Articulation of Course Outcomes(COs)

By,

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Working Definition – Course outcomes

Course outcomes are statements of what a student should know, understand and/or be able to demonstrate after completion of a course

- Course outcomes must not simply be a "wish list" of what a student is capable of doing on completion of the learning activity.

- Course outcomes must be simply and clearly described.

- Course outcomes must be capable of being validly assessed.

Why COs

- define the type and depth of learning students are expected to achieve

- provide an objective benchmark for formative, summative, and prior learning assessment

- clearly communicate expectations to learners

- clearly communicate graduates' skills to prospective employers

- define coherent units of learning that can be further subdivided or modularized for classroom or other delivery modes

- guide and organize the instructor and the learner

Course Outcomes

- Important to ensure that there is alignment between teaching methods, learning outcomes and assessment criteria.

- Clear expectations on the part of students of what is required of them are a vitally important part of students' effective learning (Ramsden, 2003)

- This correlation between teaching, learning outcomes and assessment helps to make the overall learning experience more transparent and meaningful for students.

- For the good teacher, learning outcomes do not involve a "paradigm shift".

- There is a dynamic equilibrium between teaching strategies and Learning Outcomes

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ABCDs of COs

| Element	Description	Example
A = Audience	Who is performing the action? Learning objectives are always stated in terms of student outcomes.	Following completion of the Science program, **the student** should be able to plot a quadratic equation using a graphing calculator in two minutes or less.
B = Behavior	What will the student be able to do? Use Bloom's Taxonomy and action verb that describe an accomplishment that is measurable.	Following completion of the Science program, the student should be able to **plot a quadratic equation** using a graphing calculator in two minutes or less.
C = Condition	Give the conditions under which the performance will occur. Be specific.	**Following completion of the Science program**, the student should be able to plot a quadratic equation **using a graphing calculator** in two minutes or less.
D = Degree	Describe the minimum criteria for acceptable student performance.	Following completion of the Science program, the student should be able to plot a quadratic equation using a graphing calculator **in two minutes or less.**

Parts of COs

- Action verb
  - Learning domain and level
- Subject specific statement
- Level of achievement or Condition of performance
  (if applicable)

A *Learning Outcome (LO)* is a

- **measurable**, **observable**, and **specific** statement that clearly indicates what a student should know and **be able to do** as a **result** of learning.

Well-written LOs involve the following parts:

action verb → subject content → level of achievement → condition of performance *(if applicable)*
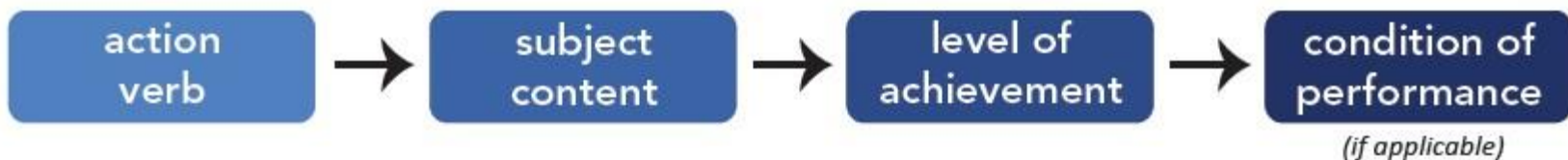
Three Step Process

- Step1 : Select suitable action verb

- Step 2: Next, select the subject content students are performing that task for.

- **Step 3:** Next, decide if your CO requires either a level of achievement or a condition of performance (if necessary)

Action Verbs (Representative List)

Remember- List, Define, State, Write, Identify, Recall, Tabulate, show, recite, Name, Quote

• Understand- Describe, Explain, Illustrate, compare, paraphrase, convert, restate, associate, interpret, contrast, summarize

• Apply- Apply, Use, Solve, Calculate, Compute, Find, Solve, predict, demonstrate ,determine, model

• Analyze- Analyze, Justify, Organize, categorize, infer, classify

• Evaluate- Evaluate, Choose, Select, Judge, examine, Assess, Decide, Conclude, Recommend, Argue

• Create- Create, Propose, Produce, Plan, Build, invent , compose

Level of achievement

- A level of achievement identifies how proficient students need to be in a task.

  - For example, in a Composition course, you might say
  - "Write a literature critique with no grammatical errors".
  - This tells students the level of achievement that's expected of them.

- Importantly, you don't need a level of achievement for every CO. You don't need to say "effectively", "accurately", or "correctly" on a CO, for example: these are all implied.

- We expect students to achieve all outcomes in all courses correctly and accurately. Levels of achievement are for specific cases.

Condition

- A condition of performance identifies if students are only performing this outcome in a specific context.

- Again, you don't need a condition of performance for every CO. Only include a condition of performance if that information clarifies the specific outcome students will achieve in the course.

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Words Should be avoided

- Understand
- Know
- Comprehend

- Appreciate
- Be familiar with
- Study

- Be aware
- Become acquainted with
- Gain knowledge of

- Cover
- Learn
- Realize

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Conditions on number of verbs

- COs should have only one verb, and only one area of significant subject content.

- If CO includes multiple verbs, select the one that articulates the highest level of learning students will demonstrate in the course.

- If CO includes multiple topics, select the one that articulates the key outcome

Writing Learning Outcomes –Challenges

- It is vital that course outcomes are clearly written so that they are understood by students, colleagues and external examiners.

- When writing course outcomes it may be helpful to you if you focus on what you expect students to be able to demonstrate upon completion of the module or programme.

- It is standard practice to list the course outcomes using a phrase like "On successful completion of this module, students should be able to:" [list of learning outcomes]

- Avoid complicated sentences. If necessary use one than one sentence to ensure clarity.

