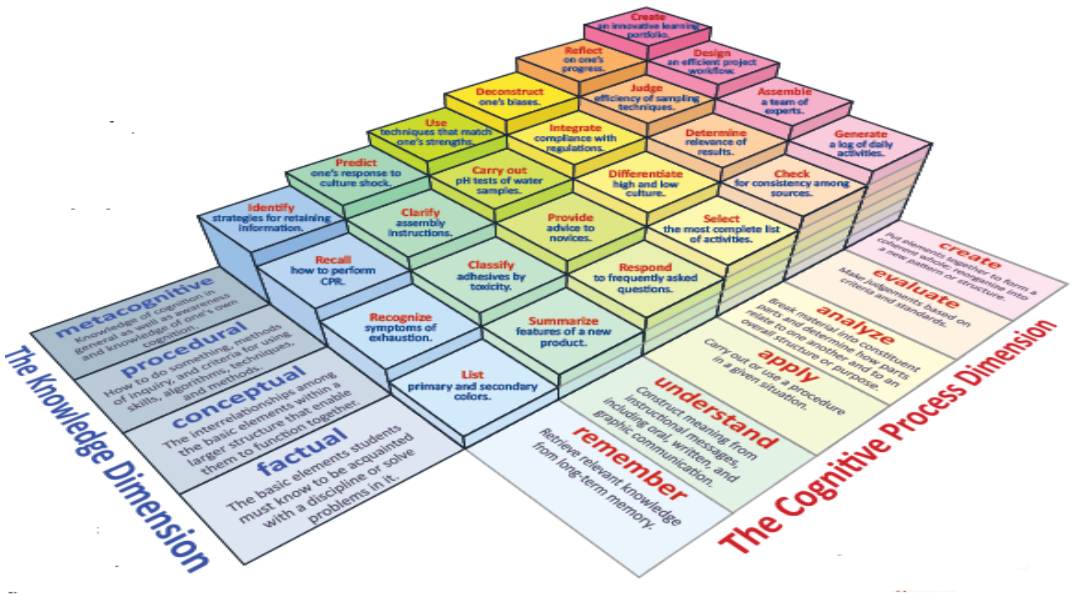
In the revised taxonomy, knowledge is at the basis of these six cognitive processes, but its authors created a separate taxonomy of the types of knowledge used in cognition:

- Factual Knowledge
    - Knowledge of terminology
    - Knowledge of specific details and elements
- Conceptual Knowledge
    - Knowledge of classifications and categories
    - Knowledge of principles and generalizations
    - Knowledge of theories, models, and structures
- Procedural Knowledge
    - Knowledge of subject-specific skills and algorithms
    - Knowledge of subject-specific techniques and methods
    - Knowledge of criteria for determining when to use appropriate procedures
- Metacognitive Knowledge
    - Strategic Knowledge
    - Knowledge about cognitive tasks, including appropriate contextual and conditional knowledge
    - Self-knowledge

Concrete knowledge		**Abstract knowledge**	
factual	**conceptual**	**procedural**	**metacognitive***
knowledge of terminology knowledge of specific details and elements	knowledge of classifications and categories knowledge of principles and generalizations knowledge of theories, models, and structures	knowledge of subject-specific skills and algorithms knowledge of subject-specific techniques and methods knowledge of criteria for determining when touse appropriatepr ocedures	strategic knowledge knowledge about cognitivetasks, including appropriate contextual and conditionalknowledg e self-knowledge

A statement of a **learning objective** contains a **verb** (an action) and an **object** (usually a noun).

- The **verb** generally refers to [actions associated with] the intended **cognitiveprocess**.
- The **object** generally describes the **knowledge** students are expected toacquire or construct.

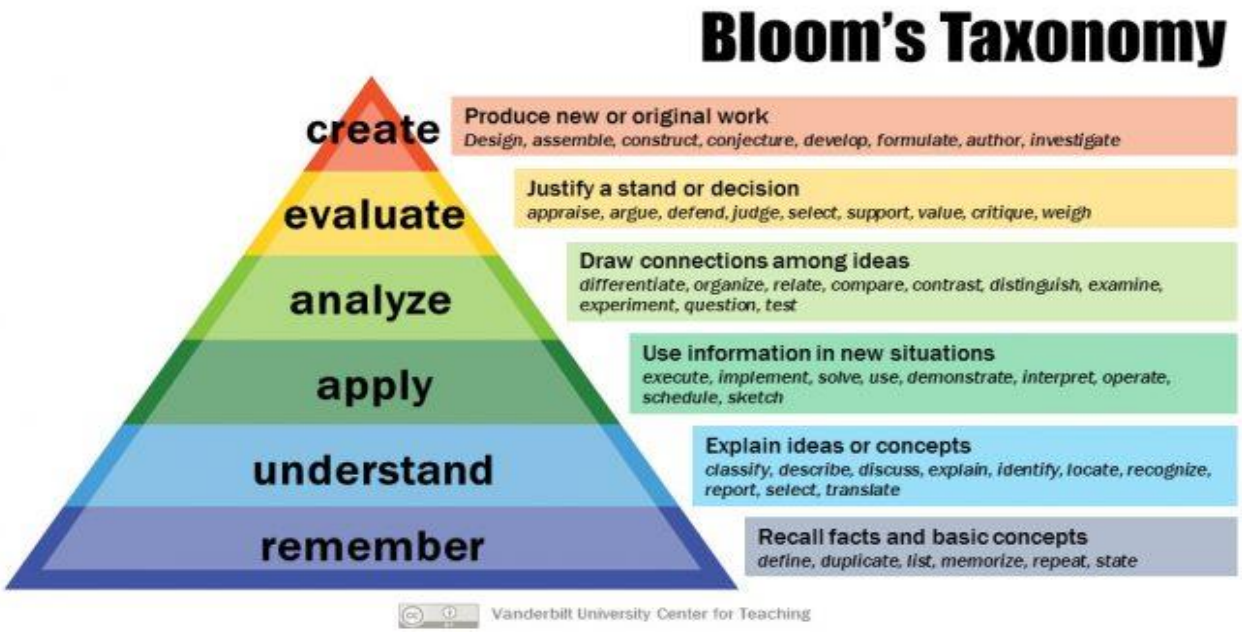


In this model, each of the colored blocks shows an example of a learning objective that generally corresponds with each of the various combinations of the cognitive process and knowledge dimensions.

Why Use Bloom's Taxonomy?

The authors of the revised taxonomy suggest a multi-layered answer to this question, to which the author of this teaching guide has added some clarifying points:

1. Objectives (learning goals) are important to establish in a pedagogical interchange so that teachers and students alike understand the purpose of that interchange.
2. Organizing objectives helps to clarify objectives for themselves and for students.
3. Having an organized set of objectives helps teachers to:
    - "plan and deliver appropriate instruction";
    - "design valid assessment tasks and strategies"; and
    - "Ensure that instruction and assessment are aligned with the objectives."

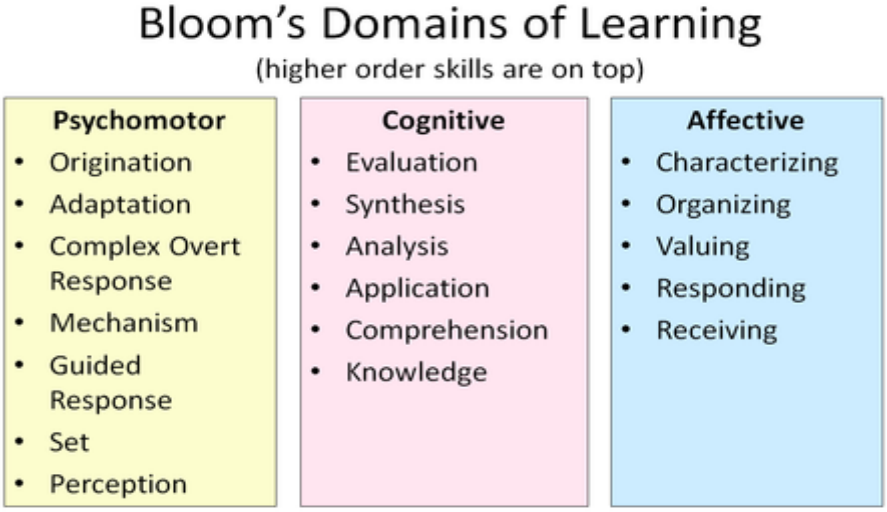


The action verbs are annexed

Learning Domains of Bloom's Taxonomy

There is more than one type of learning. A committee of colleges, led by Benjamin Bloom, identified three domains of educational activities:

- **Cognitive**: mental skills (*Knowledge*)
- **Affective**: growth in feelings or emotional areas (*Attitude*)
- **Psychomotor**: manual or physical skills (*Skills*)



Sources: Bloom 1984; Krathwohl, Bloom and Masia 1990; Simpson 1972.

Since the work was produced by higher education, the words tend to be a little bigger than we normally use. Domains can be thought of as categories. Trainers often refer to these three domains as KSA (Knowledge, Skills, and Attitude). This taxonomy of learning behaviors can be thought of as "the goals of the training process." That is, after the training session, the learner should have acquired new skills, knowledge, and/or attitudes.

The committee also produced an elaborate compilation for the cognitive and affective domains, but none for the psychomotor domain. Their explanation for this oversight was that they have little experience in teaching manual skills within the college level (I guess they never thought to check with their sports or drama department).

This compilation divides the three domains into subdivisions, starting from the simplest behavior to the most complex. The divisions outlined are not absolutes and there are other systems or hierarchies that have been devised in the educational and training world. However, Bloom's taxonomy is easily understood and is probably the most widely applied one in use today.

Cognitive

The cognitive domain involves knowledge and the development of intellectual skills. This includes the recall or recognition of specific facts, procedural patterns, and concepts that serve in the development of intellectual abilities and skills. There are six major categories, which are listed in order below, starting from the simplest behavior to the most complex. The categories can be thought of as degrees of difficulties. That is, the first one must be mastered before the next one can take place.

