



A HANDBOOK ON OUTCOME BASED EDUCATION



OBE



BHARATHIAR UNIVERSITY

Coimbatore-641 046, Tamil Nadu, India

State University | "A" Grade by NAAC | Ranked 15th among Indian Universities by MoE-NIRF

PREAMBLE

Outcome Based Education (OBE) is a model that provides a strong scaffold to enhance the quality of the educational system. There are several styles of teaching and assessment in OBE. All educational activities carried out in OBE helps the students to achieve the set goals. The faculty may adapt the role of instructor, trainer, facilitator, and/or mentor, based on the outcomes targeted. OBE enhances the traditional methods and focusses on what the institution provides to students. It shows the success by making or demonstrating outcomes using statements “able to do” in favor of students. OBE provides clear standards for observable and measurable outcomes.

OBE and Accreditation in India

From 13 th June 2014, India has become the permanent signatory member of the Washington Accord. Implementation of OBE in higher technical education. So the National Assessment and Accreditation Council (NAAC) and National Board of Accreditation (NBA) in order to promote global quality standards in technical education have started accrediting only the programs running with OBE from 2013. The National Board of Accreditation mandates establishing a culture of outcome-based education in institutions.

Expectations of students’ outcome under OBE

- Students are expected to be able to do more challenging tasks other than memorize and reproduce what was taught.
- Students should be able to: write project proposals, complete projects, analyze case studies, give case presentations, show their abilities to think, question, research, and make decisions based on the findings.
- Be more creative, able to analyze and synthesize information.
- Able to plan and organize tasks, able to work in a team as a community or in entrepreneurial service teams to propose solutions to problems and market their solutions.
- Students should be enriched on three dimensional scales of knowledge, skill and attitude throughout the course.

This handbook is intended to help teachers, staff, and other stakeholders understand the tenets of Outcomes Based Education (OBE) system, implemented at Bharathiar University from the academic year 2018. It offers a thorough illustration of outcome based education that is carried out using the four stages of educational procedure, comprising curriculum design, teaching and

learning processes, assessment and evaluation, and continuous quality improvement. OBE focuses on the accomplishment of the outcomes by the students at each level and gain qualitative progress in their learning. The Graduate Attributes of the programmes are framed in accordance with the Institution's Vision and Mission and UGC guidelines. The Programme Educational Objectives (PEO), Programme Specific Outcomes (PSO), Programme Outcomes (PO) and Course Outcomes (CO) are formulated to achieve the aims of the Graduate Attributes. This handbook facilitates the drafting of an effective curriculum development and instructional strategy.

ABOUT BHARATHIAR UNIVERSITY

The Bharathiar University was established at Coimbatore by the Government of Tamilnadu in February 1982 under the Bharathiar University Act, 1981 (Act 1 of 1982). The erstwhile Postgraduate Centre of the University of Madras formed the core of the Bharathiar University, which was functioning at Coimbatore before 1982. University Grants Commission (UGC) recognized Bharathiar University in 1985 for grants. The University has 39 Departments, offering 54 post-graduate programmes besides offering M.Phil. and Ph.D. programmes. The University is an affiliating University. The jurisdiction of the University covers the districts of Coimbatore, Erode, Tiruppur, and The Niligiris with 133 affiliated colleges. The National Assessment and Accreditation Council have accredited the University with an 'A' Grade in the third cycle assessment. Bharathiar University is marching towards becoming a World Class University by garnering ranking in the international arena. The Times Higher Education Young Universities World Ranking ranked BU in the bandwidth of 201 to 250. BU stands at the 13th rank under the category of University and 21st among the top 100 institutions in the MoE's National Institute Ranking Framework's (NIRF) ranking. In 2021, Bharathiar University secured a ranking in the range of 801-1000 in the Times Higher Education World University Rankings.

Robust infrastructure facilities are available for faculty members and scholars to nurture a culture of quality and research in cutting-edge areas. Industry infusion into the curriculum is given prominence by involving industry experts - R&D managers, product development managers, technical managers in the curriculum development as special invitees in the Board of Studies.

BU is a partner in the MHRD National Knowledge Network. Through UGC - Infonet, and Inflibnet a collection of physical and electronic resources is available. The Intellectual Property Rights Cell of Bharathiar University protects the rights of inventions of faculty and

young researchers in the University. The DRDO-BU-Center for Life Sciences was established in Bharathiar University as a joint venture by DRDO, Ministry of Defence, Government of India, as an autonomous research institute to pursue basic and applied research. Bharathiar University Centre for International Affairs (BU-CIA) facilitates admission of international students through study in India (MoU) and Indian Council for Cultural Relations (MEA). BU-CIA operates in liaison with the Association of Indian Universities, the Association of Commonwealth Universities, and Shastri Indo Canadian Institute. With a dedicated team of faculty with vast experience in teaching and research and dedicated and experienced administrative members, BU has emerged as one of the landmark universities in the region.

VISION, MISSION AND CORE VALUES

VISION

The vision of Bharathiar University is to provide internationally comparable quality higher education to the youth. The aim is not only focused on imparting subject knowledge and skills, but also to tailor the students with better conduct and character committed to the societal needs and national development. Enshrined with the motto “Educate to Elevate”, the University strives to realize the vision of India and excel in promoting and protecting the rich heritage of our past and secular ideals of the nation.

MISSION

- To be innovative, inclusive and international University; committed to excellence in teaching, research and knowledge transfer and to serve the social, cultural and economic needs of the nation.
- To innovate and offer educational programmes in various disciplines with synergistic interaction with the industry and society.
- To impart knowledge and skills to students equipping them to be ready to face the emerging challenges to the knowledge area.
- To provide equal opportunity to women students and prepare them to be equal partners in meeting the scientific and technological demands of the nation.
- To contribute to the advancement to knowledge through applied research leading to newer products and process.
- To prepare the students to work for societal transformation with commitment to justice and equality.
- To inculcate among students a global vision with skills of international competence.

CORE VALUES

- Enriching Research Knowledge
- Fostering Competitive Spirit
- Catering Employment
- Creative Excellence
- Accountability with Integrity
- Equity and Equality
- Professional Empowerment
- Social Responsibility and Sustainability
- Humanity

OBE AND ACCREDITATION

Implementation of OBE in higher education in India has been mandated by The National Assessment and Accreditation Council (NAAC) and National Board of Accreditation (NBA) for promoting global quality standards for education in India. Reports of outcome analysis help to find gaps and carryout continuous improvements in the education system of an institute, which is vital for progress towards excellence.

OVERVIEW

The outcome based education (OBE) is an educational approach that serves as the cornerstone of a high-quality educational system. It employs multiple styles of teaching and assessment as part of the instructional processes. All educational activities carried out in OBE help the students to achieve the set goals. Based on the desired goals, the faculty may change their function as a teacher, trainer, facilitator, and/or mentor. The main idea driving this strategy is that by the end of the educational process, every student should have accomplished the objective. OBE builds on conventional approaches and offers precise guidelines for measurable and observable outcomes.

BENEFITS OF OBE

- **Clarity:** The focus on outcome creates a clear expectation of what needs to be accomplished by the end of the course. ·
- **Flexibility:** With a clear sense of what needs to be accomplished, teachers will be able to structure their courses around the specific outcomes.
- **Comparison:** there is scope to make comparison across individual, class, programme and institute levels.
- **Involvement:** Students are involved in active learning.

Thus OBE is a learner-centric approach to education that focuses on what a student should be able to do by aligning the different levels of Benjamin Bloom's taxonomy by achieving observable and measurable learning outcomes. Learning outcomes are statements of the primary skills, knowledge, attitudes, abilities and proficiencies the learner will "own" at the end of the course. The key to success in outcome based education is clarity, for both teachers and students to understand what's expected of them. In addition to understanding what's expected, outcome based education also encourages transparency. The basic principle of outcome based education is that students must meet a specific standard to graduate. OBE is a student-centric learning model that helps teachers to plan the course delivery and assessment as follows:

- OBE- Education
- OBC-Curriculum
- OBLT-Learning/Teaching
- OBA-Assessment

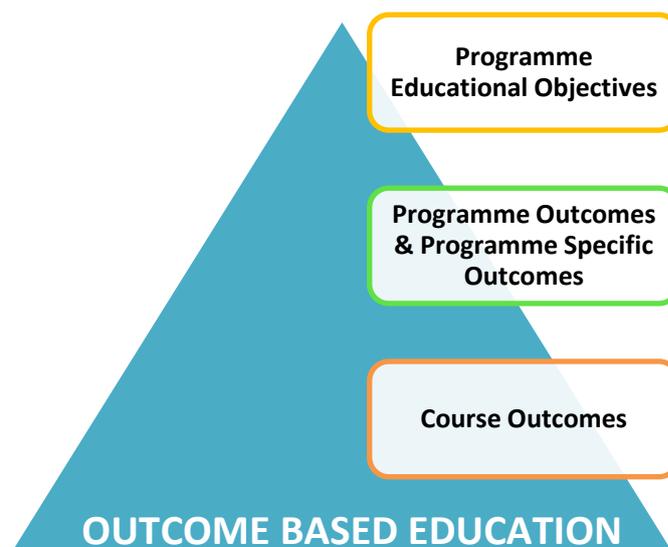


Figure 1: Outcome Based Education

In OBE, the curriculum is carefully constructed by first determining the outcomes, and then designed backwards by:

- Carefully determining authentic assessments (how will we know?)
- Choosing/building relevant learning activities and experiences.
- Selecting appropriate content.

Unique Features of OBE

- OBE enhances the communications among various stakeholders.
- OBE helps in examining the vision and mission of the institution.
- OBE evaluates students' performance effectively.
- OBE helps in mapping the course outcomes and Programme Outcomes for each assessment.

KEY PARAMETERS OF OBE

Course

Course is defined as a theory, practical or theory cum practical subject studied in a semester. For E.g. Mathematics

Programme

Programme is defined as the specialization or discipline of a Degree. It is the interconnected arrangement of courses, co-curricular and extracurricular activities to accomplish predetermined objectives leading to the awarding of a degree. For Example: B.Sc. Computer Science

Assessment

Assessment is one or more processes carried out by the institution that identifies, collect, and prepare data to evaluate the achievement of Programme Educational Objectives and programme outcomes.

Attainment

Attainment is the action or fact of achieving a standard result towards the accomplishment of desired goals. Primarily attainment is the standard of academic attainment as observed by test or examination result.

- **Graduate Attributes (GA):** The graduate attributes are exemplars of the attributes expected of a graduate from an accredited programme.
- **Programme Educational Objectives (PEOs):** The Programme Educational Objectives of the statements that describe the expected achievements of graduates in their career, and also in particular, what the graduates are expected to perform and achieve during the first few years after graduation.
- **Programme Outcomes (POs):** Programme Outcomes are narrower statements that describe what students are expected to be able to do by the time of graduation. POs are expected to be aligned closely with Graduate Attributes.
- **Programme Specific Outcomes (PSOs):** Programme Specific Outcomes are what the students should be able to do at the time of graduation with reference to a specific discipline. Usually there are two to four PSOs for a programme.
- **Course Outcomes (COs):** Course outcomes are statements that describe significant and essential learning that learners have achieved, and can be reliably demonstrated at the end of a course. Generally three or more course outcomes may be specified for each course based on its weightage.

PROCESS INVOLVED IN OUTCOME BASED EDUCATION

Outcome Based Education (OBE) starts with a clear statement on Knowledge, Skills, and Attitudes that the Graduates will be able to demonstrate . These are stated as Programme Outcomes and Course Outcomes and are related with the Vision, Mission and PEO statements and GA as stated in Washington Accord.

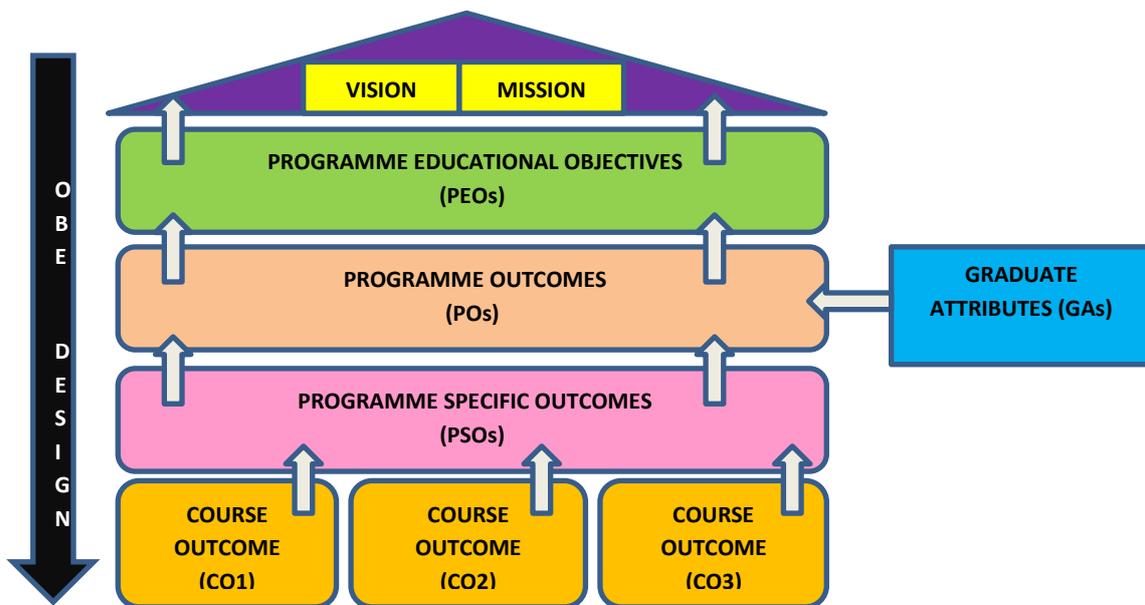


Figure 2: Key Parameters of Outcome Based Education

The OBE process involves the following steps:

1. Statement of measurable GAs, PEOs, POs/PSOs, and COs.
2. Designing appropriate Outcome Based Curriculum.
3. Deliberate Planning of Teaching-Learning Process.
4. Continuous Evaluation using suitable assessment methods and tools at apt time.

