Outcome Based Education
Manual

HOLY CROSS COLLEGE (AUTONOMOUS)
Accredited with 'A+' Grade (CGPA 3.35 – IV Cycle) by NAAC
Nagercoil – 629 004
Kanyakumari District, Tamilnadu.

Outcome Based Education
Manual

Complied by

Dr. J. Vinoliya Josephine Mary,
Controller of Examinations

Dr.S. Regi,
Assistant Controller of Examinations

Academic Deans
Dr. R. Gladis Latha,
Dr. V. Virgin Nithya Veena
Dr. J. Divya Merry Malar

OBE Co-Ordinators
Dr. L. Jesmalar
Dr. K. Jeya Daisy

OUTCOME BASED EDUCATION

Preamble

Holy Cross College (Autonomous) aims to follow Outcome-Based Education (OBE) as it ensures that learners acquire skills, attitudes and competencies along with knowledge which are essential for their personal growth, industry readiness and societal contributions. OBE is a transformative educational approach which highlights the mastery of defined learning outcomes as the focal point of educational activities. With clarity, coherence and relevance as its core principle, OBE commits to nurturing a learner-centered environment that empowers individuals to become critical thinkers, problem solvers and lifelong learners. In alignment with curriculum, instruction and assessment, and with articulated outcomes, OBE promotes educational equity, ensures continuous improvement, and prepares learners to thrive in diverse and dynamic global contexts. In the evolving landscape of education and the need to prepare learners for a demanding world, the institution considers it to be pertinent to sustain the high standards of both the students and the institution.

History

Outcome-Based Education (OBE) emerged as a significant educational reform movement in the latter half of the 20th century, driven by concerns over the effectiveness and relevance of traditional educational practices. The history of OBE can be traced through several key developments and influences:

1. **1960s-1970s: Competency-Based Education (CBE)**

   The roots of OBE can be seen in the Competency-Based Education (CBE) movement of the 1960s and 1970s. CBE emphasized the mastery of specific competencies or skills as the basis for progressing through educational programmes, rather than the traditional model of seat time or credit hours.

2. **1980s: Introduction of Outcomes-Based Education**

   The term “Outcome-Based Education” gained prominence in the 1980s when educators and policymakers started focusing on defining specific learning outcomes that students should achieve by the end of their education. This approach was seen as a response to concerns about educational quality and accountability.

3. **Shift to Standards-Based Education**

   During the 1990s and early 2000s, Outcome-Based Education evolved into Standards-Based Education. This shift emphasized the development and implementation of academic standards that specified what students should know and be able to do at different stages of their education.

4. **Global Adoption**

   Outcome-Based Education gained momentum worldwide as countries sought to align their educational systems with global standards and prepare students for the demands of the 21st century economy. Over time, it has continued to evolve, incorporating feedback and adapting to address the challenges and opportunities presented by changing educational landscapes, advancements in technology and evolving societal needs.

   National Board of Accreditation, India has become the permanent signatory member of the Washington Accord on 13th June 2014. It is considered a big leap forward for the higher education system in India. It facilitated an Engineering graduate from India to be employed in any one of the other countries who have signed the accord. National Assessment and Accreditation Council (NAAC) is also now following the same path and OBE is benchmarked as a standard for accreditation.

   In short, Outcome-Based Education has influenced educational practices globally and has emerged as a response to calls for greater accountability and effectiveness in education. Outcome-Based Education (OBE) focuses on what students should know, understand and be able to do at the end of a learning experience. It emphasizes on clearly defined and measurable learning outcomes. These outcomes are expressed in terms of specific knowledge, skills, attitudes and competencies that students are expected to acquire by the end of a course, programme or any such educational experience.