Category	Example and Key Words
Knowledge: Recall data or information.	**Examples**: Recite a policy. Quote prices from memory to a customer. Knows the safety rules. **Key Words**: defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Comprehension: Understand the meaning, translation, interpolation, and interpretation of instructions and problems. State a problem in one's own words.	**Examples**: Rewrites the principles of test writing. Explain in one ís own words the steps for performing a complex task. Translates an equation into a computer spread sheet. **Key Words**: comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives **Examples**, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Application: Use a concept in a new situation or unprompted use of an abstraction. Applies what was learned in the classroom into novel situations in the work place.	**Examples**: Use a manual to calculate an employee ís vacation time. Apply laws of statistics to evaluate the reliability of a written test. **Key Words**: applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analysis: Separates material or concepts into component parts so that its organizational structure may be understood. Distinguishes between facts and inferences.	**Examples**: Troubleshoot a piece of equipment by using logical deduction. Recognize logical fallacies in reasoning. Gathers information from a department and selects the required tasks for training. **Key Words**: analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Synthesis: Builds a structure or pattern from diverse elements. Put parts together to form a whole, with emphasis on creating a new meaning or structure.	**Examples**: Write a company operations or process manual. Design a machine to perform a specific task. Integrates training from several sources to solve a problem. Revises and process to improve the outcome. **Key Words**: categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes.
Evaluation: Make judgments about the value of ideas or materials.	**Examples**: Select the most effective solution. Hire the most qualified candidate. Explain and justify a new budget. **Key Words**: appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports.

Affective

This domain includes the manner in which we deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivations, and attitudes. The five major categories are listed from the simplest behavior to the most complex:

Category	Example and Key Words
Receiving Phenomena: Awareness, willingness to hear, selected attention.	**Examples**: Listen to others with respect. Listen for and remember the name of newly introduced people. **Key Words**: asks, chooses, describes, follows, gives, holds, identifies, locates, names, points to, selects, sits, erects, replies, uses.
Responding to Phenomena: Active participation on the part of the learners. Attends and reacts to a particular phenomenon. Learning outcomes may emphasize compliance in responding, willingness to respond, or satisfaction in responding (motivation).	**Examples**: Participates in class discussions. Gives a presentation. Questions new ideals, concepts, models, etc. in order to fully understand them. Know the safety rules and practices them. **Key Words**: answers, assists, aids, complies, conforms, discusses, greets, helps, labels, performs, practices, presents, reads, recites, reports, selects, tells, writes.
Valuing: The worth or value a person attaches to a particular object, phenomenon, or behavior. This ranges from simple acceptance to the more complex state of commitment. Valuing is based on the internalization of a set of specified values, while clues to these values are expressed in the learnerís overt behavior and are often identifiable.	**Examples**: Demonstrates belief in the democratic process. Is sensitive towards individual and cultural differences (value diversity). Shows the ability to solve problems. Proposes a plan to social improvement and follows through with commitment. Informs management on matters that one feels strongly about. **Key Words**: completes, demonstrates, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, shares, studies, works.
Organization: Organizes values into priorities by contrasting different values, resolving conflicts between them, and creating an unique value system. The emphasis is on comparing, relating, and synthesizing values.	**Examples**: Recognizes the need for balance between freedom and responsible behavior. Accepts responsibility for oneís behavior. Explains the role of systematic planning in solving problems. Accepts professional ethical standards. Creates a life plan in harmony with abilities, interests, and beliefs. Prioritizes time effectively to meet the needs of the organization, family, and self. **Key Words**: adheres, alters, arranges, combines, compares, completes, defends, explains, formulates, generalizes, identifies, integrates, modifies, orders, organizes, prepares, relates, synthesizes.

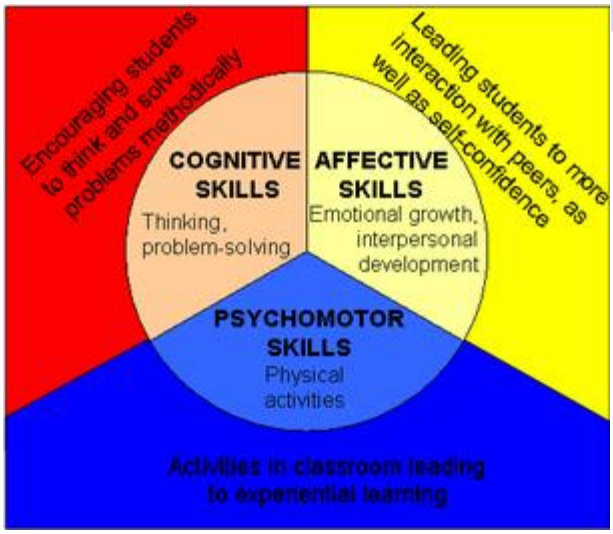
Internalizing values (characterization): Has a value system that controls their behavior. The behavior is pervasive, consistent, predictable, and most importantly, characteristic of the learner. Instructional objectives are concerned with the student's general patterns of adjustment (personal, social, emotional).	**Examples**: Shows self-reliance when working independently. Cooperates in group activities (displays teamwork). Uses an objective approach in problem solving. Displays a professional commitment to ethical practice on a daily basis. Revises judgments and changes behavior in light of new evidence. Values people for what they are, not how they look. **Key Words**: acts, discriminates, displays, influences, listens, modifies, performs, practices, proposes, qualifies, questions, revises, serves, solves, verifies.

Psychomotor

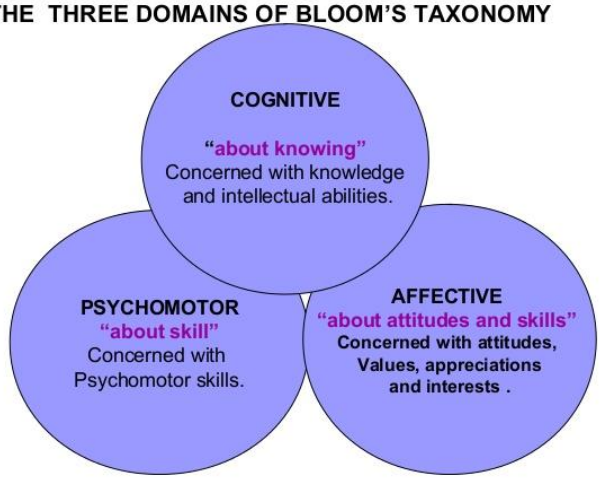
The psychomotor domain includes physical movement, coordination, and use of the motor-skill areas. Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution. The seven major categories are listed from the simplest behavior to the most complex:

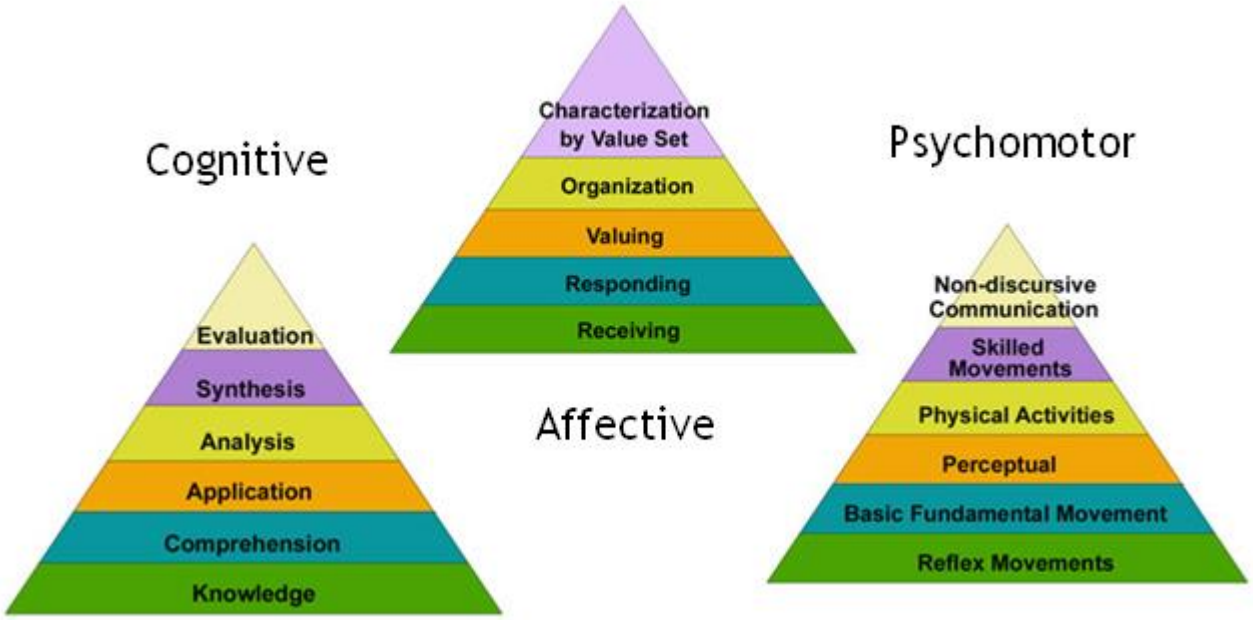
Category	Example and Key Words
Perception: The ability to use sensory cues to guide motor activity. This ranges from sensory stimulation, through cue selection, to translation.	**Examples**: Detects non-verbal communication cues. Estimate where a ball will land after it is thrown and then moving to the correct location to catch the ball. Adjusts heat of stove to correct temperature by smell and taste of food. Adjusts the height of the forks on a forklift by comparing where the forks are in relation to the pallet. **Key Words**: chooses, describes, detects, differentiates, distinguishes, identifies, isolates, relates, selects.
Set: Readiness to act. It includes mental, physical, and emotional sets. These three sets are dispositions that predetermine a personís response to different situations (sometimes called mindsets).	**Examples**: Knows and acts upon a sequence of steps in a manufacturing process. Recognize oneís abilities and limitations. Shows desire to learn a new process (motivation). NOTE: This subdivision of Psychomotor is closely related with the "Responding to phenomena" subdivision of the Affective domain. **Key Words**: begins, displays, explains, moves, proceeds, reacts, shows, states, volunteers.
Guided Response: The early stages in learning a complex skill that includes imitation and trial and error. Adequacy of performance is achieved by practicing.	**Examples**: Performs a mathematical equation as demonstrated. Follows instructions to build a model. Responds hand-signals of instructor while learning to operate a forklift. **Key Words**: copies, traces, follows, react, reproduce, responds