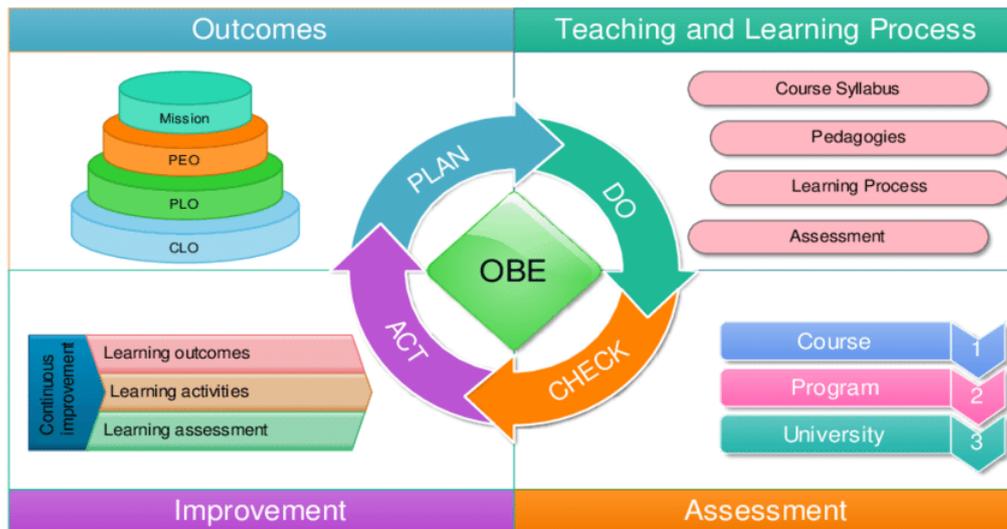


Figure 3: Process involved in Outcome Based Education

IMPLEMENTATION STRATEGY OF OBE

Since OBE focusses on student competency, it concentrates on the outcomes or goals instead of just marks or scores. So the goals which could be a certain number of skills and knowledge that the learner should have at the end of the course. The assessment methods are defined to measure the achievement of these goals. The teachers take the role of being facilitators and mentors. Constructive feedback from the students also helps in reshaping the curriculum.

STEPS

1. Assessment of curriculum and needs
2. Defining outcomes
3. Collaboration and Implementation
4. Defining the role of assessments and results, and measuring success
5. Feedback and continuous evaluation

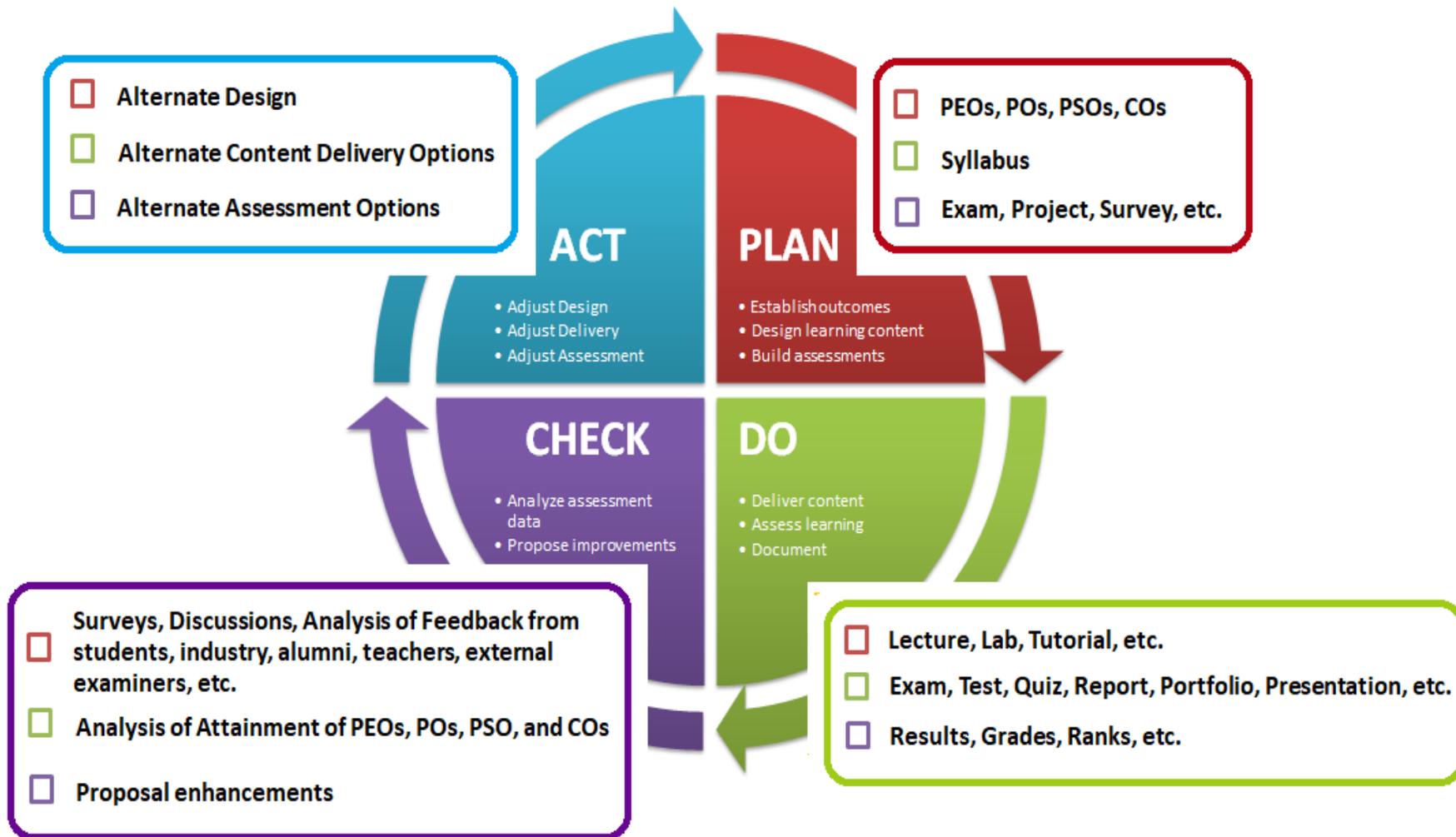


Figure 4: Implementation of Outcome Based Education

GRADUATE ATTRIBUTES

Graduate attributes refer to the skills, knowledge and abilities of the graduating students, beyond disciplinary content knowledge, that are applicable in a range of contexts in their lives. The graduate attributes are essential for employability and hence serve to enhance the development of students' academic, specialist and technical competencies defining a higher education experience and equipping them with transferrable skills that can be applied in different environments. At the successful completion of two years for PG programmes, the graduates of the University will be able to attain the following Graduate Attributes:

- Domain Expertise
- Technical Competency
- Transferrable Skills
- Interdisciplinary Knowledge
- Personality and Personal Growth
- Communication and Information Management
- Critical Thinking and Problem Solving
- Individual and Team Work
- Professional Ethics and Social Values
- Entrepreneurship Qualities
- Environment and Sustainability
- Lifelong Learning

PROGRAMME EDUCATIONAL OBJECTIVES

Programme Educational Objectives (PEOs) are broad statements that describe the career and professional accomplishments that the programme is preparing the graduates to achieve. PEO's are measured around 4-5 years after graduation. PEO's can be measured by a PO-PEO matrix. These may be guided by global and local needs, vision of the institution, long term goals, etc.

Guidelines

- PEOs should be consistent with the mission of the Institution.
- The number of PEOs should be manageable.
- PEOs should be achievable by the programme.
- PEOs should be specific to the programme and not too broad.
- PEOs should be based on the needs of the constituencies.

Evolving PEOs

- The PEOs should evolve through constant feedback from:
 - a. Industry, Alumni, Students, Management
 - b. Professional Bodies, Faculty, Parents
 - c. Data on trends in the profession
- Views regarding the feedbacks received are summarized and acceptable views are identified.
- The PEOs are formulated based on the Accepted Views.

LEVELS OF OUTCOMES

Outcomes are the learning results that the students demonstrate at the end of their learning experiences. Outcomes reflect what students can actually do with what they know and have learned as part of their programme of study. Outcomes include knowledge, skills and attitudes attained after 4 – 5 years of graduation. In OBE, the outcomes for a higher education programmes are defined at three levels as Programme Outcomes (POs), Programme Specific Outcomes (PSOs) and Course Outcomes (COs).

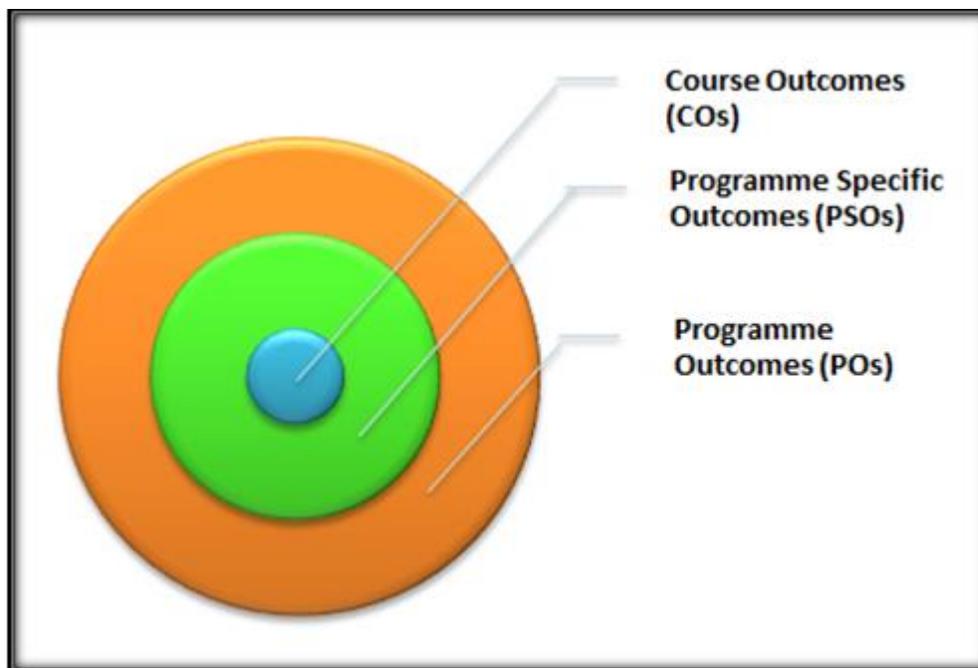


Figure 5: Levels of Outcomes

PROGRAMME OUTCOMES

POs are expected to be aligned closely with Graduate Attributes.

POs are also referred to as programme Learning Outcomes (PLOs).

Example: Outcomes formulated for M.Sc., Medical Physics programme

Vision

To produce professionally competent Medical Physicists and Atomic Energy Regulatory Board (AERB), Mumbai, Government of India, certified Medical Radiological Safety Officers (MRSOs) to the nation through effective teaching along with clinical exposure and translational research programs.

Mission

- Train Medical Physics professionals to ensure utmost quality patient care.
- Provide excellent learning opportunities and educate in a variety of Medical Physics oriented disciplines including radiology, radiation oncology, nuclear medicine and radiobiology.
- Provide outstanding training in Medical Physics service for the safe and effective delivery of cutting edge radiotherapy treatments and medical imaging at par with international standards.
- To produce professionally competent Medical Physicists who can adopt in the Health Industry environment as well.
- Our research mission is to develop better methods and technologies for the personalized diagnosis and treatment of cancer disease focusing on radiation based approaches in medical imaging, radiation oncology, and image guided intervention.