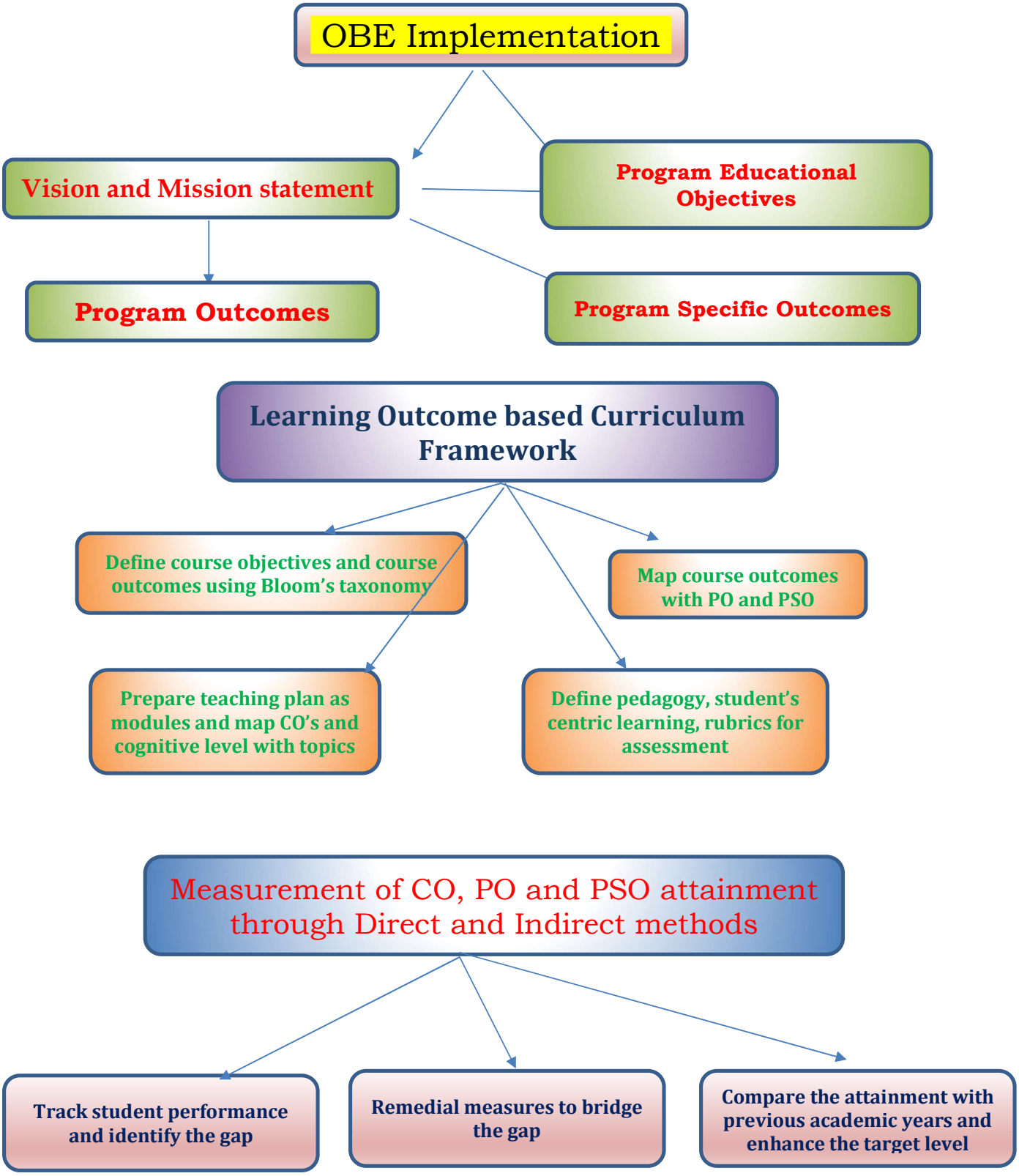
Importance of Outcome-Based Education:

1. **Clear Learning Outcomes:** OBE starts with precise defining of what students are expected to learn. These outcomes are often specified in terms of observable behaviours or performance indicators.
2. **Alignment:** Curriculum, teaching methods and assessment strategies should fall in line with the intended learning outcomes. This alignment ensures that what students are taught and how they are assessed are directly connected to the desired learning outcomes.

3. **Student-Centric Approach:** OBE emphasises the needs and abilities of students. It aims to personalize learning experiences and provide opportunities for students to progress at their own pace while ensuring that the intended outcomes are achieved.
4. **Continuous Improvement:** OBE encourages ongoing assessment and feedback to monitor student progress and improve educational practices. This may involve formative assessment strategies that help both students and educators adjust their approach as per the need.
5. **Preparation for Real-World Application:** OBE aims to prepare students not only with knowledge but also with skills and competencies that are relevant and applicable to real-world contexts. This often includes critical thinking, problem-solving, communication skills and collaboration.
6. **Quality Assurance:** OBE incorporates mechanisms to ensure the quality and rigour of education. This may involve standards, benchmarks and assessments designed to measure the achievement of learning outcomes effectively.

Overall, Outcome-Based Education shifts the focus from simply delivering content to ensuring that students achieve specific, measurable outcomes that prepare them for future success, whether in further education, careers, or as engaged citizens in society through holistic education.