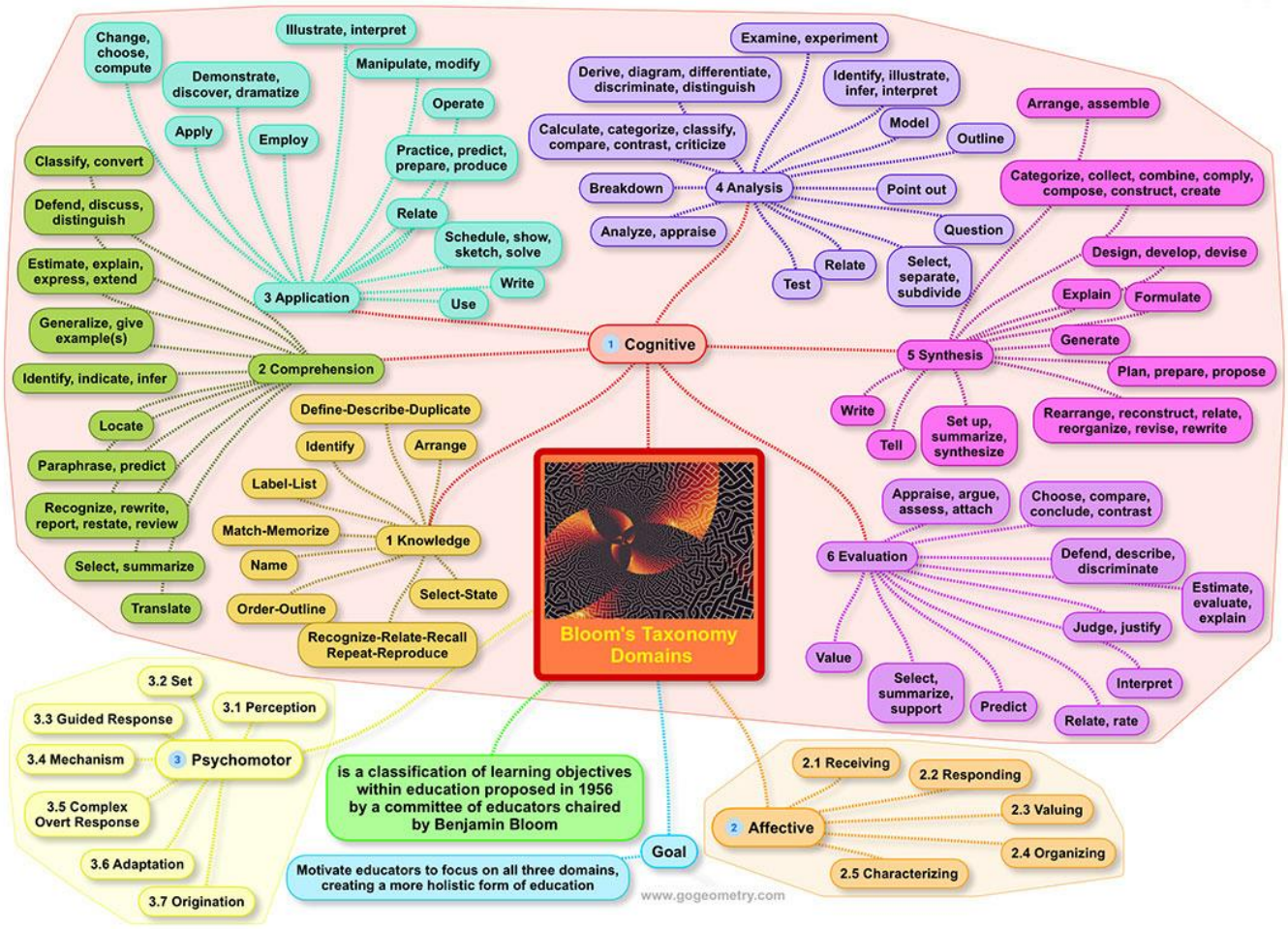
Mechanism: This is the intermediate stage in learning a complex skill. Learned responses have become habitual and the movements can be performed with some confidence and proficiency.	**Examples**: Use a personal computer. Repair a leaking faucet. Drive a car. **Key Words**: assembles, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches.
Complex Overt Response: The skillful performance of motor acts that involve complex movement patterns. Proficiency is indicated by a quick, accurate, and highly coordinated performance, requiring a minimum of energy. This category includes performing without hesitation, and automatic performance. For example, players are often utter sounds of satisfaction or expletives as soon as they hit a tennis ball or throw a football, because they can tell by the feel of the act what the result will produce.	Examples: Maneuvers a car into a tight parallel parking spot. Operates a computer quickly and accurately. Displays competence while playing the piano. Key Words: assembles, builds, calibrates, constructs, dismantles, displays, fastens, fixes, grinds, heats, manipulates, measures, mends, mixes, organizes, sketches. NOTE: The Key Words are the same as Mechanism, but will have adverbs or adjectives that indicate that the performance is quicker, better, more accurate, etc.
Adaptation: Skills are well developed and the individual can modify movement patterns to fit special requirements.	**Examples:** Responds effectively to unexpected experiences. Modifies instruction to meet the needs of the learners. Perform a task with a machine that it was not originally intended to do (machine is not damaged and there is no danger in performing the new task). Key Words: adapts, alters, changes, rearranges, reorganizes, revises, varies.
Origination: Creating new movement patterns to fit a particular situation or specific problem. Learning outcomes emphasize creativity based upon highly developed skills.	**Examples**: Constructs a new theory. Develops a new and comprehensive training programming. Creates a new gymnastic routine. **Key Words**: arranges, builds, combines, composes, constructs, creates, designs, initiate, makes, originates.



THE THREE DOMAINS OF BLOOM'S TAXONOMY






Bloom's Taxonomy Domains
1 Cognitive
1 Knowledge
Define-Describe-Duplicate
Identify
Arrange
Label-List
Match-Memorize
Name
Order-Outline
Select-State
Recognize-Relate-Recall
Repeat-Reproduce
2 Comprehension
Change, choose, compute
Illustrate, interpret
Demonstrate, discover, dramatize
Manipulate, modify
Operate
Apply
Employ
Practice, predict, prepare, produce
Classify, convert
Defend, discuss, distinguish
Relate
Schedule, show, sketch, solve
Estimate, explain, express, extend
Write
3 Application
Use
Generalize, give example(s)
Identify, indicate, infer
Locate
Paraphrase, predict
Recognize, rewrite, report, restate, review
Select, summarize
Translate
4 Analysis
Examine, experiment
Derive, diagram, differentiate, discriminate, distinguish
Identify, illustrate, infer, interpret
Calculate, categorize, classify, compare, contrast, criticize
Model
Outline
Breakdown
Point out
Analyze, appraise
Question
Test
Relate
Select, separate, subdivide
5 Synthesis
Arrange, assemble
Categorize, collect, combine, comply, compose, construct, create
Design, develop, devise
Explain
Formulate
Generate
Plan, prepare, propose
Write
Tell
Set up, summarize, synthesize
Rearrange, reconstruct, relate, reorganize, revise, rewrite
6 Evaluation
Appraise, argue, assess, attach
Choose, compare, conclude, contrast
Defend, describe, discriminate
Estimate, evaluate, explain
Judge, justify
Value
Select, summarize, support
Predict
Interpret
Relate, rate
3 Psychomotor
3.1 Perception
3.2 Set
3.3 Guided Response
3.4 Mechanism
3.5 Complex Overt Response
3.6 Adaptation
3.7 Origination
2 Affective
2.1 Receiving
2.2 Responding
2.3 Valuing
2.4 Organizing
2.5 Characterizing
is a classification of learning objectives within education proposed in 1956 by a committee of educators chaired by Benjamin Bloom
Goal
Motivate educators to focus on all three domains, creating a more holistic form of education
www.gogeometry.com

COURSE OUTCOME STATEMENTS

Course Outcomes (COs):statements indicating what a student can do after the successful completion of a course. Every Course leads to some Course Outcomes. The CO statements are defined by considering the course content covered in each module of a course. For every course there may be 5 or 6 COs. The keywords used to define COs are based on Bloom's Taxonomy.

STEPS IN WRITING COURSE LEARNING OUTCOMES

What are course learning outcomes ?

Course Learning Outcomes are statements that describe what students are expected to know and be able to do by the time they complete the course. These relate to the skills, knowledge, attitudes, values, and behaviors that students acquire in their matriculation through the program. Course Learning Outcomes should be derived from the program learning outcomes which are already mapped to program objectives. Course Learning Outcome statements provide direction for assessment activities; define the faculty expectations of students; and provide stakeholders, other program faculty with information about the educational experience in a given course.

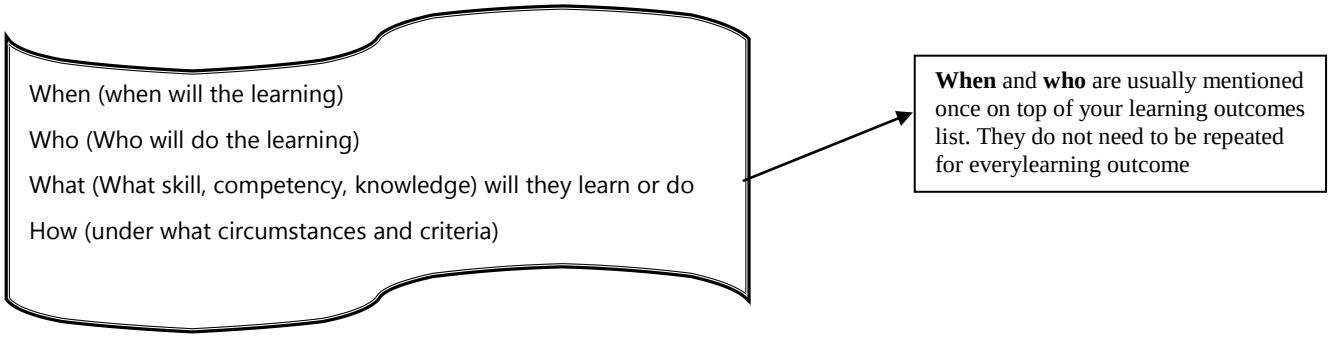
Why do we need them ?