In alignment with the vision and mission the PEOs are stated as
Program Educational Objectives (PEOs)

On completion of the students are expected to:

PEO1 - Demonstrate the Physics, Biological and Safety aspects of Diagnostic radiology, External Beam Radiotherapy, Brachytherapy, Radiation Detection, Radiation Dosimetry, Advanced Radiotherapy Techniques and Nuclear Medicine for effective treatment of patients.

PEO2 - Learn step by step quality assurance/quality control procedures in medical imaging equipment and Radiation Oncology.

PEO3 - Categorize proper application of dosimetry and its instruments in medical imaging, and radiation dose delivery for Radiation Oncology.

PEO4 - Perform the applicators insertion of radioactive implants directly into the tissue

during Brachytherapy.

PEO5 - Be prepared as effective RSO to meet the regulatory requirements in radiation medicine for patient, personnel and public.

PROGRAMME SPECIFIC OUTCOMES

Programme Specific Outcomes (PSOs) are statements that describe what the graduates of a specific academic programme should be able to do. These are Programme Outcomes (POs) defined in specific to the discipline of study.

PG Programme Guidelines

- PSOs must be specific to the particular discipline of an academic programme.
- PSOs must reflect POs.
- **Mapping for the courses**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10
CO1										
CO2										
CO3										
CO4										
CO5										

COURSE OUTCOMES

COs are the statements of knowledge/ skills/ abilities that students are expected to know, understand and perform as a result from their learning experiences in each course. In order to graduate from a programme, students must pass a significant number of required courses (subjects) with at least a minimal proficiency level (often in the form of marks or grades), as set forth by the affiliating university. Usually, a university gives a syllabus that the institution must adhere to. The syllabus specifies the teaching strategy and content for each course. Course Outcomes (COs) are the measurable parameters which evaluate the student performance for each course that the student undertakes in every semester.

COs are also referred to as Course Learning Outcomes (CLOs).

Guidelines

- COs should aim to develop higher order skills in each Domain of Learning.
- Typically 4-6 COs are identified per Course.
- The CO statements are defined by considering the course content covered in each module of a course. On average, a typical CO is expected to take between 7-10 lessons in a 40 lesson course.
- Attainment of each CO should lead to attainment of one or more POs.

DEFINING COURSE OUTCOMES

Course Outcomes (COs) are statements clearly describing the meaningful, observable and measurable knowledge, skills and/or dispositions that the students will learn in a particular course – the essential knowledge, abilities, and attitudes that constitute the basic learning needed by a graduate of this course. These are major domain specific outcomes written using action verbs which are specific, measurable, achievable, realistic and time-bound (SMART) and can be demonstrated by students on completion of each course. A well written CO facilitates teachers in measuring the achievement of the CO at the end of each course. It also helps the teachers in designing suitable delivery and assessment methods to achieve the designed COs. COs can be defined and verified by using SMART principle as given below.

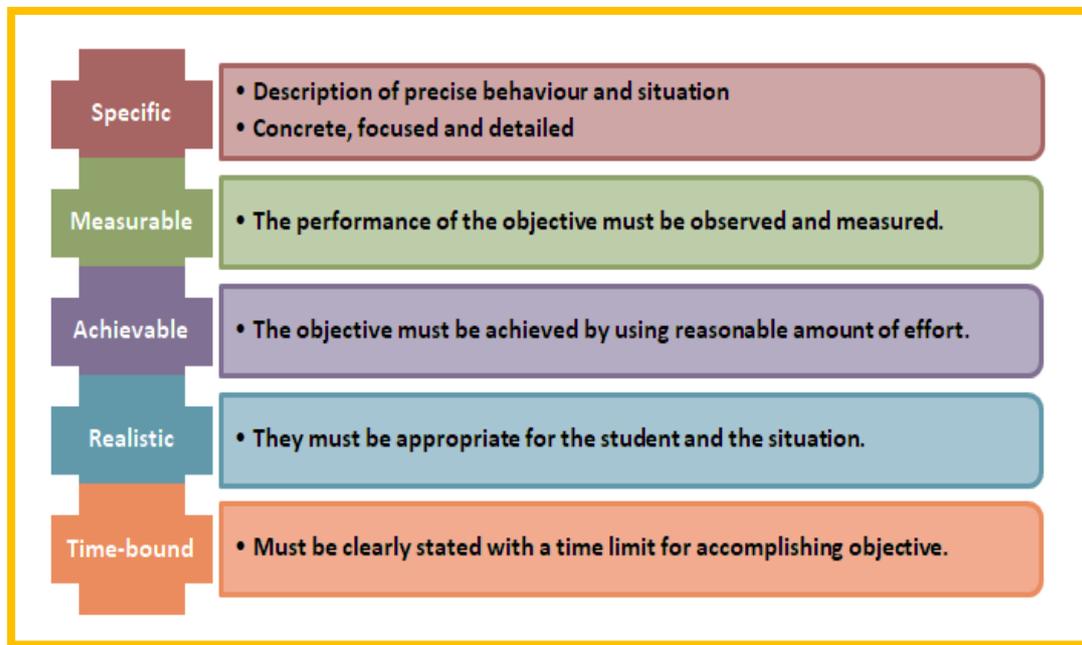


Figure 6: SMART Technique of Defining Learning Outcomes

There are 3 types of Course Learning Outcomes:

- 1) **Cognitive Outcomes:** “What will the students know after completing a course?”
- 2) **Behavioral Outcomes:** “What will the students be able to do after completing a course?”
- 3) **Affective Outcomes:** “What will the students care about or think after completing this course?”

Well-written learning outcomes involve the following parts:

- Action verb
- Subject content
- Level of achievement
- Condition of performance (if applicable)

GOOD COURSE OUTCOMES

Course Outcomes (COs) are central to a course's curriculum. They articulate to students, faculty, and other stakeholders what students will achieve in each course and how their learning will be measured. Good Course Outcomes use action verbs to specify the demonstrable and measurable knowledge, skills or dispositions possessed by students completing this course. Instead of using vague and not easily observable or measurable verbs or phrases like know, understand, appreciate, be aware of, learn comprehend, or become familiar with, is used. Good COs *employ specific verbs* like, compile, identify, create, plan, revise, analyze, design, select, utilize, apply, demonstrate, prepare, use, compute, discuss, explain, predict, assess, compare, rate, critique, outline, or evaluate.

Mapping of COs and POs

Steps to write a good CO

The primary footstep in writing a good CO is to identify and select the essential, distinct, measurable and demonstrable learning that the students are expected to achieve in a particular course of a programme and under specific programme discipline and that will support or advance the learning outcomes of the department and the institution. For every identified and chosen learning outcome, the following precautions are undertaken:

1. Select an action verb using Bloom's Taxonomy identifying the specific student knowledge, skill or disposition to be demonstrated.
2. Clearly identify the subject content focusing on specific knowledge, skill or disposition that the students are expected to be able to demonstrate.
3. Decide if the CO requires either a level of achievement or a condition of performance. A *level of achievement* identifies how proficient students need to be in a task. A *condition of performance* identifies if students are performing this particular outcome in a specific context only and hence may not be needed for every CO.
4. Be certain to pair each CO with one or more learning activities that will allow the students to achieve this outcome and permit faculty to measure this achievement.

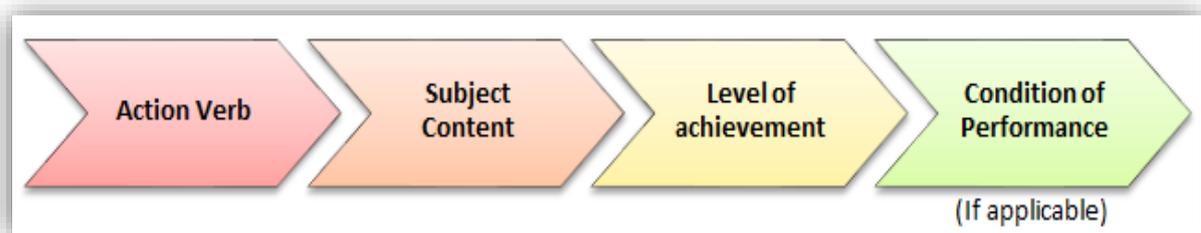


Figure 7: Parts of Good Learning Outcome

Finally, each learning outcome is defined in the form of statements comprising of the identified action verb and specific skill/knowledge/skill/disposition. The attainment of each CO is adequately paired with appropriate and suitable learning activities and is measured through appropriate assessment methods and tools.

BLOOM'S TAXONOMY OF EDUCATIONAL OBJECTIVES

Bloom's Taxonomy is a hierarchical model that categorizes learning objectives into varying levels of complexity (arranged in an order), from basic knowledge and comprehension to advanced evaluation and creation (Bloom, 1956). The taxonomy provides different levels of learning objectives, divided by complexity. Only after a student masters one level of learning goals, through formative assessments, corrective activities, and other enrichment exercises, can they move onto the next level (Guskey, 2005). Bloom's Taxonomy should be applied when creating learning objectives. At the end of the learning process, the goal of Bloom's taxonomy is that a student has sharpened a new skill, level of knowledge, and/or developed a different attitude towards the subject. Also, teachers are able to effectively evaluate this learning on an ongoing basis, as the course moves through each stage of the framework.

Domains of Learning

Bloom's Taxonomy comprises of three learning domains: cognitive, affective, and psychomotor. Within each domain, learning can take place at a number of levels ranging from simple to complex. Designers, trainers, and educators often refer to them as KSA (Knowledge [cognitive], Skills [psychomotor], and Attitudes [affective]). After a learning experience, the learner should possess a new skill, knowledge, and/or attitude.

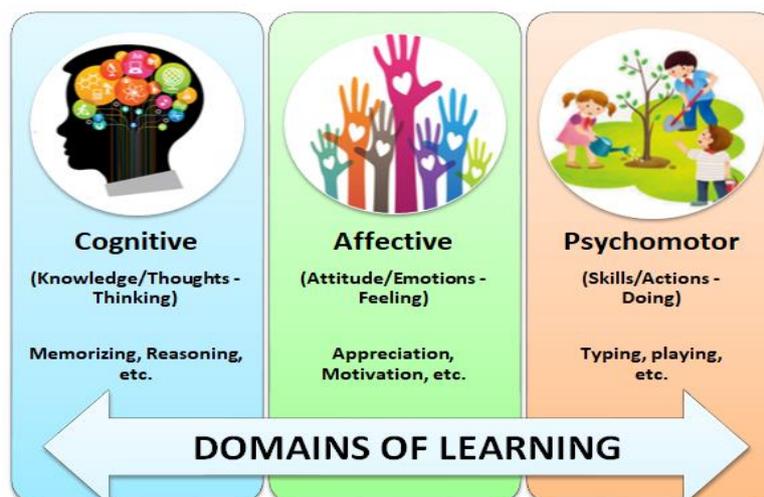


Figure 8: Domains of Learning

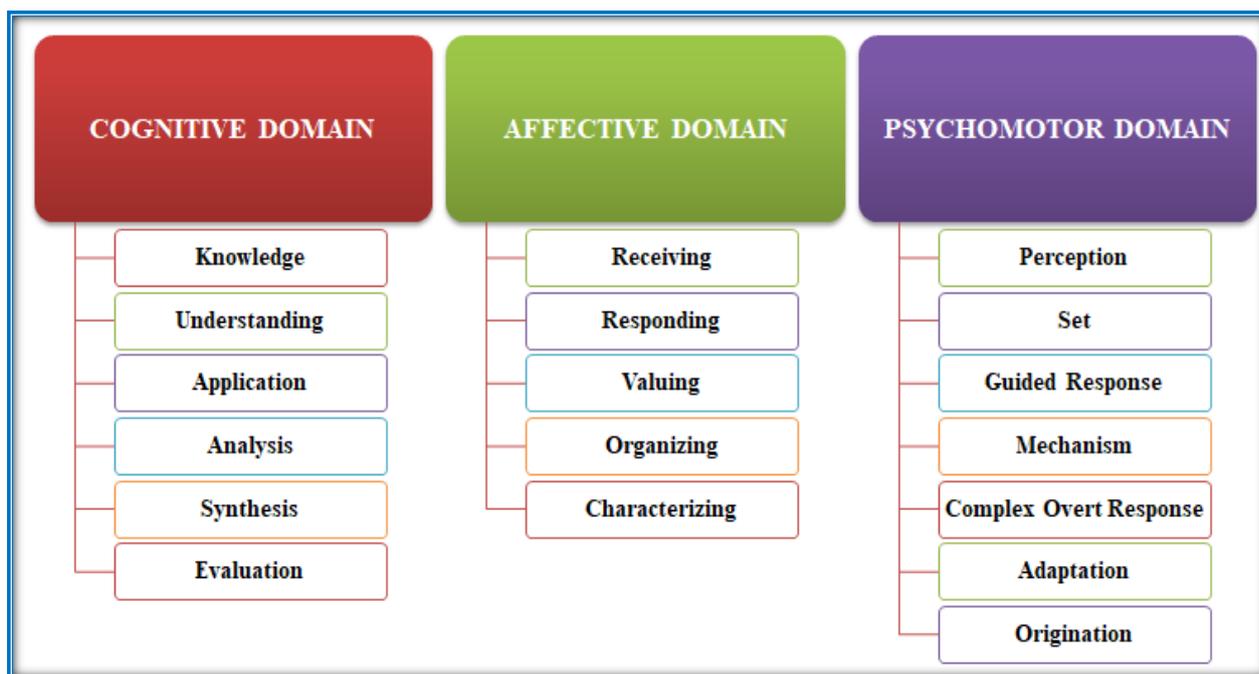


Figure 9: Domains of Learning

Bloom’s Taxonomy (Cognitive Domain): Original and Revised Versions

Bloom’s Taxonomy classifies learning objectives for students, from recalling facts to producing new and original work. The framework elaborated by Bloom and his collaborators consisted of six major categories under cognitive domain: 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.