OUTCOME BASED EDUCATION FRAMEWORK

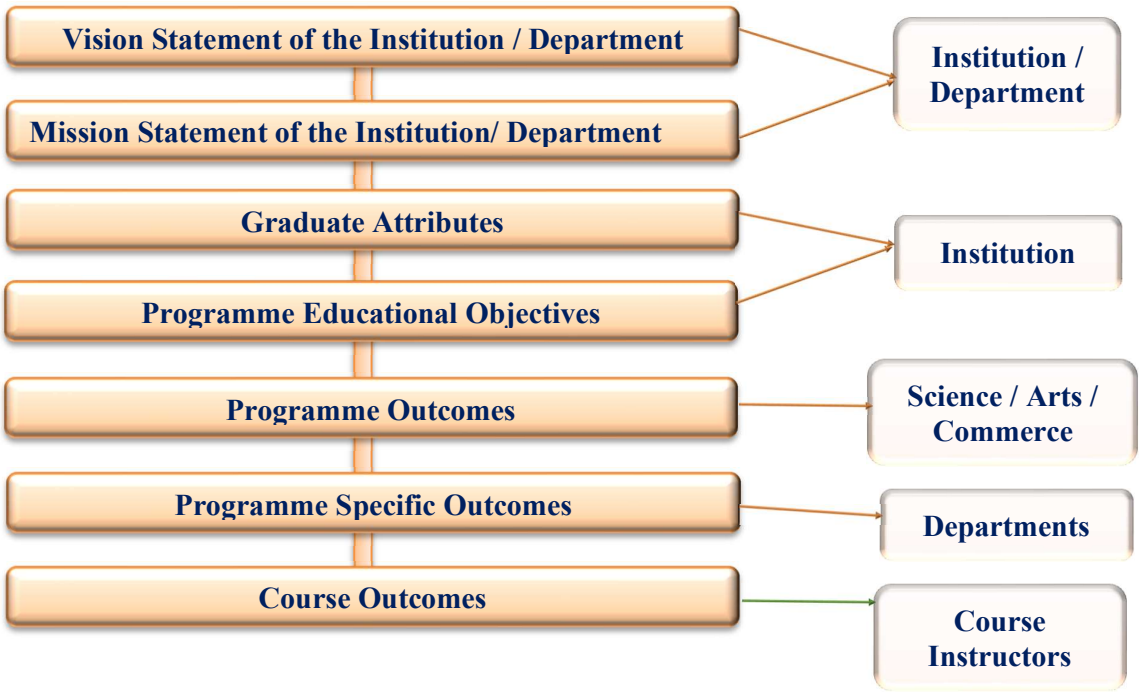


OUTCOME-BASED EDUCATION (OBE) PROCESS AND FRAMEWORK

Goal-setting leads students to strive for excellence and encourages them to achieve their academic and personal aspirations. Institutional and department-wise vision and mission are defined by the following given steps.

- Begin with multiple brainstorming sessions with experts and experienced faculty from various departments.
- Interact with industrialists and alumnae.
- Analyze the opinion and define a concrete plan of action.

Once the vision and mission are clear, the institute needs to focus on the teaching and learning processes.



Vision Statement

A vision statement describes what an institution or department aims to achieve in the long-term future. It inspires and serves as a guide for choosing current and future courses of action. The following points should be considered while writing the vision statement of an institution or department.

- Identify core values.
- Define long-term goals.
- Ensure the vision aligns with stakeholder aspirations and expectations.
- Draft a statement that is concise, inspirational, and forward-looking.
- Use clear and compelling language.
- Once the vision statement is polished, share it broadly within the institution or department.

Mission Statement

A mission statement defines the purpose of the institution or department, its primary objectives, and the approach to achieving those objectives. It serves as a guide for day-to-day operations and decision-making. Following are the steps to write the mission statement of the institution or department.

- Clearly articulate the purpose.
- Focus on the primary objectives.
- Involve stakeholders to ensure the mission statement accurately reflects the purpose and values.
- Write a draft that is clear, concise, and specific.
- Revise the statement to incorporate valuable insights and ensure clarity.
- Promote the mission statement within the institution or department.

VISION AND MISSION OF THE INSTITUTION

VISION

Imbibing the Spirit of the Holy Cross, the institution envisions a harmonious society by empowering young women for global competency and ecological sustainability through a holistic approach with innovative skills.

MISSION

1. To provide quality education and to promote scholarly activities catering to global competency.
2. To nurture participatory leadership to enhance social consciousness and social responsibility.
3. To uphold ethical values of honesty, personal accountability and transparency through professional commitment.
4. To create global professionals and entrepreneurs with innovative spirit and zeal.
5. To create empowered women of competence, commitment and compassion.
6. To instill in students the awareness of interconnectedness between human and nature.