Course Learning Outcomes help us to:

- Have a student centered approach to teaching when focus on what students need to know
- Better tie instruction, learning , teaching and assessment activities
- Communicate to students and others what is valuable for our course/program

Help students better direct their learning if they know what is expected of them

Components of Course learning outcomes



STEP 1 :

- Identify all of the content, skills, behaviors and thinking processes that you want the students to learn.Possible Sources : Below are some documents and actions that could help you when writing your course learning outcomes.
  - **Program learning outcomes (PO,PSO)**
  - **Course syllabi**
  - **discussions with other instructors**
  - **textbooks and/or required readings**
  - **emerging needs of the field (discipline)**

STEP 2

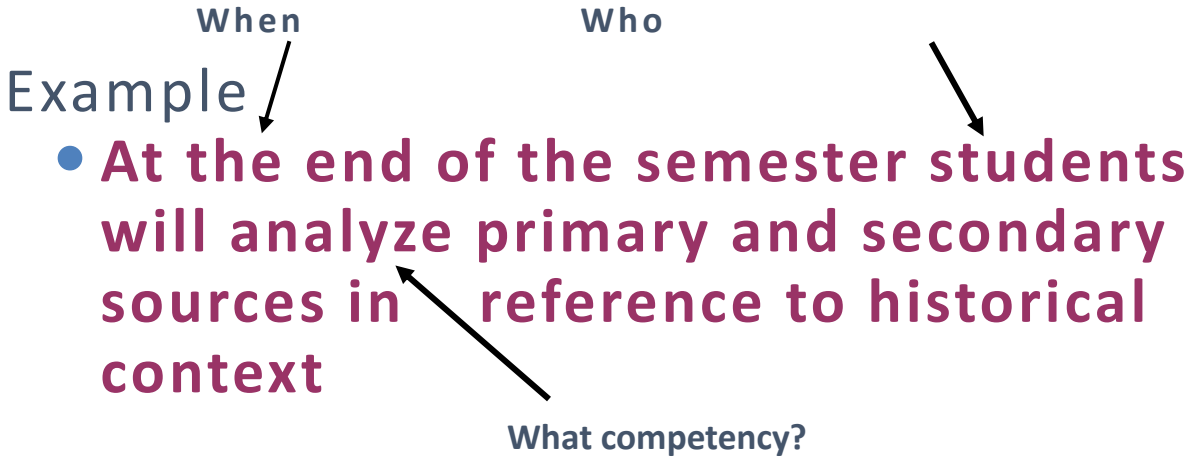
- Make a list of the topics, ideas, concepts, skills and behaviors you think need to be taught from the sources above
- Refine the list to include only those areas that are most important (Competencies , skills, theoretical knowledge, behaviors etc⋯)

STEP 3

- For each competency identify the level competency you want them have . You can use Bloom taxonomy here to identify competency level : (Example , do you want them to know something, to do something etc⋯
- Identify when
- Identify how they will show the competency (this will be helpful when you come to the Assessment). The following table is an example of assessment and learning outcomes applicable to different fields

SETP 4

- Write your learning outcome put steps 1, 2, 3, and 4 together



CHARACTERISTICS OF GOOD LEARNING OUTCOMES

- Measurable/Assessable/able to be demonstrated. The specified action by the learners must be observable.—writing, talking, drawing etc.
- Clearly stated for both instructors and students
- Must be *outcome specific:* The specified action must be done by the learners and not have multiple action verbs.
- Uses a variety of Bloom' s Taxonomy levels
- Provide a common language for describing student learning
- Build on the Program Outcomes(POs)and PSOs
- Should be communicated to students " Students can better focus their learning if they know what is expected of them"

THINGS TO AVOID

- Avoid abstract verbs: understand, know, appreciate, learn, become aware, become familiar with etc⋯,
- Avoid using ambiguous words. Example: Often, frequently occasionally etc⋯ These words can mean different things to different people. For example what is often for me could once a week while often mean twice a week or once a month to someone else.

SAMPLE CO STATEMENTS:

FIFTH SEMESTER B. E. ELECTRICAL	
BEELE502T :- UTILIZATION OF ELECTRIC ENERGY	
After studying this subject, the students will be able to	
C502T.1	Explain electric energy for industrial heating
C502T.2	Elucidate electric energy for industrial welding.
C502T.3	Design Illumination schemes for Various applications.
C502T.4	Describe basics of Refrigeration and Air conditioning system.
C502T.5	Explain application of Fans & Pumps.
C502T.6	Evaluate the performance. Of compressors and DG systems.

CO – PO AND CO – PSO MAPPING OFCOURSES

All the courses together must cover all the POs (and PSOs). For a course we map the COs to POs through the CO-PO matrix and to PSOs through the CO-PSO matrix as shown below. The various correlation levels are:

- **"1"** – Slight (Low)Correlation
- **"2"** – Moderate (Medium)Correlation
- **"3"** – Substantial (High)Correlation
- **"-"** indicates there is nocorrelation.

SAMPLE CO-PO AND CO-PSO MAPPING:

Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12
FIFTH SEMESTER												
BEELE502T :- UTILIZATION OF ELECTRIC ENERGY												
C502T.1	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**-**	**2**	**-**	**-**	**2**
C502T.2	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**-**	**2**	**-**	**-**	**2**
C502T.3	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**-**	**2**	**-**	**-**	**2**
C502T.4	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**-**	**2**	**-**	**-**	**2**
C502T.5	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**-**	**2**	**-**	**-**	**2**
C502T.6	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**-**	**2**	**-**	**-**	**2**
Average	**3.00**	**3.00**	**3.00**	**3.00**	**2.00**	**3.00**	**2.00**	**-**	**2.00**	**-**		**2.00**

Course Code	PSO1	PSO2
FIFTH SEMESTER		
BEELE502T :- UTILIZATION OF ELECTRIC ENERGY		
C502T.1	**3**	--
C502T.2	**3**	--
C502T.3	**3**	--
C502T.4	**3**	--
C502T.5	**3**	--
C502T.6	**3**	--
Average	**3.00**	

ASSESSMENT PROCESS

The key aspects in Outcome-Based Education (OBE) are the assessment of course outcomes. At the initial stage of OBE implementation, the Course Outcomes (COs) for each course are defined and mapped with the Programme Outcomes (POs) and Program Specific Outcomes (PSOs). Attainment of Course Outcomes needs to be assessed at the end of each course. Attainment evaluation is the action of achieving a standard result towards accomplishment of desired goals and is assessed directly by test or examination results. Direct attainment is the display of students' knowledge and skills as is seen from their test performance.

The assessment of Course Outcome is based on the performance of students in internal evaluation and in university examination. For theory courses, weightage of 20% is given to internal assessment and 80 % for university assessment for the aggregate assessment of a CO. For practical courses and projects, the weightage of internal and university assessment is 50% each of the aggregate assessment of a CO.

CO Assessment Tools:

Evaluation of Course Outcomes is carried out based on the performance of students in Internal Assessment which comprises of various tools like sessional examinations, pre-university tests, objective tests, class tests, assignments, class performance etc. & University Examination. These methods provide a sampling of what students know and/or can do and give a strong evidence of student learning. Fig. 1shows the direct assessment tools for theory, practical & project.

Theory: -

- As per R.T.M. Nagpur University norms, Department can access the students for 20% of total marks as Internal Assessment and 80% as university examination for each theory subject.
- The Internal Assessment marks for theory papers are based on two sessional examinations, a Pre-University Test, objective tests, assignments, class performance and activities scheduled in accordance with the university and college calendar of events.
- Question papers for the corresponding course are set by the respective course faculty and submitted to the sessional In-charge well in advance.
- The evaluation for theory courses is carried out by the concerned faculty based on the parameters shown in Table 1and submitted to the class-in-charge. The attainment of course outcomes is calculated after declaration of results for each examination.
- Internal Evaluation marks are submitted online by the subject teacher before commencement of R.T.M. Nagpur university examination.