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”. In the revised taxonomy, two dimensions are presented in the cognitive domain: the knowledge dimension and the cognitive dimension. There are four levels on the knowledge dimension: factual, conceptual, procedural, and metacognitive. There are six levels on the cognitive process dimension: remembering, understanding, applying, analyzing, evaluating, and creating. The new taxonomy enables teachers to think more in depth about the content that they are teaching and the objectives they are focusing on within the classroom. It allowed teachers to categorize objectives in a more-multidimensional way and to do so in a manner that allows them to see the complex relationships between knowledge and cognitive processes.

Dimensions of Knowledge

The dimension of knowledge is focused on 'Knowing what'. The knowledge dimension represents a range from concrete (factual) to abstract (metacognitive). Knowledge is characterized under the following four dimensions.

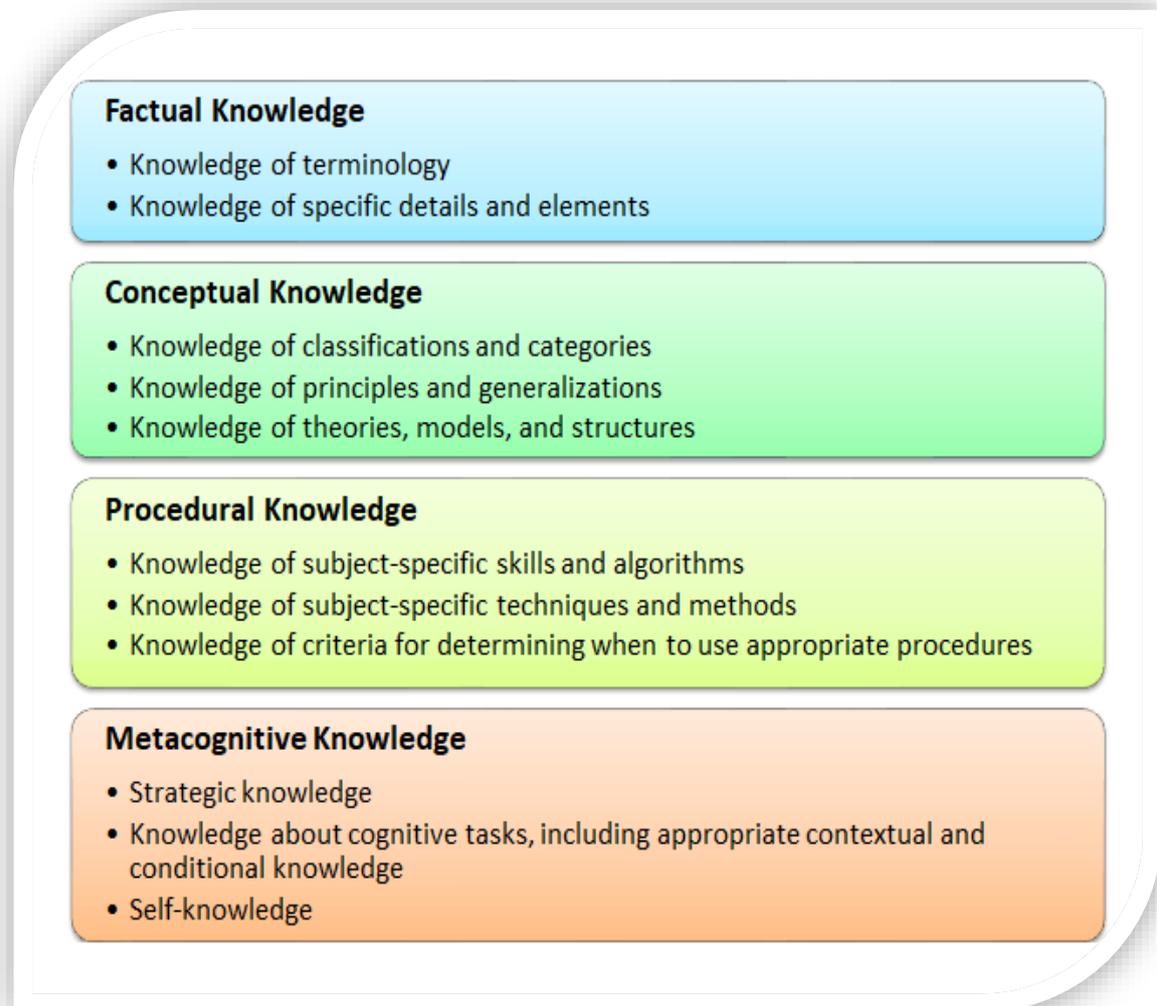


Figure 10: Dimensions of Knowledge

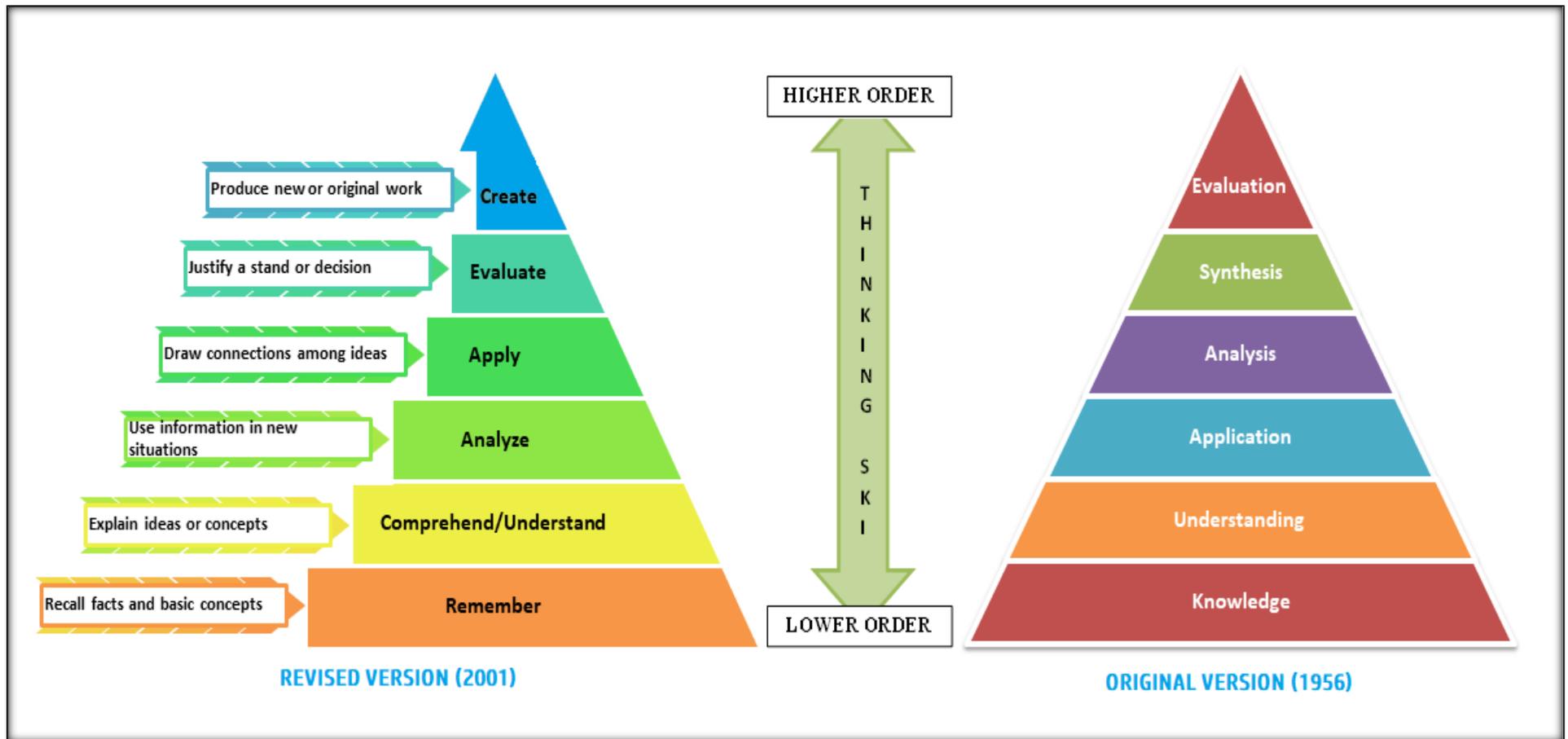


Figure 11: Revised Bloom's Taxonomy

ACTION VERBS – COGNITIVE DOMAIN

	LOWER ORDER			HIGHER ORDER		
Levels	Remember	Comprehend	Apply	Analyze	Evaluate	Create
Overview	Recalling basic facts and concepts	Explaining ideas or concepts	Using information in new situations	Drawing connections among ideas	Justifying a stand or decision	Produce new or original work

Action Verbs	• Define	• Describe	• Apply	• Analyze	• Assess	• Combine
	• Identify	• Discuss	• Carry out	• Categorize	• Conclude	• Construct
	• Label	• Explain	• Demonstrate	• Compare	• Evaluate	• Design
	• List	• Locate	• Illustrate	• Contrast	• Interpret	• Develop
	• Name	• Paraphrase	• Prepare	• Differentiate	• Justify	• Generate
	• Recall	• Give Example	• Solve	• Discriminate	• Measure	• Plan
	• State	• Translate	• Use	• Outline	• Support	• Propose
	• Choose	• Annotate	• Adapt	• Detect	• Appraise	• Create/Compile
	• Enumerate	• Classify	• Advise	• Diagnose	• Argue	• Compose
	• Find	• Convert	• Build	• Diagram	• Critique	• Discover
	• Group	• Exemplify	• Change	• Dissect	• Debate	• Expand
	• Match	• Generalize	• Choose	• Distinguish	• Decide	• Formulate
	• Reproduce	• Infer	• Compute	• Examine	• Deduce	• Improve
	• Sort	• Map	• Customize	• Separate	• Defend	• Invent
	• Recognize	• Organize	• Dramatize	• Simplify	• Determine	• Integrate
		• Relate	• Employ	• Survey	• Disprove	• Manage
		• Select	• Implement	• Test for	• Estimate	• Prepare
		• Show	• Manipulate	• Trace	• Forecast	• Produce
		• Summarize	• Modify/Alter	• Correlate	• Judge	• Synthesize
		• Translate	• Investigate			

		<ul style="list-style-type: none"> • Restate • Extrapolate 				
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ACTION VERBS – AFFECTIVE DOMAIN

	LOWER ORDER		HIGHER ORDER		
Levels	Receiving	Responding	Valuing	Organization	Internalizing
Overview	Selective attention to stimuli	Responding to stimuli	Attaching value or worth to something	Conceptualizing the value and resolving the	Integrating the value into a value system

Action Verbs				conflict between it and other values	that controls behavior
<ul style="list-style-type: none"> • Accept • Acknowledge • Be aware • Listen • Notice • Pay attention • Tolerate 		<ul style="list-style-type: none"> • Agree to • Answer freely • Assist • Care for • Communicate • Comply • Confirm • Consent • Contribute • Cooperate • Follow • Obey • Participate willingly • Read voluntarily • Respond • Visit • Volunteer 	<ul style="list-style-type: none"> • Adopt • Assume responsibility • Behave according to • Choose • Commit • Desire • Exhibit loyalty • Express • Initiate • Prefer • Seek • Show concern • Use resources to 	<ul style="list-style-type: none"> • Adapt • Adjust • Arrange • Balance • Classify • Conceptualize • Formulate • Group • Organize • Rank • Theorize 	<ul style="list-style-type: none"> • Act upon • Advocate • Defend • Exemplify • Influence • Justify behavior • Maintain • Serve • Support

ACTION VERBS – PSYCHOMOTOR DOMAIN

	LOWER ORDER		HIGHER ORDER				
Levels	Perception	Set	Guided Response	Mechanism	Complete Overt Response	Adaption	Origination
Overview	Senses cues that guide motor activity	Mental, emotional and physical readiness to act	Imitation and practice of skills often in discrete steps	Performing acts with increasing efficiency, confidence and proficiency	Automatic performance	Adapting skill sets to meet a problem situation	Creating new patterns for specific situations.