- General recommendation: 5 – 8 learning outcomes per module.

- Avoid certain words……….

Checklist for writing course outcomes
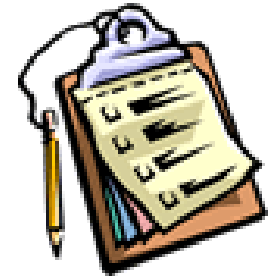
❑ Have I begun each outcome with an active verb?

❑ Have I avoided terms like *know*, *understand*, *learn*, *be familiar with*, *be exposed to*, *be acquainted with*, *be aware of* and *appreciate*?

❑ Have I included learning outcomes across the range of levels of Bloom's Taxonomy?

❑ Are my outcomes observable and measurable?

❑ Do all the outcomes fit within the aims and content of the course ?

Course Outcomes –Electrical Circuits

On successful completion of this course, students should be able to :

- **Analyze** circuit systems using direct application of Kirchoffs Current and Voltage Laws along with Ohms Law.

- **Interpret** analytical circuit results to properly assign power, current, and voltage values to circuit graphical representations.

- **Apply** node-voltage analysis techniques to analyze circuit behavior.

- **Apply** mesh-current analysis techniques to analyze circuit behavior.

- **Explain** the characteristics of capacitor, inductor, and transformer circuit elements.

- **Compute** initial conditions for current and voltage in first order R-L and R-C capacitor and inductor circuits.

- **Compute** time response of current and voltage in first order R-L and R-C capacitor and inductor circuits.

- **Compute** initial conditions for current and voltage in second order RLC circuits.

- **Compute** time response of current and voltage in second order RLC circuits.

Course Outcomes – Computer Architecture

On successful completion of this course, students should be able to :

- **Compare** the performance of computer systems using MIPS and MFLOPS ratings.

- **Identify** the components of an instruction set, such as opcode, operands, and format.

- **Translate** fractional numbers into IEEE scientific format.

- **Translate** numbers in IEEE scientific format into their fractional form.

- **Implement** 32-bit multiplication using iterative methods.

- **Construct** a simple 32-bit data path composed of two function units and a register file.

- **Use** pipelining to improve the performance of a simple 32-bit instruction set.

- **Compare** the design of direct-mapped and associative caches.

- **Explain** the function of the translation lookaside buffer in a memory management unit.

Blooms Taxonomy Vs Content delivery

- Lecture

- Lecture with discussion

- Demonstrations

- Group discussion

- Debate

- Technical Quiz

- Seminar

- Mini-project

- Asynchronous discussions

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Blooms Taxonomy Vs Assessment

- Internal Test

- End semester exams

- Lab exam

- Case study

- Quiz

- Seminar

- Mini project /Project

- Assignment

- Group Assignment

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Laboratory skills

- *Operate the range of instrumentation specified in the module safely and efficiently in the electronics laboratory.*

- *Perform load test of an electrical machine accurately and safely in the laboratory.*

- *Construct simple hardware interfacing diagram for a microprocessor based system.*

Presentation skills

- Deliver an effective presentation.

- Demonstrate a range of graphic and CAD communication techniques.

Examples of
Course Outcomes in Affective Domain

- Accept the need for professional ethical standards.
- Appreciate the need for confidentiality in the professional client relationship.
- Display a willingness to communicate well with clients .
- Relate to participants in an ethical and humane manner.
- Resolve conflicting issues between personal beliefs and ethical considerations.
- Embrace a responsibility for the welfare of children taken into care.
- Participate in class discussions with colleagues and with teachers.

References

Bloom Benjamin S. and David R. Krathwohl. Taxonomy of Educational Objectives: The Classification of Educational Goals, by a committee of college and university examiners. <u>Handbook I: Cognitive Domain.</u> New York, Longmans, Green, 1956.

Bloom, B.S., Masia, B.B. and Krathwohl, D. R. (1964). *Taxonomy of Educational Objectives Volume II : The Affective Domain.* New York: McKay.

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Krathwohl, David, R. (2002) A Revision of Bloom's Taxonomy: An Overview. *Theory into Practice*, 41 (4).

Receiving (A1)

❑   Lowest level

❑   Student passively pays attention. Without this level no learning can occur. Awareness, willingness to hear, selected attention

- Examples:
  - Listen to others with respect.
  - Listen for and remember the name of newly introduced people.

- Keywords: asks, chooses, describes, follows, gives, holds, identifies, locates, names, points to, selects, sits, erects, replies, uses

Responding (A2)

- 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.

- Keywords: answers, assists, aids, complies, conforms, discusses, greets, helps, labels, performs, practices, presents, reads, recites, reports, selects, tells, writes.

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Valuing (A3)

- 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 learner's 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.

- Keywords: completes, demonstrates, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, shares, studies, works.

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Organizing (A4)

- 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 one's 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.*

- *Keywords: adheres, alters, arranges, combines, compares, completes, defends, explains, formulates, generalizes, identifies, integrates, modifies, orders, organizes, prepares, relates, synthesizes.*

Characterizing (A5)

- Has a value system that controls their behavior.

- The behavior is pervasive, consistent, predictable, and most importantly, characteristic of the learner.

- 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.

- Keywords: acts, discriminates, displays, influences, listens, modifies, performs, practices, proposes, qualifies, questions, revises, serves, solves, verifies.

Active verbs for affective domain

Appreciate, accept, assist, attempt, challenge, combine, complete, defend, demonstrate (a belief in), discuss, dispute, embrace, follow, hold, integrate, order, organise, join, share, judge, praise, question, relate, share, support, synthesise, value.

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Thank you

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