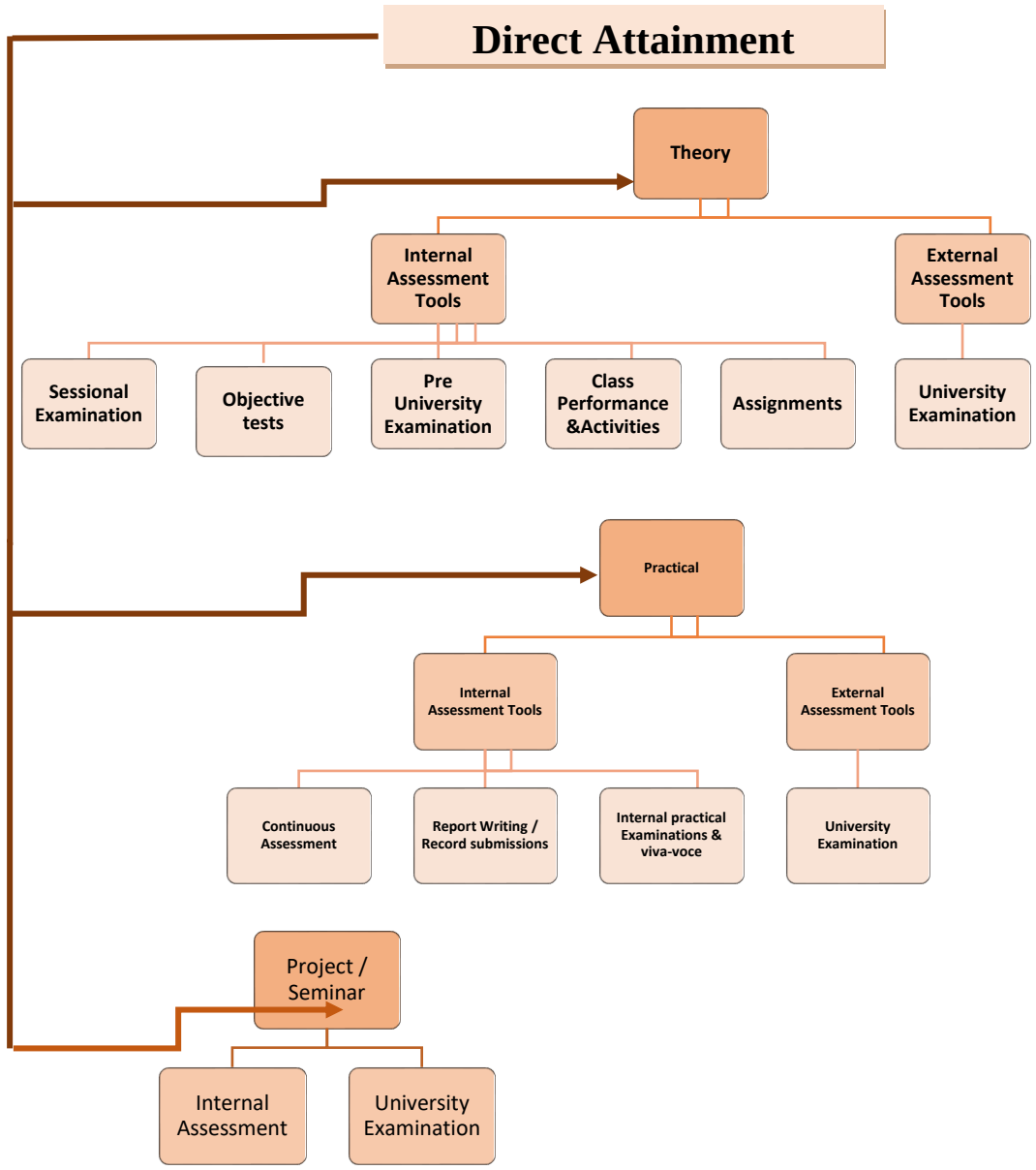


Fig 1. : Direct Assessment Tools

Table 1: Evaluation of the Course Work (Theory)

Course Type	Assessment Method	Assessment Tools
Theory	Internal Assessment Tools	Sessional Examination
		Pre University Examination
		Objective tests
		Assignments
		Class Performance &Activities
	External Assessment Tools	University Exam

Practical

Practical sessions conducted in laboratories play a key role in the development of technical skills among the students. It also helps in developing students to work as an individual as well as in a team which may include 4-5 students. Students are provided with laboratory manuals. Faculty gives demonstration covering the design aspects and theoretical calculations as required for each experiment.

It is a customary process of performing laboratory experiments as per schedule and to submit the complete practical record in compiled laboratory journal to the corresponding supervising faculty. Experiments beyond the curriculum are also discussed in the laboratory sessions.

- As per R.T.M.Nagpur University norms, Internal Assessment Marks contribute to 50% of total marks for each practical subject and the university conducts a practical examination for remaining 50% marks.
- The Internal Assessment marks are based on the laboratory performance, record submissions, practical tests and viva-voce.
- Faculty member conducts the practical tests and viva-voce.
- The evaluation for practical courses is carried out by the respective faculty supervising practical course based on the parameters shown in Table 2.
- R.T.M.N.U. practical examination is conducted by the External faculty examiner appointed by Nagpur University as per schedule given by the University. Marks are submitted by the external examiner in on-line format on the same day of examination to R.T.M. Nagpur University, Nagpur.

Table 2:Evaluation of the Course Work (Practical)

Course Type	Assessment Method	Assessment Tools
Practical	Internal Assessment Tools	Continuous Assessment
		Report Writing / Record submissions
		Internal practical Examinations & viva-voce
	External Assessment Tools	University Exam

Continuous Assessment Rubrics

Sr. no.		Rubrics	Exceed Expectation (3)	Meet Expectation (2)	Doesn't meet expectation (0-1)	Marks
1.	Conduction of Experiment (Hardware)	**Selection of Equipment**	Student has selected correct equipment relevant to the experiment	Student needed minor guidance to select correct equipment relevant to the experiment	Student is incapable of selecting equipment relevant to the experiment	
2.		**Equipment connection**	Student has made correct equipment /component connection as per standard circuit diagram	Student needed guidance to make correct equipment/ component connection as per standard circuit diagram	Student was unable to make correct equipment/ component connection as per standard circuit diagram	
3.		**Data Recording / Collection**	Student has correctly measured the relevant parameters	Student has performed incorrect measurement of relevant parameters	Student was unable to identify/ measure relevant parameters.	
4.		**Result**	Accurate results have been achieved	The achieved results are not accurate but are within tolerance range.	No results are achieved OR the achieved results are meaningless.	
5.		**Troubleshooting**	Students has ability to detect and correct the errors	Students can detect the errors but unable to correct it.	Student was unable to detect the error.	
6.	ETHICS	**Safety**	Students carefully observes the safety rules and procedure during practical work	Student observe safety rules and procedure with minor deviation during practical work.	Student does not care about safety rules during practical work.	
7.		**Punctuality**	Student was on time and stayed till the completion of task	Student was on time but wasted time outside the workplace during the experiment	Student was not on time and left class before time	
8.	Team Work	**Research & gather information**	Student has collected a great deal of information which goes beyond the basics	Student has collected basic information related the topic	Student has not collected any information that relates to the topic.	
9.		**Fulfill team role's duties**	Student has performed the duties assigned and actively assisted others	Student has shown limited performance in the duties that are assigned	Student has not performed any duties of assigned team role.	
10.		**Listen to other teammates**	Consistently listens and respond to others appropriately.	Usually doing most of the talking, rarely allowed others to speak.	Student shows an assertive behavior and was unable to show respect towards other teammates.	

Project Seminar

- A senior faculty member works as a Project Seminar coordinator. The coordinator ensures that the students choose project topics based on recent developments and novel concepts in Electrical and allied research areas with a lot of relevance and applicability.
- Each student delivers a Project seminar in the VII semester as per schedule.
- A team of faculty members, who are also project guides, assesses the Project Seminar Presentations by students. Rubrics shown in Table 3 are used to evaluate students' performance in seminars.

Table 3: Rubrics of Evaluation for Student Technical Project Seminars

Rubrics	Marks
Content	
Background/Introduction is sufficient to understand how this project is relevant & Explanations are understandable/clear	10
References/Sources are cited correctly.	5
Audience questions are answered properly	10
Presentation Quality	
Speaking is understandable/clear	10
Visuals/PPT are clear and readable	10
Visuals/PPT have appropriate amount of text, diagrams	5

Project

- Students are directed to form the project groups based on their subject interest.
- Student groups request faculty members with appropriate area of interest and specializations to help in choosing topics for project work
- Students prepare a synopsis in consultation with the project guide and submit to the project coordinator for final approval.
- Each project guide continuously monitors the progress of group of students and guides them to complete the undertaken project work as per schedule in the Time Table.
- Panels of project guides conduct project reviews as per Departmental academic calendar. Rubrics are used for evaluation purpose.
- Internal assessment is for 50% of maximum marks and 50% marks are awarded based on University project examination.
- External Project examination includes project demonstration and Viva voce and is conducted by theexaminers deputed by the R.T.M. Nagpur University.
- Based on the examination, marks are awarded to the students and submitted to university on the same day in online format.
- The Department encourages students to participate in Technical project competitions and also motivates them to publish their work in standard conferences/journals.

Table4: Rubrics of Evaluation for Student Project

Rubrics	Marks
Project objective formulation, methodology to be followed, background	20
Organization and presentation of the report	20
Quantum of work completed	10
Project demonstration	20
Question Answer Session	5

Attainment Levels:

Table5: Attainment Levels & Targets for Attainment of CO

Assessment Methods	Course Type	Attainment Levels	Academic Year 2019-20 & 2020-21
			% of students scoring more than absolute marks ***(absolute marks = 47.5% of total marks for theory absolute marks = 60% of total marks for practical absolute marks = 75% of total marks for project)***
Internal/ University Assessment	**Theory**	**Level 1**	45 %
		Level 2	55 %
		Level 3	65 %
Internal/ University Assessment	**Practical**	**Level 1**	55 %
		Level 2	65 %
		Level 3	75 %
Internal/ University Assessment	**Project**	**Level 1**	70 %
		Level 2	75 %
		Level 3	80 %

Sample of Detailed CO assessment with corrective actions

for improving CO attainments

Course Outcome Attainment Sheet								
Program:- B.E. Electrical Engineering								
Semester / Section :- V Semester B.E. Electrical Engineering								
Course / Course Code: BEELE502T Utilization of Electrical Energy								
Academic Year:-2021-22								
Assessment Tools	**20 Marks** Online Test 1 Subjective	**20 Marks** Online Test 2 Subjective	**20 Marks** Online Test 3 Subjective	**30 Marks** PUT Subjective	**40 Marks** PUT - MCQ MCQ	**Class Performance & Activities**	**Assign**	**Uni. Exam**
Max. Marks	**20**	**20**	**20**	**30**	**40**	**5**	**5**	**80**
CO Mapped	CO1	CO2	CO3	ALL CO	ALL CO	ALL CO	ALL CO	ALL CO
Sr. No.	**Marks Scored**							
1	15	10	12	21	38	4	5	**72**
2	19	19	18	27	38	3	4	**74**
3	15	14	10	12	39	1	2	**68**
4	18		10	20	40	3	4	**74**
5	15	13	14	15	37	4	2	**68**
6	19	14	16	20	39	3	4	**64**
7	19	19	17	28	40	2	2	**78**
8		16		20	39	2	2	**62**
9	19	20	16	21	36	5	4	**76**
10	19	17	18	14	38	5	2	**68**
11	19	19	15	20	39	4	4	**66**
12	15	20		24	39	4	4	**72**
13		19	17	18	33	4	3	**64**
14	19	17	9	22	36	3	4	**70**
15			13		37	2	3	**60**
16	15	18	20	25	39	5	4	**68**
17	19	15	14	15	39	4	3	**70**
18	15	14	14	12	37	5	2	**58**
19	0	12		22	35	2	3	**48**
20	19	15	19	25	38	4	4	**70**
21	15	14	10	12	39	5	2	**56**