Action Verbs	<ul style="list-style-type: none"> • Detect • Hear • Listen • Observe • Perceive • Recognize • See • Sense • Smell • Taste • View • Watch 	<ul style="list-style-type: none"> • Achieve a posture • Assume a body stance • Establish a body position • Place hands, arms, etc. • Position the body • Sit • Stand • Station 	<ul style="list-style-type: none"> • Copy • Duplicate • Imitate • Manipulate with guidance • Operate under supervision • Practice • Repeat • try 	<ul style="list-style-type: none"> • Complete with confidence • Conduct • Demonstrate • Execute • Improve efficiency • Increase speed • Make • Pace • Produce • Show dexterity 	<ul style="list-style-type: none"> • Act habitually • Advance with assurance • Control • Direct • Excel • Guide • Maintain efficiency • Manage • Master • Organize • Perfect • Perform automatically • Proceed 	<ul style="list-style-type: none"> • Adapt • Reorganize • Alter • Revise • Change • Modify 	<ul style="list-style-type: none"> • Design • Originate • Combine • Compose • Construct
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ATTAINMENT OF OUTCOMES AND OBJECTIVES

OBE organizes the entire educational system towards what are considered essential for the learners to successfully do at the end of their learning experiences. By the end of the educational experience, each student should have achieved the goal. There is no single specified style of teaching or assessment in OBE; instead, classes, opportunities, and assessments should all help students achieve the specified outcomes.

- The attainment of COs of all the courses of a programme correlates to the attainment of the respective POs & PSOs.
- The final attainment levels of POs and PSOs for a batch of students of a branch in all the three years (for UG programme) or two years (for PG programme) indicate the effectiveness of the programme implemented.
- As POs are mainly formulated on the basis of GAs, achievement of POs would lead to achievement of GAs by pass outs.
- Achievement of POs and additional training/work for about four to five years after graduation would lead to achievement of PEOs.

The course outcomes are attained through the following instructional activities:

- Projects
- Tutorials
- Laboratory Experiments
- Field work
- Discussions
- Lectures
- Portfolios
- Educational Tours
- Assignment
- Quiz
- Log Book
- Site Visits
- Industrial Training
- Demonstration
- Presentation
- Case study
- Practical
- Debates

MEASUREMENT OF OUTCOME ATTAINMENT

For OBE implementation, initially it is necessary that the desired or defined outcomes are determined and then according to defined outcomes, programme curriculum, teaching and learning methodology and supporting facilities are designed. During the course of the programme, various measurement methods are used to measure the attainment of outcomes. The assessment of outcome attainment largely depends on the student's performance output or marks obtained in final theory and practical examination, test, and submission of assignments which indicates students learning achievements. Therefore, it is necessary and important to carry out a proper attainment method in order to measure student learning achievement and to predict the student's performance in future.

Methods of Assessment of Learning Outcomes

There are different ways to assess student learning. In this section, we present the different types of assessment approaches available and the different frame works to interpret the results.

- Continuous Internal Assessment (CIA)
- Alternate Assessment Tools (AAT)
- Semester End Examination (SEE)
- Laboratory and Project work
- Course exit survey
- Programme exit survey
- Alumni survey
- Employer survey
- Course expert committee
- Programme Assessment and Quality Improvement Committee (PAQIC)
- Department Advisory Board (DAB)
- Faculty meetings
- Professional societies

ASSESSMENT OF OUTCOMES

All (Direct + Indirect) CO Assessment Tools = PO Direct Assessment Tools

- The assessment process of COs, PSOs and POs can be direct or indirect.
- The direct assessment will be done through interim assessment by conducting continuous internal exam and semester end exams.
- The indirect assessment on the other hand could be done through student's programme exit questionnaire, alumni survey and employment survey.

Direct Assessment Tools	Indirect Assessment Tools
<ul style="list-style-type: none"> • Class Test • Internal Assessment • Assignments • Practical Examination • Mock Test • Seminar/Presentations • Mini Project • Revision Examinations • Semester End Examinations 	<ul style="list-style-type: none"> • Student Feedback Survey • Alumni Feedback Survey • Teachers Feedback Survey • Employer Feedback Survey

CO ATTAINMENT ASSESSMENT

Direct Assessment (Component-wise)

S.No.	Courses	Components	Frequency	Max. Marks
1	Core/Elective	Continuous Internal Examination	Twice in a Semester	50
		Alternative Assessment Tools	Thrice in a Semester	
		Semester End Examinations	Once in a Semester	50
2	Laboratory	Conduction of experiment	Once in a week	50
		Observation		

		Result Record		
		Internal Laboratory Assessment	Once in a Semester	
		Semester End Examinations	Once in a Semester	50
3	Project Work	Presentation	Once in the end semester	100
		Semester End Examination (Viva-Voce)	Once in the end semester	100

Indirect Assessment

S.No.	Tool	Process	Frequency
1	Student feedback survey	<ul style="list-style-type: none"> • Taken at the end of every academic year • Providing feedback analysis reports to the HoDs, BoS members and AOs • Remedial actions 	Once in an academic year
2	Alumni feedback survey		Once in an academic year
3	Teachers feedback survey		Once in an academic year
4	Employer feedback survey		Once in an academic year

PO ATTAINMENT ASSESSMENT

	Assessment	Tools	Weight
POs/PSOs Attainment	Direct Assessment	CO attainment of courses	80%
	Indirect Assessment	Student Feedback Survey	20%
		Alumni Feedback Survey	
		Employer Feedback Survey	
		Teacher Feedback Survey	

Example : Department of Education

ABOUT THE DEPARTMENT

The Department of Education, Bharathiar University was established in March, 2012 with an objective of bringing out effective and efficient Teacher Educators besides ensuring quality and need based researches in the field of Education. At present, the Department offers M.Phil. and Ph.D. Programmes in Education (Both Full-time & Part time). The Department emphasizes a shift from mass teaching to personalized instruction, single learning to multiple learning, rigid teacher-dominated to flexible learner centered classroom environment. The thrust areas of research in the Department are Educational Psychology, Educational Technology, Environment Education, Pedagogical Techniques, Instructional Designs, Media in Education, Web -Based Learning, English Language Teaching, etc.

MISSION

Our mission is to provide quality higher education to all people. We aim at developing citizens with knowledge, skill and character, contributing to societal transformation and national development in consonance with our motto 'Educate to Elevate'. We strive to form students to be men and women for others offering their selfless service for the growth of the country and people.

GRADUATE ATTRIBUTES

- Professional Capacity Building
- Professional Ethics
- Academic Administrative and Management Capacities
- Continuous Academic Development
- Commitment towards Society
- Independent and Team Work Capacities
- Professional Communication Skills
- Decision Making Skills
- Structuring the Curricula
- Self-Directed Learning

PROGRAMME EDUCATIONAL OBJECTIVES

(M.Ed. Programme)

(For the students admitted from 2021-22 onwards)

On successful completion of the programme, the students will be able to:

PEOs	Statements
PEO1	Gain insight and reflect on the concept and the status of pre-service and in-service teacher education.
PEO2	Acquaint with the content, organization of pre-service teacher education, curriculum, infrastructure, resources needed, and problems related to teacher preparation.
PEO3	Examine the existing pre-service and in-service teacher education programme from the point of policy and its relevance to the demands of present day school realities.
PEO4	Involve in various activities and processes of a teacher education institution, in order to gain the insight into the multiple roles of teacher educators and understand the organizational culture.
PEO5	Develop competence in organization and evaluation of various components of pre-service and in-service teacher educational programme.
PEO6	Design in-service teacher professional development programme/activities based on the needs of teachers.
PEO7	Critically examine the role and contribution of various agencies and regulating bodies in enhancing the quality of teacher education.
PEO8	Understand and appreciate the research perspectives on various practices in teacher education.
PEO9	Feed professional attitudes, values and interests needed to function as a teacher educator.
PEO10	Involve in Outcome Based Education in all subjects.

PROGRAMME OUTCOMES

(M.Ed. Programme)

On successful completion of the programme, the students will be able to:

POs	Graduate Attributes	Statements
PO1	Professional Capacity Building	Apply the knowledge of Philosophy, Sociology, Psychology, Management, Administration, Information and Communication Technology to set the context of teaching profession and develop the capacity in teaching, research and extension work in the field of teacher education.
PO2	Professional Ethics	Demonstrate Professional ethics by keeping self-abiding to rules, regulations, values and high standards in teaching, research and administration at diversified educational setting and teacher education institutes.
PO3	Academic Administrative and Management Capacities	Apply the knowledge of educational management, administration, philosophy, sociology, psychology, ICT, academic planning, organization, evaluation, decision making, and resources management according to the predetermined goals, norms and standards.
PO4	Continuous Academic Development	Identify own educational needs and requirements, keep academic development and learning in an independent way in the context of change in different aspects of education and teacher education.
PO5	Commitment towards Society	Recognize areas of commitment, accountability, constitution values and national goals.
PO6	Independent and Team Work Capacities	Perform function effectively either in the role of member or leader in diversified educational settings and institutions of teacher education.
PO7	Professional Communication Skills	Use diversified tools & technologies of communications, communication skills to serve the professional purpose and standards expected from classroom to broader zone of educational activities.

PO8	Decision Making Skills	Enable them to solve various problems of school management and classroom management.
PO9	Structuring the Curricula	Understand the basis, principles and process of curriculum development at primary and secondary level.
PO10	Self-Directed Learning	Self-study component helps in self-directed learning as it gives opportunity to student to study in depth about a particular issue and gain knowledge.

PROGRAMME SPECIFIC OUTCOMES
(M.Ed. Programme)

On successful completion of the programme, the students will be able to:

PSOs	Statements
PSO1	Professional Capacity Building
PSO2	Professional Ethics
PSO3	Academic Administrative and Management Capacities
PSO4	Continuous Academic Development
PSO5	Commitment towards Society and Professional Development
PSO6	Professional Communication Skills
PSO7	Independent and Team Work Capacities
PSO8	Developing competence in research and evaluation of various components in curriculum
PSO9	Training in ICT based methodology

PSO10	Developing soft skills for teaching, learning and life
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COURSE OUTCOMES (COs)
(M.Ed. Programme)

Course Name: *Basics of Educational Research*

Course code: *IC*

Exam Duration: *3 Hrs*

Credits: *4*

CIA: *50*

ESE: *50*

On successful completion of the course, the students will be able to:

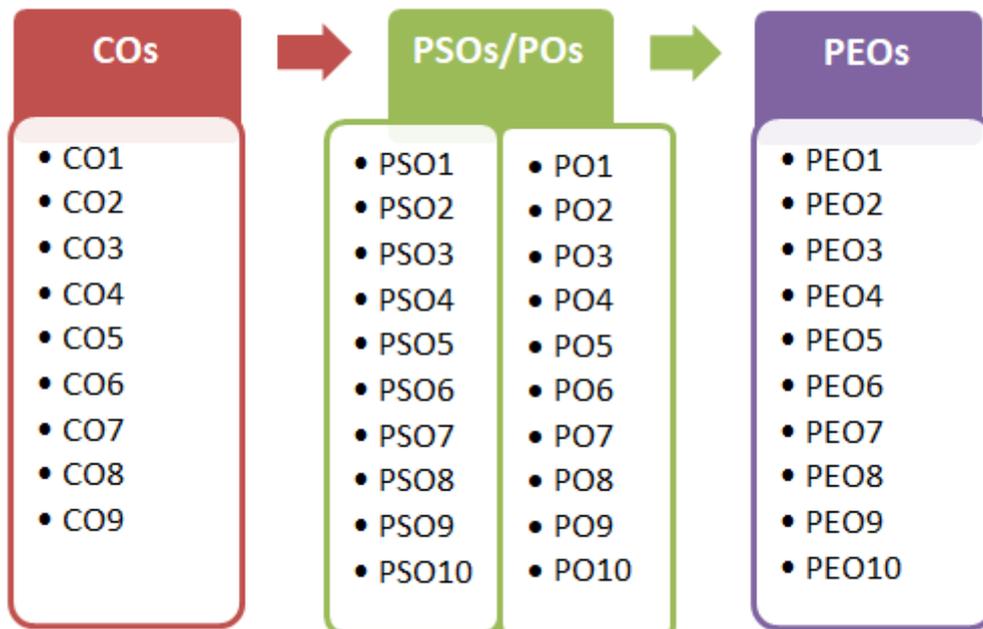
COs	Statements	Bloom's Level of COs
CO1	Identify the research problems independently.	L1
CO2	Select prompt research method for research process.	L2
CO3	Train to collect appropriate reviews for selected problems.	L2
CO4	Acquire the ability to select samples from research population area.	L3
CO5	Practice proper sampling techniques.	L2
CO6	Able to choose variables according objectives of the study.	L4
CO7	Prepare and standardize tools for research.	L5
CO8	Use SPSS package for data analysis.	L5
CO9	Write research proposal for the projects.	L6

L1 - Remember L2 - Understand L3 - Apply L4 - Analyze L5 - Evaluate L6 - Create

CO-PO AND CO-PSO MAPPING

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

- “1” – Slight (Low) Correlation
- “2” – Moderate (Medium) Correlation
- “3” – Substantial (Strong) Correlation
- “-” -- Indicates there is no correlation.