22		14	14	18	34	2	4	**68**
23	10	12	14	23	37	3	2	**68**
24	9	10	8	18	39	3	5	**66**
25	19	14	16	22	35	3	2	**72**
26	15	15	11	19	37	5	4	**68**
27					10	2	5	**52**
28	7	16	18	27	39	5	2	
29	19	15	16	17	36	3	3	**68**
30	15	16	13	15	39	4	3	**72**
31	15		12	17	40	4	3	**70**
32	18	19	17	24	37	4	3	**62**
33	15			17	39	2	3	**70**
34	15	12	6	14	38	4	4	**52**
35	15	13	8	17	38	5	2	**62**
36	14	19	18	25	39	5	5	**66**
37	15	19	18	25	39	5	2	**78**
38						1	4	**60**
39		13	13	21	36	2	2	**66**
40		15	19	22	39	2	4	**56**
41				18	39	2	2	**50**
42	15	15	9	17	34	5	3	**70**
43	8	14	12	16	39	3	4	**60**
44	15	14	18	20	35	5	2	**76**
45		4			17	2	4	**66**
46				6	39	1	2	**60**
47	10	10	5	8	37	1	4	**74**
48	15	12				2	2	**72**
49	15			8	34	3	5	**60**
50	15	19	12	18	37	5	2	
51	10		10			2	5	**66**
52	19		19	20	38	5	3	**60**
53	20	19	14	26	40	3	4	**80**
54	10	10	6		36	3	2	**66**
55						2	4	**72**
56				20	37	2	2	**72**
57	20	19	13	14	36	3	4	**66**
58	20	6	5	16	37	3	2	**74**

59	19	14	14	21	39	5	3	**70**
60	19	14	9	19	40	4	4	**62**
61	15	16	17	13	38	4	3	**74**
62	19	20	10	18	38	3	4	**70**
63	20	17	10	25		5	3	**60**
64	15	20	18	22	39	5	4	**74**
65	14	12	18	12	39	5	3	**66**
66	10	16	10	21	35	5	3	
67	19	14	14	21	39	1	3	**68**
68	15	19	17	22	40	4	4	**70**
69	15	15	11	14	36	4	2	**62**
70	15	6			38	1	4	**68**
71	19	13	9	15	32	2	4	**64**
72	19	6		17	38	4	4	**66**
73	10	14	12	15	29	3	5	**58**
74	18	19	10	21	34	5	5	**72**
75	18	19	18	24	37	5	5	**70**
76	15	18	10		40	2	5	**68**
77	20	17	18	25	39	3	4	**52**
78	9	19	17	26	36	5	2	**66**
79		19	12	17	37	2	4	**64**
80	19	20	14	25	39	4	2	**58**
81		17	11	22	38	2	4	**52**
82		14	15	19	36	2	2	**68**
83	14	16	17	25	33	5	3	**62**
84		17		15	29	2	4	**76**
85	18	18	19	22	40	4	2	**66**
86					34	2	4	**78**
87	15	19	20	21	40	5	2	**72**
88	14	10		20	39	4	4	**62**
89	15	20	17	24	40	4	4	**68**
90	20	10	9	7	38	2	2	**70**
91	19	11	19	23	39	4	3	**56**
92					34	1	4	**62**
93				16	37	2	3	**70**
94	15	18	13	26	38	4	4	**56**
95		14	10	21	38	2	3	**74**

96				20	38	2	4	**58**
97	15	10	11	22	28	2	3	**50**
98	15	19	10	23	36	4	4	**72**
99	15	14	19	24	37	4	3	**66**
100	15	14	14	18	40	4	4	
101				10	36	2	3	**72**
102	19	17	19	27	40	5	4	**70**
103	19	16	18	22	40	4	4	**50**
104	19	18	18	14	38	4	4	**68**
105	19	19	13	24	38	4	5	**66**
106		17	15	17	40	2	2	**64**
107	19	18	18	27	37	4	5	**80**
108	14	19	15	23	39	4	2	**46**
109				21	38	2	5	**66**
110	15	6	14	22	35	2	5	**64**
111	18	16	10	16	38	5	3	**68**
112				6	38	5	3	**76**
113					34	1	3	**56**
114	5	3	8	12	39	5	3	**64**
115		8	8	10	34	2	4	**58**
116	15	19	16	22	37	4	2	**76**
117	10	13	10	15	33	4	4	**aa**
118	15		14	22	39	4	2	**68**
119				14	38	2	2	**74**
120		0			39	2	2	**44**
121	15	19	15	20	38	5	4	
122	13	19	14	22	40	5	4	**64**
123						1	2	**74**
124	13	16	14	17	39	4	2	**74**
125	15	20	14	16	39	4	4	**68**
126	9	15	9	13	36	3	4	**70**
127	15	16	16	27	37	5	4	
128	10		4		26	2	4	**68**
129	15	12	15	23	37	5	2	**66**
130	19	15	10	14	39	5	3	**70**
131	15	15		13	37	5	4	**76**
132		7		6	39	1	3	**68**
133						1	4	**68**

134	15	13	13	18	38	5	3	**66**
135	15	18			37	4	3	**68**
136				7	39	1	3	**54**
137				14	31	1	4	**68**
138	15	15	18	15	36	5	2	**68**

Average =	15.44	14.96	13.62	18.76	36.89	3.34	3.31	66.15
Absolute Marks (47.5%)	9.5	9.5	9.5	14.3	19	2.4	2.4	38
Total no. of students	103	110	104	120	131	138	138	131
No.of students scoring above absolute marks	96	101	89	95	129	90	100	131
% of students scoring above absolute marks	93.21	91.82	85.58	79.17	98.48	65.22	72.47	100
CO Attainment	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

CO Attainment						
	CO1	**CO2**	**CO3**	**CO4**	**CO5**	**CO6**
Internal CO Attainment	3.00	3.00	3.00	3.00	3.00	3.00
University CO Attainment	3.00	3.00	3.00	3.00	3.00	3.00
Actual CO Attainment = 80% UCOA + 20% ICOA	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**	**3.00**

Consolidated CO attainment of the subject	**3.00**

ASSESSMENT PROCESSES FOR OVERALL PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES ATTAINMENT

In Outcome based Education, the assessment of program outcome and program specific outcomes is carried out using various processes by collecting and analyzing collected. The assessment process acting as tools are defined as discussed below for Program Outcomes and Program Specific Outcomes.

PO Assessment Tools: Assessment tools are categorized into direct and indirect methods to assess the Program Outcomes and Program Specific outcomes.

Direct methods:

These methods directly display the students' knowledge and skills from their performance in the relevant assessment instrument – like Internal Assessment, University Examination and Co-Curricular & Extra Co-Curricular Activities. They give information about students' understanding and application skills regarding a particular course and provide strong evidence of student's learning.

It is observed that the internal and external/university evaluation gives direct attainment for PO1 to PO5 as these PO's are highly or moderately mapped with most of the engineering courses of the program. However PO6 to PO12 and PSO1,PSO2 are moderately or slightly mapped with engineering courses and co-curricular and extracurricular activities which are conducted throughout the session become a powerful measure for attainment of these PO'S and PSO's.

At the end of every academic year, annual report is prepared containing the details of students' participation in students' association/ chapter activities, workshops, seminars, conferences, project/paper presentation competitions, internship& summer/winter industrial trainings, industrial tours and visits etc. This report forms a base for direct assessment of the POs and PSOs, i.e., PO6, PO7, PO8, PO9, PO10, PO11, PO12& PSO1, PSO2.

Indirect methods:

Interaction with stakeholders yields important information about skill expectations to be acquired by the students. Surveys and discussions with alumni, parents etc. give a feedback on student's learning. They point to the graduate's knowledge & skills and help in deciding the future course of action. Following surveys are conducted regularly:

a. Exit Survey
b. Parent Survey
c. Alumni Survey

The processes for assessment of PO1 to PO5 and assessment of PO6 to PO12 along with PSO1, PSO2 are based on different parameters as explained below:

PO1 to PO5 Assessment Methodology:-

Assessment of Program Outcomes for PO1 to PO5 is done by giving 80% weightage to direct assessment and 20% weightage to indirect assessment. Fig 2 shows the different Assessment tools and process for PO1 to PO5.

Direct assessment is based on attainment of Course Outcomes and Project Outcomes. The 80% weightage is divided into:

i) 60% weightage given to attainment through Courses.
ii) 20% weightage given to attainment through Projects.

Indirect assessment is carried out through surveys of stakeholders. The 20% Indirect Assessment is contributed by –

i) Exit survey (5% weightage)
ii) Parent survey (5% weightage)
iii) Alumni survey (10%weightage).

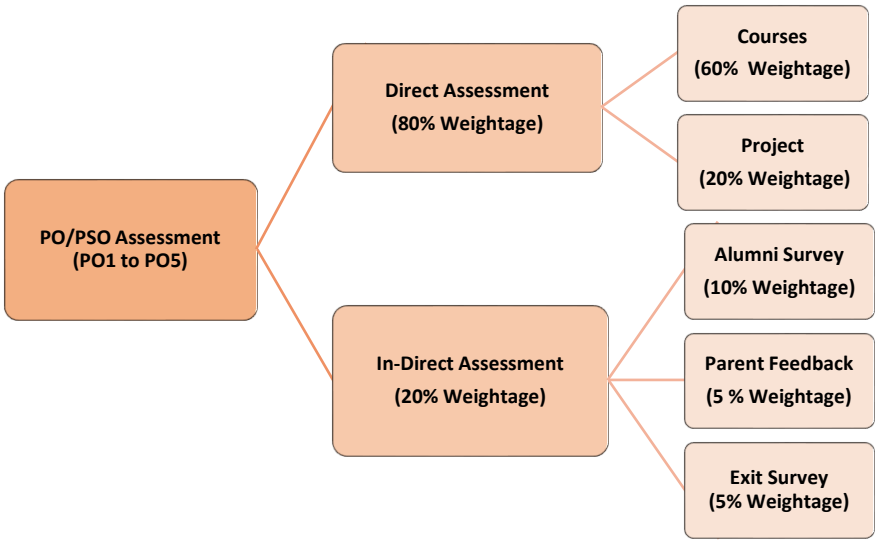


Fig.2: Assessment tools and processes for PO1 to PO5

PO6 to PO12, PSO1 and PSO2 Assessment Methodology:-

PO/PSO assessment for PO6 to PO12, PSO1 and PSO2 is carried out by giving –

i) 80% weightage to direct assessment and
ii) 20% weightage to indirect assessment technique.

Direct assessment is based on attainment of Course Outcomes, Project Outcomes and attainment of Outcomes for Co-curricular & Extra-curricular activities. The assessment is contributed by-

i) Attainment through Courses - 40%

ii) Attainment through Projects - 20%,and
iii) Attainment through co-curricular & extra co-curricular activities - 20%

Indirect assessment is carried out through various surveys of stakeholders. The 20% Indirect Assessment is contributed by –

i) Exit survey (5% weightage)
ii) Parent survey (5% weightage)
iii) Alumni survey (10%weightage)

The frequency of conduction of various surveys is given in the following Table 7 and the assessment basis for co-curricular and extra-curricular activities is mentioned.

Table 7: Frequency of Conduction of Various Surveys

Assessment Tool	Assessment Frequency	Assessment Responsibility
Exit Survey	Annually	Faculty Coordinator
Student performance in university examinations	Every Semester end	Faculty Coordinator
Alumni survey	Annually	Departmental Alumni Coordinator
Parent Survey	Every Semester	Faculty Coordinator
Departmental Annual report	Annually	Faculty Coordinator

Assessment Using Co-Curricular Activities and Students Participation

Co-Curricular Activities		Poor (1)	Satisfactory (2)	Good (3)
1	Guest Lecturers	Organized 1 Guest Lecture	Organized 2-3 Guest Lectures	Organized > 3 Guest Lectures
2	Paper Presentations	Less than 20 students participated	21 - 30 students participated	More than 30 students participated
3	Library, ICT etc.	Less than 20% students using the facility	21% - 40% students using the facility	More than 41% students using the facility
4	Entrepreneurships – Lecturers	0-1 Program	2 Programs	More than 2 Program
5	Industry Internship	Less than 10 students participated	11 - 15 students participated	More than 15 students participated
6	Industry/ Field visit	One industry visited	2 industries visited	More than 2 industries visited

Assessment Using Extra -Curricular Activities and Students Participation

Extra-Curricular Activities		Poor (1)	Satisfactory (2)	Good (3)
1	NSS Activities	Less than 20 students participated	21 - 30 students participated	More than 30 students participated
2	Ethical Practices Health/ Yoga	0-1 Program	2 Programs	More than 2 Programs
3	Students' Participation in Cultural Events, Activities	10 - 25 %	26 - 50 %	51 % and above
4	Students' Participation in Sports Events, Activities	11 - 25 %	27 - 50 %	51 % and above

The process adopted for PO6 to PO12 and PSO1, PSO2 attainment by direct and indirect assessment is shown below and sample forms used for different surveys carried out by the department.

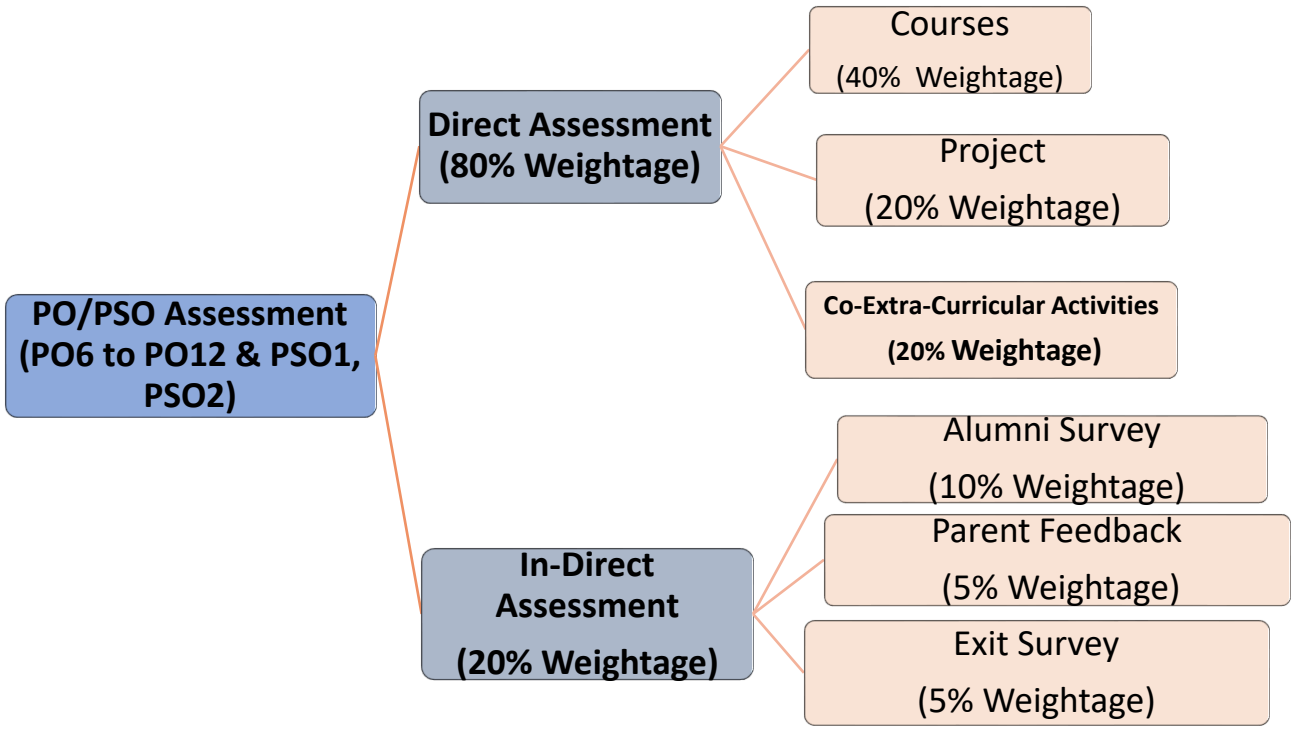


Fig. 3: Assessment tools and processes for PO6 to PO12 & PSO1, PSO2

K.D.K. College of Engineering
Department of Electrical Engineering
CO-PO Mapping
Session 2021-22

Sr. No.	Name of Subject	CODE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	Applied Mathematics-I	CO101T	3.00	3.00										1.00	1.00	
2	Engineering Physics	CO102T	3.00	2.00										1.00	2.00	2.00
3	Engineering Physics	CO102P	3.00	2.00						1.00	2.00			1.00	1.33	1.33
4	Engineering Chemistry	CO103T	3.00	1.50				1.00	1.00					1.00	1.00	1.00
5	Engineering Chemistry	CO103P	3.00						1.00		1.00	1.00		1.00		
6	Basic Electrical Engineering	CO104T	3.00	3.00	1.00									3.00	2.00	
7	Basic Electrical Engineering	CO104P	3.00	3.00						1.00	2.00	2.00		2.00	2.00	
8	Basic Civil Engineering	CO105T	2.00	1.00			1.00	1.00	1.00	1.00		1.00		1.25		
9	Engineering Graphics-I	CO106T	3.00	2.00	3.00									2.25	2.00	1.00
10	Engineering Graphics-I	CO106P	3.00	2.00	3.00						2.00			2.33	2.00	1.00
11	Communication Skills	CO107P									2.00	3.00		3.00	2.00	2.00
12	Computational Skill Lab	CO108P	2.33	1.67	1.00		1.00				2.00			2.00		1.00
13	Applied Mathematics-II	CO201T	3.00	3.00										1.00	1.00	
14	Advanced Physics	CO202T	3.00	3.00										1.00	1.75	1.50
15	Advanced Physics	CO202P	2.00	2.00							2.00	1.00		1.00	1.33	1.33
16	Material Chemistry	CO203T	3.00	0.75					1.33					1.00	1.00	
17	Material Chemistry	CO203P	3.00								2.00	1.00		1.00	1.00	
18	Engineering Mechanics	CO204T	2.25	1.75	1.75	1.00						1.00		1.00		
19	Engineering Mechanics	CO204P	3.00	2.67	2.00					1.00	1.00	2.00		3.00		
20	Advanced Electrical Engineering	CO205T	3.00	2.75	2.25		1.00	2.00	2.00					2.00	2.00	
21	Engineering Graphics-II	CO206P	3.00	2.00	3.00		2.50				2.00			2.33	2.00	1.00
22	Engineering Workshop	CO207P	3.00					1.00		1.00	2.00	2.00		2.00	3.00	2.00
23	Ethical Science	CO208P						2.00	1.50	2.00	1.00	1.75		2.00		

Sr. No.	Name of Subject	CODE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
24	Applied Mathematics-III	CO301T	3.00	3.00										1.00	1.00	
25	Non Conventional Electrical Sources	CO302T	3.00	2.25				3.00	2.50				2.67	3.00	2.83	
26	Electrical Measurement & Instrumentation	CO303T	3.00	3.00							2.00			2.00	2.00	
27	Electrical Measurement & Instrumentation	CO303P	3.00	3.00							2.00			2.00	2.00	
28	Network Analysis	CO304T	3.00	3.00	1.00						1.00	1.00		1.00	2.00	2.00
29	Network Analysis	CO304P	3.00	3.00							2.00	1.00		2.00	2.00	
30	Electronic Devices & Circuits	CO305T	3.00	3.00	2.00						1.00	1.00		1.00	2.00	1.00
31	Electronic Devices & Circuits	CO305P	3.00	3.00	1.00						2.00	1.00		2.00	2.00	1.00
32	Applied Mathematics-IV	CO401T	3.00	3.00										1.00	1.00	1.00
33	Elements of Electromagnetic	CO402T	3	3	1						1	1		1	2	
34	Digital & Linear Electronics circuits	CO403T	3.00	3.00	1.00						1.00			1.00	2.00	
35	Digital & Linear Electronics circuits	CO403P	3.00	3.00	1.00					1.00	2.00	2.00		2.00	2.00	
36	Electrical Machines-I	CO404T	3.00	3.00	1.20						1.00	1.00		2.00	2.00	
37	Electrical Machines-I	CO404P	3.00	3.00	2.00		1.00	1.00		1.00	3.00	2.00		2.00	2.00	1.00
38	Computer Programming	CO405T	3.00	3.00	3.00		2.33	0.00			2.00	2.00		2.00	1.50	2.00
39	Computer Programming	CO405P	3.00	3.00	3.00		2.33				2.00	2.00		2.00	2.00	3.00
40	Environmental Science	CO406T	1.00					1.00	1.83					1.00		
41	Electrical Power System-I	CO501T	3.00	2.67	2.20	1.75	2.00	2.00	2.00					2.00	2.00	2.00
42	Utilization of Electrical Engineering	CO502T	3.00	3.00	3.00	3.00	2.00	3.00	2.00		2.00			2.00	3.00	
43	Electrical Machines Design	CO503T	3.00	3.00	2.67					1.00	1.00	1.00		2.00	3.00	1.00
44	Microprocessor & Interface	CO504T	3.00	3.00	1.80					2.00	1.00			2.00	2.00	1.00
45	Microprocessor & Interface	CO504P	3.00	3.00	2.00		2.00			1.00	2.00	2.00		2.00	2.00	1.00
46	Electrical Machines-II	CO505T	3.00	3.00	2.00						1.00	1.00		2.00	2.00	
47	Electrical Machines-II	CO505P	3.00	3.00	2.00	2.00				1.00	3.00	2.00		2.00	2.00	1.00
48	Electrical Drawing & Simulation	CO506P	3.00	2.00	1.00		2.00			1.00	2.00	2.00		2.00	2.00	3.00
49	Electrical Engineering Workshop	CO507P	3.00	3.00	3.00	3.00				2.00	3.00	2.00	1.00	3.00	3.00	