SAMPLE CO-PSO MAPPING

(M.Ed. Programme)

Course Name: *Basics of Educational Research*

Course code: *1C*

CO-PSO MATRIX

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	M	S	S	S	M	M	L	S	L	S
CO2	S	S	S	S	M	L	L	S	L	S
CO3	M	M	S	S	M	M	L	S	L	S
CO4	S	S	S	M	M	M	L	S	L	S
CO5	M	S	M	S	S	S	M	S	L	S
CO6	M	M	S	S	S	S	L	M	L	S
CO7	S	S	S	S	M	L	L	S	L	S
CO8	M	S	M	S	M	M	L	S	L	S
CO9	M	S	S	S	M	M	L	S	L	S

*S-Strong; M-Medium; L-Low

COs	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9	PSO10
CO1	2	3	3	3	2	2	1	3	1	3
CO2	3	3	3	3	2	1	1	3	1	3
CO3	2	2	3	3	2	2	1	3	1	3
CO4	3	3	3	2	2	2	1	3	1	3
CO5	2	3	2	3	3	3	2	3	1	3
CO6	2	2	3	3	3	3	1	2	1	3
CO7	3	3	3	3	2	1	1	3	1	3
CO8	2	3	2	3	2	2	1	3	1	3
CO9	2	3	3	3	2	2	1	3	1	3

SAMPLE CO-PO MAPPING

(M.Ed. Programme)

Course Name: *Basics of Educational Research*

Course code: *IC*

CO-PO MATRIX

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	S	M	M	L	S	L	S
CO2	M	S	S	S	M	L	L	S	L	S
CO3	M	S	S	S	M	M	L	S	L	S
CO4	S	S	S	S	M	M	L	S	L	S
CO5	S	S	S	S	S	S	M	S	L	S
CO6	M	S	S	S	S	S	L	S	L	S
CO7	M	S	S	S	M	L	L	S	L	S
CO8	M	S	S	S	M	M	L	S	L	S
CO9	S	S	S	S	M	M	L	S	L	S

*S-Strong; M-Medium; L-Low

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	2	3	3	3	2	2	1	3	1	3
CO2	2	3	3	3	2	1	1	3	1	3
CO3	2	3	3	3	2	2	1	3	1	3
CO4	3	3	3	3	2	2	1	3	1	3
CO5	3	3	3	3	3	3	2	3	1	3
CO6	2	3	3	3	3	3	1	3	1	3
CO7	2	3	3	3	2	1	1	3	1	3
CO8	2	3	3	3	2	2	1	3	1	3
CO9	3	3	3	3	2	2	1	3	1	3

SAMPLE CO – PO – PSO MAPPING
(M.Ed. Programme)

Course Name: *Basics of Educational Research*

Course code: *IC*

COs	POs										PSOs									
	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
C01		✓	✓	✓				✓		✓		✓	✓	✓				✓		✓
C02		✓	✓	✓				✓		✓	✓	✓	✓	✓				✓		✓
C03	✓	✓	✓	✓				✓		✓			✓	✓				✓		✓
C04	✓	✓	✓	✓				✓		✓	✓	✓	✓					✓		✓
C05	✓	✓	✓	✓	✓	✓		✓		✓		✓		✓	✓	✓		✓		✓
C06		✓	✓	✓	✓	✓		✓		✓			✓	✓	✓	✓				✓
C07		✓	✓	✓				✓		✓	✓	✓	✓	✓				✓		✓
C08		✓	✓	✓				✓		✓		✓		✓				✓		✓
C09	✓	✓	✓	✓				✓		✓		✓	✓	✓				✓		✓

PROGRAMME OUTCOMES ATTAINED THROUGH COURSE MODULES (SAMPLE)

Courses offered in M.Ed. Programme (2021-22 Batch) and POs attained through course modules for I, II, III and IV semesters.

Semester/ Code No.	Paper	Subject	Programme Outcome Mapped
SEMESTER I			
1A	Core – I	Philosophical And Sociological Perspectives of Education	PO1, PO2, PO8, PO9
1B	Core – II	Psychology of Learning And Development	PO1, PO3, PO6, PO7, PO8, PO10
1C	Core – III	Basics of Educational Research	PO2, PO3, PO4, PO8, PO10
1E1	Elective-I	Early Childhood Care And Education	PO1, PO2, PO6, PO7
1E2	Elective-II	Basis of Elementary Education	PO1, PO2, PO3, PO6
1T1	Tool Course-I	Preparation of Research Proposal	PO2, PO3, PO4
1T2	Tool Course-II	Professional Career Skill Development (Activity Based)	PO1, PO2, PO3, PO4, PO5, PO6, PO7
SEMESTER II			
2A	Core –IV	Curriculum Design And Development	PO1, PO3, PO4, PO5, PO6, PO9, PO10
2B	Core – V	Historical, Political And Economical Perspectives In Education	PO1, PO2
2C	Core – VI	Advanced Educational Research And Statistics	PO2, PO3, PO4
2E1	Elective-III	Basis of Secondary And Higher Secondary Education	PO1, PO3, PO4, PO6

2E2	Elective-IV	Curriculum, Pedagogy And Assessment	PO3, PO4, PO5, PO6, PO9, PO10
2T1	Tool Course-III	Training In Educational Software (SPSS)	PO2, PO3, PO4
2IT	Internship Training- I	Preparation of Video Package For Three Weeks	
SEMESTER III			
3A	Core – VII	Pre-Service And In-Service Teacher Education	PO2, PO3
3B	Core – VIII	Education As A Field of Study	PO1, PO2, PO3, PO6
3E1	Elective-V	Financing of Education	PO1, PO2, PO3
3E2	Elective-VI	Environmental Education	
3E3	Elective-VII	Inclusive Education	PO1, PO2
3E4	Elective-VIII	Educational Management And Administration	PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO10
3T1	Tool course-IV	Expository And Academic Writing	PO4, PO7
3T2	Tool course-V	Self-Development; Yoga Education	PO1, PO4, PO7, PO10
3T3	Tool course-VI	Construction And Standardization of Research Tool	PO2, PO3, PO4
3IT	Internship Training – II	Visit To Teacher Education Institution For Three Weeks	
SEMESTER IV			
4A	Core-IX	Gender Disparity In Education	PO1, PO2, PO3, PO6
4B	Core-X	Teacher Education For 21st Century	PO1, PO2
4E1	Elective-IX	Recent Trends In Higher Education	PO1, PO2, PO3

4E2	Elective-X	Technology of E-Learning	PO1, PO3, PO7
4E3	Elective-XI	Augmented Reality In Education	PO1, PO3, PO7
4T1	Tool course-VII	Training In Communicative Skills	PO4, PO7
–	Practical	Dissertation And Viva-Voce	

M. Sc Applied Psychology Curriculum

Course on RESEARCH METHODOLOGY AND STATISTICS

COs	PO1	PO2	PO3	PO4	PO5	PO6	P07	P08	P09	P10
CO1	S	S	S	M	S	M	S	S	S	S
CO2	M	S	S	M	S	S	S	S	S	S
CO3	S	S	M	S	M	S	S	M	S	M
CO4	S	S	M	S	S	M	S	M	S	M
CO5	M	M	S	S	S	S	M	S	M	S



OBE - ATTAINMENT



ATTAINMENT OF COURSE

Course outcomes (CO) are framed to specify what will the student gain in terms of knowledge and skill by learning the course. The outcomes are measurable and observable which are used to determine the attainment level of the course. Programme outcomes (PO) projects the status of accomplishments after completing the programme. The PO attainment is calculated based on the attainment levels of courses offered under the programme.

Course correlation matrix explained below gives the information about the relationship between Course Outcomes and Programme Outcomes. The mapping of PO and CO correlates whether the course outcomes matches with programme outcomes which finally reflects the success of the programme.

Verbs	Bloom levels
Remember	K1
Understanding	K2
Apply	K3
Analyse	K4
Evaluate	K5
Create	K6

Type	PO	Pos action Verbs	Pos Blooms Levels	COs Bloom's Level(s)
Technical skills	PO1	Apply	K3	K1 to K4 »»» Theory Courses, K1 to K5 »»» Laboratory Courses, K1 to K6 »»» Mini Project and Major Project (Assign 1 for K1, 2 for K2....6 for K6)
	PO2	Understanding	K2	
		Create	K6	
	PO3	Analyze	K4	
		Design	K3, K6	
	PO4	Develop	K3, K6	
		Analyze	K4	
		Interpret	K2, K3	
	PO5	Design	K6	
		Create	K6	
		Select	K1, K2, K6	
	PO6	Apply	K3	
Assess		K5		
Transferable Skills	PO7	THUMB RULE		
	PO8	If K1 Action Verbs of a CO »»» Correlates with any		
	PO9	of PO7 to PO12 »»» then assign 1		
	PO10	If L2 to L3 Action Verbs of a CO »»» Correlates with any		
	PO11			

Note:

- The first six Pos are purely technical in nature, while the other Pos are transferable skills.
- The CO level is set between 1 and 4 for the theory courses. The CO level is set between 1 and 5 for the laboratory courses. The CO level is extended upto 6th level only for mini projects and major projects.
- For a given course, the course faculty member has to involve all other faculty members who teach that course and ask them to come up with the CO-PO mapping. The course faculty member has to take the average value of all of these CO- PO mappings and finalize the values, or the course faculty member can go with what the majority of the faculty members prefer. While matching COs with non-technical Pos, correlate the action verbs used in the COs with the thumb rule given in the table and map the values.

Procedure followed while assigning the values by mapping COs to Pos.

- Select action verbs for a CO from different Bloom's levels based on the importance of the particular CO for the given course.
- Stick on to single action verbs while composing COs and use for multiple action verbs if the need arises.
- Values to CO-PO (technical Pos in particular) matrix are assigned by
 - ❖ Judging the importance of the particular CO in relation to the Pos. If the CO matches strongly with a particular PO criterion then 3 is assigned, if it matches moderately then 2 is assigned or less than 1 is assigned else marked with “ – ” symbol.
 - ❖ If an action verb used in a CO is repeated at multiple Bloom's levels, then reconsider which Bloom's level is the best fit for that action verb.

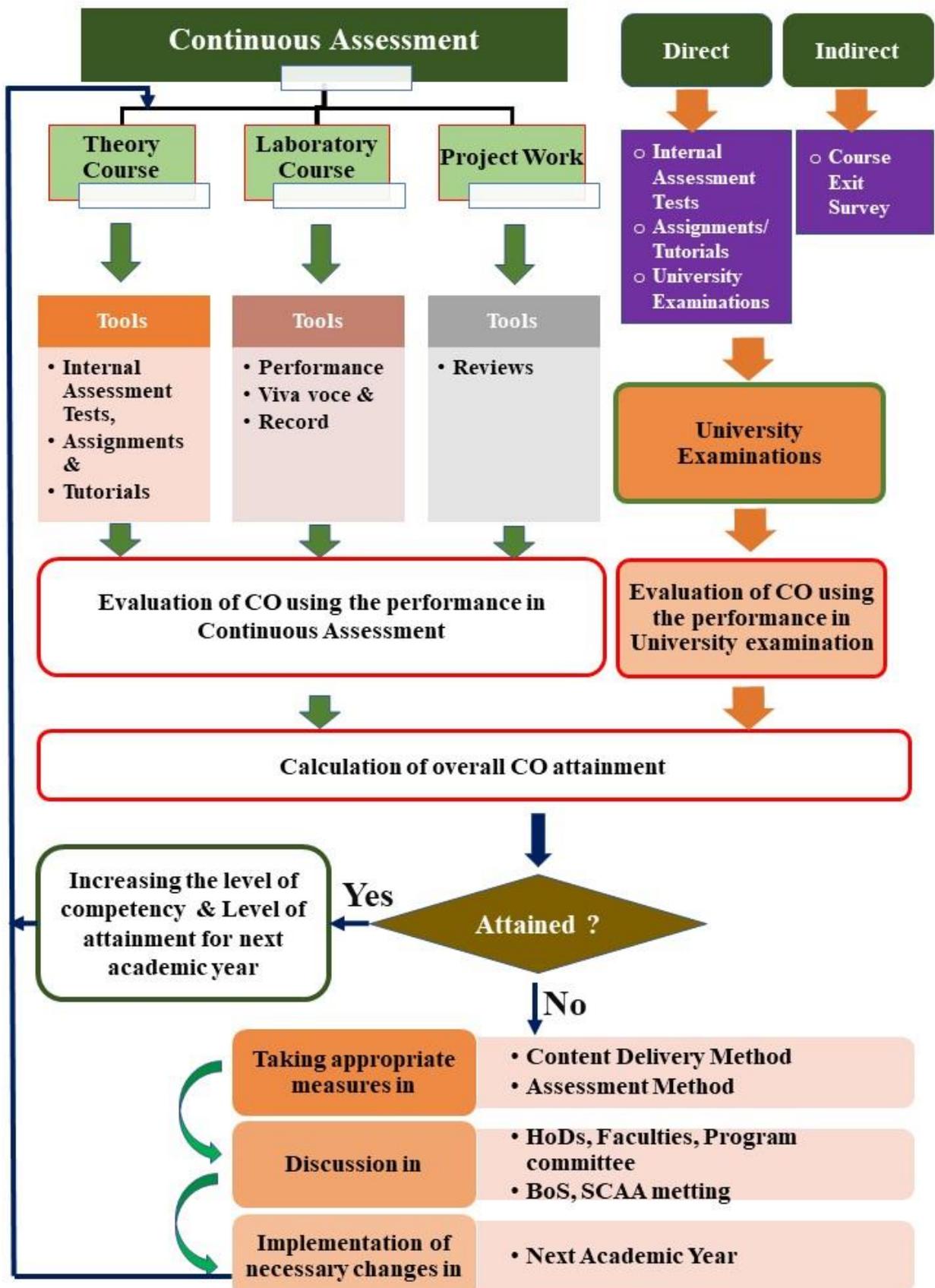
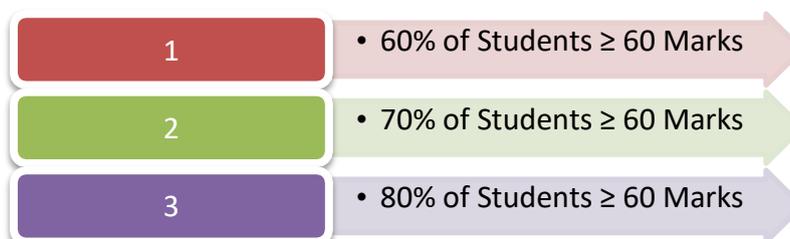