Sr. No.	Name of Subject	CODE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
50	Power Station Practice	CO601T	3.00	3.00	2.00	2.00			2.00		2.00	2.00		2.00	2.00	
51	Engineering Economics & Management	CO602T		2.00				2.00			2.00	2.00	3.00	2.00	2.00	
52	Electrical Drives & Their Control	CO603T	3.00	3.00	1.00		2.00					1.00		2.00	2.33	2.00
53	Power Electronics	CO604T	3.00	3.00	2.00	1.25	1.00	1.00				2.00		2.00	2.00	2.00
54	Power Electronics	CO604P	3.00	2.00			2.00	1.00		1.00	2.00	2.00		2.00	2.00	2.00
55	Control System-I	CO605T	3.00	3.00	1.00	1.00	1.00							2.00	2.00	1.00
56	Control System-I	CO605P	3.00	2.00	1.00	1.00	2.00				3.00	2.00		2.25	2.00	1.50
57	Industrial Visit & report Writing	CO606P	2.00							2.00	3.00	3.00		3.00	2.00	2.00
58	Functional English	CO607T									2.00	3.00		3.00	1.00	1.00
59	Control System-II	CO701T	3.00	3.00	3.00		2.67							2.50	3.00	3.00
60	Electrical Power System-II	CO702T	3.00	3.00	2.00	2.00					2.00	2.00	2.00	3.00	2.00	2.00
61	Felix able AC transmission system	CO703(3)T	3.00	3.00	2.00	2.00	3.00	1.00	2.00			1.00		2.00	2.00	2.00
62	Energy Management & Audit	CO703(4)T	3.00	3.00	3.00	2.00	2.00	3.00	3.00	1.00	2.00	2.00		3.00	3.00	
63	High voltage Engineering	CO704T	3.00	3.00	1.60			1.67		1.00	2.00	1.40		2.00	2.00	2.00
64	High voltage Engineering	CO704P	3.00	3.00	2.00					1.00	3.00	2.00		2.00	3.00	1.00
65	Electrical Installation & Design	CO705T	3.00	2.60	2.60			1.33		1.67		1.00	1.00	2.00	2.00	
66	Electrical Installation & Design	CO705P	3.00	1.00						1.00	3.00	3.00		2.00	2.00	
67	Project Seminar	CO706P	3.00	3.00		3.00				3.00	3.00	3.00		3.00	2.00	3.00
68	EHVAC & HVDC Transmission	CO801(4)T	3.00	2.25	1.60			2.00						2.00	2.00	
69	Power Semiconductor Based Drives	CO802(3)T	3.00	3.00	2.00	2.00	1.00	1.00	2.00			1.00		2.00	2.00	2.00
70	Electrical Distribution System	CO802(4)T	3.00	3.00								1.00		2.00	2.00	
71	Switchgear & Protection	CO803T	3.00	3.00	2.67		2.00		2.00		2.00			2.00	2.00	
72	Switchgear & Protection	CO803P	3.00	2.25		2.67	3.00		2.00	2.00	2.00	2.00		2.00	2.00	
73	Computer Application in Power System	CO804T	3.00	3.00		3.00	2.83							2.83	2.83	3.00
74	Computer Application in Power System	CO804P	3.00	3.00		2.00	3.00				3.00			3.00	2.00	3.00
75	Project	CO805P	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00

K.D.K. College of Engineering
Department of Electrical Engineering
Rubrics for Project

Component	Exemplary	Competent	Needs Work	No good enough
Project objective formulation, methodology to be followed, background (20)	The objectives are well defined and prioritized. All relevant information and constraints are obtained and accurately analyzed. Decision and design recommendation are well supported by the information.	All major objectives are identified. Sufficient information is obtained. Appropriate analyses are selected. Decision and design recommendation are reasonable and mostly supported by the information	Most major objectives are identified but one or two minor ones are missing or priorities are not established. Most constraints are identified; some are not adequately addressed or accurately analyzed. Decision and design recommendation is reasonable.	Many major objectives are not identified. Information is collected but without any analysis. Only one solution is considered or other solutions were ignored or incompletely analyzed. Many constraints and criteria were ignored.
Clarity and presentation of the report (organization, use of English) (20)	Report is well organized and clearly written. The underlying logic is clearly articulated and easy to follow. Words are chosen that precisely express the intended meaning and support reader comprehension. Diagrams or analyses enhance and clarify presentation of ideas. Sentences are grammatical and free from spelling errors.	Report is organized and clearly written for the most part. In some areas the logic or flow of ideas is difficult to follow. Words are well chosen with some minor exceptions. Diagrams are consistent with the text. Sentences are mostly grammatical and only a few spelling errors are present but they do not hinder the reader.	Report is organized via topic/flow, but in some areas it is difficult to follow the flow of ideas. Words can be further improved. Some diagrams are not well explained. Grammar errors that impede the flow of communication.	Report lacks an overall organization. Reader has to make considerable effort to understand the underlying logic and flow of ideas. Diagrams are absent or inconsistent with the text. Grammatical and spelling errors make it difficult for the reader to interpret the text in places.
Work completed (10)	Progress is beyond expectations with respect to plan. Highly detailed discussions on milestones completed	Progress is highly satisfactory with respect to plan. Detailed discussions on milestones completed.	Progress is mostly satisfactory with respect to plan. Some discussions on milestones completed	Progress is not satisfactory with respect to plan. No discussions on milestones completed.
Project demonstration (20)	Present a fully-functioning working product with several original/inventive elements. Show strong effort was made in breaking new ground and building excitement about the application. The demonstration techniques are imaginative and effective in conveying ideas to the audience.	Present a working product with support to all desired functions. Offer some new information or approach about the application. The demonstration techniques are effective in conveying main ideas.	Present a working product but some desired functions are not supported or malfunctioned. Simply shows how the application works. The demonstration only conveys main ideas.	The product is incomplete or does not work. Show little effort in building the application. The demonstration failed to capture the interest of the audience and/or is confusing in what was communicated
Quality of answers (5)	Student has presented full knowledge of both problem and solution. Answers to questions are strengthened by rationalization and explanation	Student has competent knowledge and is at ease with information. Can answer questions.	Student is uncomfortable with information. Seems novice and can answer basic questions only.	Student has no or very less knowledge of both problem and solution. Cannot answer questions.

Sample copy of Survey Forms:-

Department of Electrical Engineering

Exit Survey Form

All the passing out students are requested to rate the following program outcome on the scale of 1 to 4.

1 Excellent	2 Good	3 Average	4 Poor

Name of the Student

Passing out Year: _____

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

1	2	3	4

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.

1	2	3	4

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.

1	2	3	4

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.

1	2	3	4

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.

1	2	3	4

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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.

1	2	3	4

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.

1	2	3	4

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

1	2	3	4

9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings

1	2	3	4

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.

1	2	3	4

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

1	2	3	4

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

1	2	3	4

Sample Copy of Exit Form

Parents Survey Form

Your feedback count for us!!!

Name of the parent: _____

Address : _____

_____

Name of the ward who had studied in this college: _____

Quality of Academics of the College

o Not satisfied	o Satisfied	o Highly satisfied	o Other

How you rate the overall Personality Development of your ward during these 4 years of Degree

o Not satisfied	o Satisfied	o Highly satisfied	o Other

Infrastructure Facilities like Library, Computer Labs, Canteen and other Campus facilities

o Poor	o Good	o Very Good	o Excellent

Encouragement to students for participation in various Co-curricular activities

o Not satisfied	o Satisfied	o Highly satisfied	o Other

Quality of Academic Resources namely teachers, course material etc.

o Not satisfied	o Satisfied	o Highly satisfied	o Other

Placement Activities

o Not satisfied	o Satisfied	o Highly satisfied	o Other

Any other Feedback that you want to give to the college

_____

_____

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Sample Copy of Parent Survey Form

Alumni Survey Form

All the passed out students of K.D. K. College of Engineering, Nagpur are requested to give their valued time to fill this survey form.

Name of the Student

Branch

Batch (Passing out Year)

Whether you had gone for Higher Studies? (Yes/No)

If yes, Name of the Degree obtained after B.E.

How do you find the relevance of the Curriculum of your B.E. Degree in relevance with Higher Studies?

O Poorly relevant O Relevant O Excellent

Basis of Admission in Higher Studies

O GATE O GMAT O GRE O OTHER

If doing job after degree, then Name of Company / Current Employer

Address of Company

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Designation

Job Profile

O Networking Administrator
O Administrator
O Designer
O Programmer
O Production
O Other
O Database Administrator
O HR Manager
O Marketing
O Testing
O Teaching

Salary Package (per annum)

O <5.0 Lacs O 5.0 to 10.0 Lacs O >10.0 Lacs

How do you find the relevance of the Curriculum of your B. E. Degree with respect to your current job?

O Poorly relevant O Relevant O Excellent

To meet the current job requirements, please specify Tools/ New Technologies, you have used

Any other valuable suggestions to the college

Contact No.

Email-ID

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Sample Copy of Alumni Survey Form

Blooms Taxonomy Action Verbs

REVISED Bloom's Taxonomy Action Verbs

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