Figure 1. Process for CO Attainment

Direct Assessment:

Evaluation Methods	Process
Internal Assessment Tests	Three Internal Assessment Tests are conducted per semester to evaluate the attainment of course outcomes. Each question is mapped with COs and blooms level.
Assignments & Tutorials	The tutorials and assignments are given to the students based on the subject nature. For four credit papers tutorials are mandatory. Tutorial and Assignment sheets are prepared by the faculty member with COs and levels.
Continuous Assessment & Model Exam (Laboratory Course)	The evaluation criteria for each experiment are based on performance, viva-voce and record mark. The attainment of COs is calculated through continuous assessment and model practical performance.
Project Reviews	Three reviews are conducted periodically to monitor and evaluate the progress of the project using project rubrics. Viva-Voce is conducted at the end of the semester as per University norms.
University Examination	At the end of each semester, final examination is conducted for Theory and Laboratory courses by Anna University, in which question paper covers the entire syllabus and all the Cos are covered in the question papers.

Attainment Level:



Theory courses:

For each theory course, faculty member calculates the course outcome attainment using University Examination and Internal Assessment Test. The attainment level will be calculated based on the average performance levels of both University Examination and Internal Assessment Test. The evaluation process of Internal Assessment Tests/Assignments/Tutorials/Group Discussion is counted for 40% and the remaining 60% will be given for university examination. Based on the level of CO attainment, the faculty member will decide whether to increase the competency level or change the content delivery method, assessment methods to improve attainment level for the course.

	Assessment Tool	Weightage	Frequency
CO Attainment	Internal Assessment Tests	40%	Thrice in a Semester
	University Examination	60%	Once in a Semester

Laboratory Courses:

For laboratory courses, the course outcome will be calculated based on performance, viva-voce, record work and model practical examination with the weightage of 40% for Continuous Internal Assessment and 60 % weightage for University Practical Examination. Based on the CO attainment level, the faculty member will decide whether to increase the competency level or enhance the practical knowledge of the students in order to improve attainment level for the laboratory course.

	Assessment Tool	Weightage	Frequency
CO Attainment	Continuous Internal Assessment	40%	Every Week
	University Practical Examination	60%	Once in a Semester

Project Work Assessment:

For project work, Continuous Internal Assessment is based on the performance in the three reviews. The Course Attainment is calculated based on the three reviews and project Viva voce.

- Project review is conducted every month to review the progress of the project and the second review will be conducted in the presence of an industry expert.
- Suggestions are given to the students for their continuous update and improvement.
- Evaluation of each review is based on the parameters discussed in teaching learning process.

The faculty member will decide the competency level and attainment level for project work considering the average performance level of the students.

	Assessment Tool	Weightage	Frequency
Continuous Assessment	Reviews	40%	Every Month
University Assessment	Viva-Voce	60%	Once in a Semester

CO Attainment Calculation:

The course outcomes for all the courses are calculated in terms of percentage using the formula.

$$\text{CO}_x \text{ in } \% = \frac{\text{Marks obtained by the students in CO}_x}{\text{Maximum Marks allotted in CO}_x} \times 100$$

Where, $x = [1 \text{ to } N]$, $N = \text{Number of COs}$.

Each course outcome is calculated for all the students based on marks obtained by the students.

$$\text{CO}_x \text{ Attainment in } \% = \frac{\text{no. of Students scored more than or equal to 60\% of Marks in CO}_x}{\text{no. of Students}} \times 100$$

Where, $x = [1 \text{ to } N]$, $N = \text{Number of Course Outcomes}$

CO_x Attainment Level	3	80% of the Students scoring more than or equal to 60% of Marks in CO_x
	2	70% of the Students scoring more than or equal to 60% of Marks in CO_x
	1	60% of the Students scoring more than or equal to 60% of Marks in CO_x

After calculating the attainment levels of each COs from the performance of Internal Assessment Test 1, 2 & 3, the attainment level of Internal Assessment Test is calculated with ratio of sum of all COs attained by total number of COs as shown below:

$$\text{IAT Attainment Level} = \frac{\text{Sum of all COs attained by students}}{\text{Total Number of COs}}$$

Based on university grade, the attainment level of COs is calculated. The attainment level is decided based on the following criteria.

University Attainment Level	3	80% of the Students scoring more than or equal to 50% of Marks in University Exam
	2	70% of the Students scoring more than or equal to 50% of Marks in University Exam
	1	60% of the Students scoring more than or equal to 50% of Marks in University Exam

Overall CO Attainment:

The Overall Attainment for a course is sum of 40% of Internal Assessment Test Attainment Level and 60% of University Attainment Level.

$$\text{Overall CO Attainment} = \left(\frac{\sum_i^n}{i} \right) \text{Where } n = \text{number of course outcome.}$$

Sample Calculation:

$$\text{CO}_x \text{ in } \% = \frac{\text{Marks obtained by the students in CO}_x}{\text{Maximum Marks allotted in CO}_x} \times 100$$

Where, x= [1 to N], N= Number of COs

Reg. No of the student: 953615106001

$$\text{CO1 in \%} = \frac{11.5}{18} \times 100 = 63.88 \%$$

$$\text{CO2 in \%} = \frac{28}{32} \times 100 = 87.50 \%$$

$$\text{CO3 in \%} = \frac{12}{18} \times 100 = 66.67 \%$$

$$\text{CO4 in \%} = \frac{44.5}{65} \times 100 = 68.46 \%$$

$$\text{CO5 in \%} = \frac{9.5}{17} \times 100 = 55.88 \%$$

Reg. No of the student: 953615106005	$\text{CO1 in \%} = \frac{29.5}{33} \times 100 = 89.39 \%$ $\text{CO2 in \%} = \frac{16}{17} \times 100 = 94.12 \%$ $\text{CO3 in \%} = \frac{16}{18} \times 100 = 88.89 \%$ $\text{CO4 in \%} = \frac{64}{65} \times 100 = 98.46 \%$ $\text{CO5 in \%} = \frac{17}{17} \times 100 = 100 \%$
Reg. No of the student: 953615106007	$\text{CO1 in \%} = \frac{12.5}{18} \times 100 = 69.44 \%$ $\text{CO2 in \%} = \frac{26.5}{32} \times 100 = 82.81 \%$ $\text{CO3 in \%} = \frac{24}{33} \times 100 = 72.73 \%$ $\text{CO4 in \%} = \frac{47.5}{50} \times 100 = 95 \%$ $\text{CO5 in \%} = \frac{17}{17} \times 100 = 100 \%$
Reg. No of the student: 953615106062	$\text{CO1 in \%} = \frac{30}{33} \times 100 = 90.91 \%$ $\text{CO2 in \%} = \frac{17}{17} \times 100 = 100 \%$ $\text{CO3 in \%} = \frac{18}{18} \times 100 = 100 \%$ $\text{CO4 in \%} = \frac{45.5}{50} \times 100 = 91 \%$ $\text{CO5 in \%} = \frac{31}{32} \times 100 = 96.87 \%$

After calculating each course outcomes in terms of percentage, the attainment level of the course is shown below table.

CO1	1	60% of Students scored more than or equal to 60 Marks
CO2	2	70% of Students scored more than or equal to 60 Marks
CO3	2	70% of Students scored more than or equal to 60 Marks
CO4	3	80% of Students scored more than or equal to 60 Marks
CO5	2	70% of Students scored more than or equal to 60 Marks

Internal Attainment is calculated as follows:

$$\text{IAT Attainment Level} = \frac{\text{CO1} + \text{CO2} + \text{CO3} + \text{CO4} + \text{CO5}}{5}$$

$$\text{IAT Attainment Level} = \frac{1 + 2 + 2 + 3 + 2}{5} = 2$$

University Attainment is calculated as follows:

The university attainment level can be calculated as follows:

University Attainment level	1	60% of Students scored more than or equal to 50 Marks
	2	70% of Students scored more than or equal to 50 Marks
	3	80% of Students scored more than or equal to 50 Marks

In this subject 96.36 % of the students scored more than or equal to 50% of the mark in university examination, so the University Attainment Level is 3.

The Overall Attainment for the course is calculated as follows.

$$\text{Overall CO Attainment} = \left(\frac{\sum_{i=1}^n \text{CO}_i}{n} \times 0.4 \right) + (\text{UA} \times 0.6)$$

Where n = number of course outcome.

$$\text{Overall CO Attainment} = (0.4 \times 2) + (0.6 \times 3) = 2.6$$

$$\text{Overall CO Attainment} = 2.6$$

1.2 Record the attainment of Course Outcomes of all courses with respect to set attainment levels

The attainment level for each course is decided by the respective faculty member. The attainment of COs for all subjects from I year, II year, III year and IV year for the batch 2013-2017, 2014-2018, 2015-2019 and 2016-2020 are assessed by having 60% weightage for university examination and 40% weightage to internal assessment tests.

Set Attainment Level Calculation:

- The set attainment level for the first batch (2013-2017) has been fixed as 1.5 for theory courses and 2 for Laboratory courses/Project.
- The set attainment level for the batch 2014-2018 has been fixed by taking average grade point analysis value of the university examinations obtained by the 2013-2017 batch students.
- The set attainment level for the batch 2015-2019 has been fixed by taking average value of average grade point analysis value of university examination obtained by the previous two batch students.
- The set attainment level for the batch 2016-2020 has been fixed by taking average value of average grade point analysis value of university examination obtained by the previous three batch students.

The table 1 shows the methodology Target attainments (Set Attainment Level) for all the courses.

Batch	Target Attainment
2013-2017 (AGPA ₁)	1.5 for Theory Courses & 2 for Laboratory Courses/Projects
2014-2018 (AGPA ₂)	AGPA ₁ × 0.3
2015-2019 (AGPA ₃)	$\left(\frac{AGPA_1 + AGPA_2}{2} \right) \times 0.3$
2016 - 2020	$\left(\frac{AGPA_1 + AGPA_2 + AGPA_3}{3} \right) \times 0.3$

Table 2 Targets for Course outcomes

For measuring the attainment of Program Outcomes and Program Specific Outcomes various tools are used. The process for measuring the attainment of each PO & PSO is described in Figure 2.

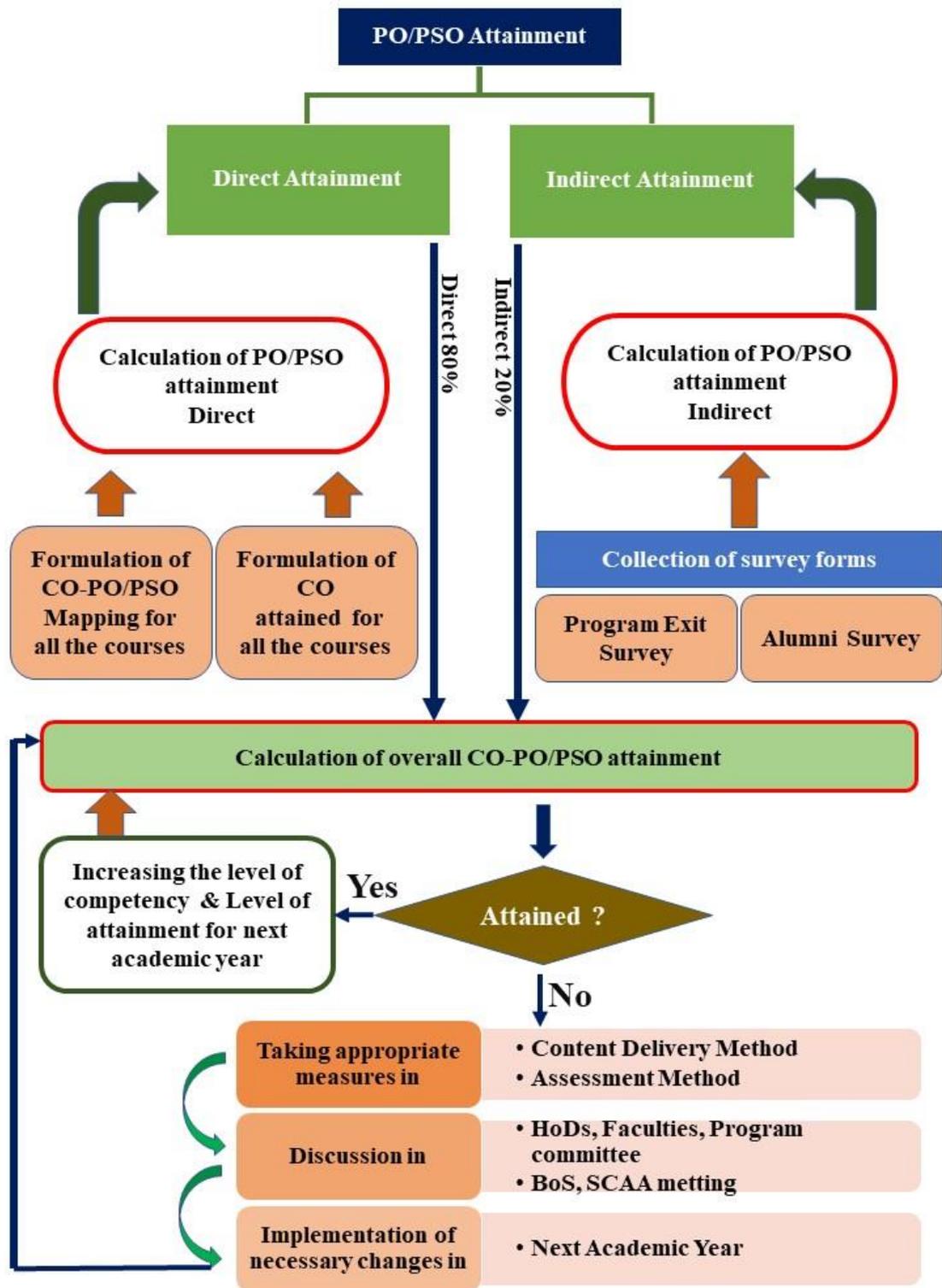


Figure 2. Process for PO/PSO Attainment

PO/PSO Assessment Tools:

Evaluation of attainment of POs and PSOs is based on direct and indirect assessment tools. Direct assessment of POs and PSOs is based on students' performance in Continuous Assessments and University Examination. Indirect assessment is based on Program Exit Survey, Alumni Survey and Course Exit Survey (Theory and Practical).

Direct Assessment:

Using Program Outcomes prescribed by NBA, the faculty member evaluates the Program Outcomes and Program Specific Outcomes through Internal Assessment Tests, Assignments / Tutorial and Group Discussion. PO will be evaluated by the CO-PO Mapping with the attainment value for each course. For each course, every faculty member decides the competency level and attainment level.

The following table 3 shows the tools and process for direct PO attainment.

PO Attainment	Tools	Process
Direct (CO Attainment)	<ul style="list-style-type: none"> • Internal Assessment Test • Assignments • Tutorials • Online Quiz • University Examination 	<ul style="list-style-type: none"> • Assignments / Tutorials / online quizzes are given periodically for the entire course to attain the specific POs. • Three Internal Assessment Tests are conducted per semester to evaluate the student performance. • University Examination is conducted once in a semester as per Anna University Schedule
	<ul style="list-style-type: none"> • Performance • Viva Voce • Record • Presentation • Group Discussion 	<ul style="list-style-type: none"> • Student Contribution in laboratory is evaluated based on the performance, Viva Voce, Presentation and Record Work. • Model Practical examination is conducted for 100 marks for a duration of 3 hours. • University Examination is conducted once in a semester as per Anna University Schedule
	<ul style="list-style-type: none"> • Project Reviews 	<ul style="list-style-type: none"> • Students are divided into batches. Each batch consists of three to four students. • Supervisors are allotted for each group. • Zeroth reviews are conducted for the students to identify the area of project. • Three reviews are conducted periodically to monitor and evaluate the progress of the project. • Viva-Voce is conducted at the end of the semester .

Table 3 Direct Assessment

Course level PO & PSO Attainment Calculation:

The PO & PSO attainment for the course is calculated using the following formula.

$$CO \text{ Attainment Ratio of Course}(x) = \frac{CO \text{ Attainment of Course}(x)}{3(\text{Maximum attainment Value})}$$

Where, $x = [1 \text{ to } N]$, $N = \text{Number of Courses}$.

$$POm \text{ Attainment of course}(x) = CO \text{ Attainment Ratio of Course}(x) \times POm \text{ Mapping Value of Course}(x)$$

Where, $m = [1 \text{ to } 12]$

$$\begin{aligned}
 &PSOm \text{ Attainment of course}(x) \\
 &= CO \text{ Attainment Ratio of Course}(x) \times PSOm \text{ Mapping Value of Course}(x) \\
 &\text{Where, } m = [1 \text{ to } M], M = \text{Number of Program Specific Outcomes.}
 \end{aligned}$$

Program level PO & PSO Direct Attainment Calculation:

The PO & PSO attainment for Program is calculated using the following formula

$$\begin{aligned}
 POm \text{ Direct Attainment} &= \frac{\sum_{i=1}^x POm \text{ Attainment of course}(i)}{x} \\
 &\text{Where, } m = \text{Program Outcomes varies from 1 to 12} \\
 &\quad x = \text{Number of Courses mapped with POM} \\
 PSOm \text{ Direct Attainment} &= \frac{\sum_{i=1}^x PSOm \text{ Attainment of course}(i)}{x} \\
 &\text{Where, } m = \text{Program Specific Outcomes varies from 1 to 4} \\
 &\quad x = \text{Number of Courses mapped with PSOM}
 \end{aligned}$$

Indirect Assessment:

The following tools are used to assess the indirect assessment of attainment of COs, POs and PSOs. The assessment tools listed in table 3.3.1.2 are used for both CO, PO – PSO attainment calculation.

S.No.	Tools used for Assessment processes	Batch 2013-17	Batch 2014-18	Batch 2015-19	Batch 2016-20
POs, PSOs Indirect Assessment Tools					
1	Program Exit Survey	-	✓	✓	✓
2	Alumni Survey	✓	✓	✓	✓
CO Attainment Indirect Assessment Tool					
3	Course Exit Survey	-	-	-	✓

Table 4 Indirect Assessment Tools

Course Exit Survey (Theory & Practical):

The course exit survey is process of collecting reviews on each course from the students at the end of each semester. It helps to improve the overall aspect of the course in future semesters. The survey covers the overall view about teaching and learning of the respective course. The survey form reveals the following attributes

- Course Content- Quality of the content provided, incorporation of Outcome Based Education
- Course Delivery- Experience about the teaching methodologies, ICT tools, NPTEL resource utilization
- Course Assessment- Methodology of evaluation, feedbacks on assignments and tutorials
- General suggestions for improvement

Program Exit Survey:

It is a process of collecting satisfaction survey on the quality of education from the perspective of graduating students upon the completion of their program. Program Exit Survey is structured with 5 likert scale questions. The survey helps in identifying

- Perception on the overall quality of teaching, learning and mentoring.
- Opinion about the support provided by the programme in projects, modern tools and softwares.
- Support provided for extra-curricular and co-curricular activities.
- Exposure to the competitive exams and personality development programmes.
- Insight on imparting skills like entrepreneurship and societal responsibility through NSS, YRC, NGO and Club’s
- Improvement on facilities.

PO & PSO Attainment Calculation of PES:

Question Level Calculation:

$$O(x) \text{ in } \% = \frac{\text{no. of Students provided more than or equal to 3 Marks in } Q(x)}{\text{no. of Students}} \times 100$$

Where, $x = [1 \text{ to } 25]$, $Q[x] = x^{\text{th}}$ Questions in Program Exit Survey

Question Level Attainment:

Program Exit Survey (PES) Question Level Attainment	3	80% of the Students provided more than or equal to 3 Marks in Survey Question
	2	70% of the Students provided more than or equal to 3 Marks in Survey Question
	1	60% of the Students provided more than or equal to 3 Marks in Survey Question

Table 5 PES Attainment level

$$POm \text{ Attainment of PES} = \frac{\sum_{i=1}^x Q(x) \text{ Attainment mapped with } POm}{x}$$

Where, $m = [1 \text{ to } M]$, $M = \text{Number of Program Outcomes}$.
 $x = \text{Number of Questions mapped with } POm$

$$PSOm \text{ Attainment of PES} = \frac{\sum_{i=1}^x PO(x) \text{ Attainment mapped with } PSOm}{x}$$

Where, $m = [1 \text{ to } M]$, $M = \text{Number of Program Specific Outcomes}$.
 $x = \text{Number of POs mapped with } PSOm$

Alumni Survey:

The alumni survey is conducted through the survey questionnaire after graduation towards the achievement of POs and PSOs. Survey form is structured with six sections with respect to,

- Personal information.
- Employment/higher studies/entrepreneurship- details.

- Technical, professional, communication and general skills at present towards RIT contribution.
- Experience at RIT in projects, extra-curricular, co-curricular activities, personality development, sports, NSS and YRC facilities.
- Suggestions for further improvement.
- Suggestions for bridging curriculum gap and other valuable inputs.

PO & PSO Attainment Calculation of AS:

Question Level Calculation:

$$O(x) \text{ in } \% = \frac{\text{no. of Students provided more than or equal to 3 Marks in } Q(x)}{\text{no. of Students}} \times 100$$

Where, $x = [1 \text{ to } 25]$, $Q[x] = x^{\text{th}}$ Questions in Alumni Survey

Question Level Attainment:

Alumni Survey (AS) Question Level Attainment	3	80% of the Students provided more than or equal to 3 Marks in Survey Question
	2	70% of the Students provided more than or equal to 3 Marks in Survey Question
	1	60% of the Students provided more than or equal to 3 Marks in Survey Question

Table 6 Alumni Survey Attainment level

$$POm \text{ Attainment of AS} = \frac{\sum_{i=1}^x Q(x) \text{ Attainment mapped with } POm}{x}$$

Where, $m = [1 \text{ to } M]$, $M = \text{Number of Program Outcomes}$.

$x = \text{Number of Questions mapped with } POm$

$$PSOm \text{ Attainment of AS} = \frac{\sum_{i=1}^x PO(x) \text{ Attainment mapped with } PSOm}{x}$$

Where, $m = [1 \text{ to } M]$, $M = \text{Number of Program Specific Outcomes}$. $x = \text{Number of POs mapped with PSOM}$

Program level PO & PSO Indirect Attainment Calculation:

$$POm \text{ Indirect Attainment} = (POm \text{ Attainment of PES} \times 0.5) + (POm \text{ Attainment of AS} \times 0.5)$$

Where $m = \text{number of Program Outcomes}$

$$PSOm \text{ Indirect Attainment} = (PSOm \text{ Attainment of PES} \times 0.5) + (PSOm \text{ Attainment of AS} \times 0.5)$$

Where $m = \text{number of Program Specific Outcomes}$

Overall PO & PSO Attainment Calculation:

The Overall PO & PSO attainment is calculated by using the following formula

Overall POM Attainment

$$= (POm \text{ Direct Attainment} \times 0.8) + (POm \text{ Indirect Attainment} \times 0.2)$$

Where $m = \text{number of Program Outcomes}$

Overall PSOM Attainment

$$= (PSOm \text{ Direct Attainment} \times 0.8) + (PSOm \text{ Indirect Attainment} \times 0.2)$$

Where $m = \text{number of Program Specific Outcomes}$

The following table 3.3.1.5. shows the tools and process for Indirect PO attainment.

PO Attainment	Tools	Process
Indirect	<ul style="list-style-type: none"> Program Exit Survey 	On completion of program, a feedback is obtained from each student about the entire program experience.
	<ul style="list-style-type: none"> Alumni Survey 	During the alumni meet, graduation day the alumni survey are collected from the graduates based on the various parameters.

Table 7 Indirect Assessment Process

— O B E —

BHARATHIAR UNIVERSITY

Coimbatore-641 046, Tamil Nadu, India

State University I "A" Grade by NAAC | Ranked 15th among Indian Universities by MoE-NIRF