VISION AND MISSION OF THE DEPARTMENT

The following steps are to be followed to establish Vision and Mission of the Department:

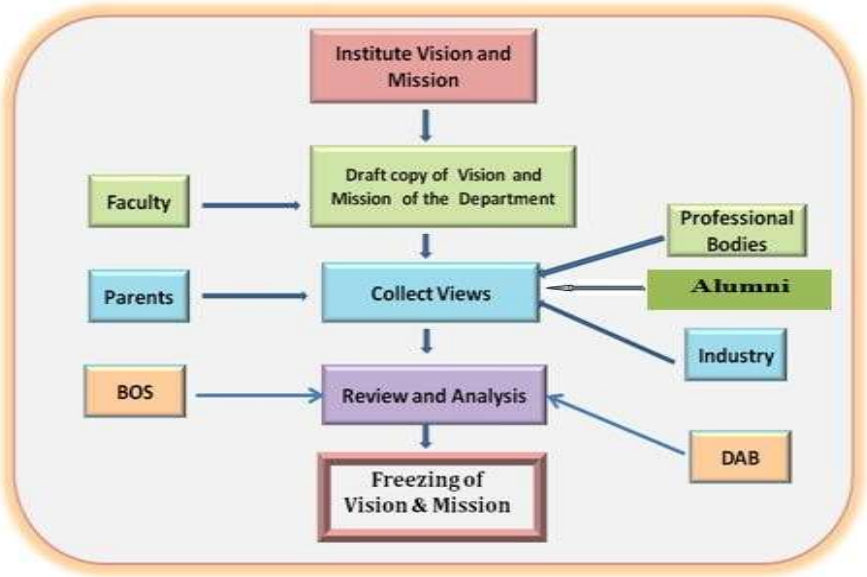
Step 1. The Vision & Mission of the Institute is taken as the basis.

Step 2: The Department conducts brain-storming sessions with the faculty on the skill-set required by the local and global employers, Industry Advances in Technology and R & D, and the draft copy of the Vision and Mission of the Department is drafted.

Step 3: The views from Parents, Professional Bodies, Industry representatives and Board of Studies (BOS) on the draft are also collected and incorporated to revise the draft version based on their inputs.

Step 4: The accepted views are analyzed and reviewed to check the consistency with the vision and mission of the institute.

Process for Defining Vision and Mission of the Department



GRADUATE ATTRIBUTES

Graduate attributes are articulated by educational institutions to ensure that their graduates are well-rounded individuals capable of contributing positively to society and their chosen professions. It refers to the disciplinary knowledge and skills, critical thinking and problem-solving, communication skills, digital literacy, teamwork and leadership, ethical and social responsibility, cultural competence and global awareness, and adaptability and lifelong learning a college aims to develop in its students by the time they complete their degree program.

Graduate attributes that a Holy Cross College student should achieve at the end of the program:

Creative thinking:

Equipping students with hands-on-training through skill-based courses and promote startup.

Personality development:

Coping with increasing pace and change of modern life through value education, awareness on human rights, gender issues and giving counselling for the needful.

Environmental consciousness and social understanding:

Reflecting upon green initiatives and understanding the responsibility to contribute to the society; promoting social and cultural diversity through student training and service-learning programmes.

Communicative competence:

Offering effective communication skills in both professional and social contexts through bridge courses and activities of clubs and committees.

Aesthetic skills:

Engaging mind, body and emotions for transformation through fine arts, meditation and exercise; enriching skills through certificate courses offered by Holy Cross Academy.

Research and knowledge enrichment:

Getting in-depth knowledge in the specific area of study through relevant core papers; ability to create new understanding through the process of critical analysis and problem solving.

Professional ethics:

Valuing honesty, fairness, respect, compassion and professional ethics among students. The students of social work adhere to the National Association of Social Workers Code of Ethics.

Student engagement in the learning process:

Obtaining extensive and varied opportunities to utilize and build upon the theoretical and empirical knowledge gained through workshops, seminars, conferences, industrial visits and summer internship programmes.

Employability:

Enhancing students in their professional life through Entrepreneur development, Placement & Career guidance Cell.

Women empowerment and leadership:

Developing the capacity of self-management, team work, leadership and decision making through gender sensitization programmes.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Programme Educational Objectives are statements that describe the expected attainment of graduates within a few years of graduation. This includes both academic and behavioural aspects that are required to excel in their career. The steps to prepare programme educational objectives are given below:

- The defined vision and mission statements should be central to the action plan.
- The rough draft of the Programme Educational Objectives should be prepared by heads and experienced faculty of various departments.
- Thorough discussions need to be had with the experts from all the departments, and a final draft is to be prepared.
- Once the final draft is ready after considering all the requirements, it is to be presented to management. Further, it is to be forwarded to the Administrative Committee.
- The Administrative Committee reviews the statements mentioned in the draft and forwards them to the Board of Studies and Academic Council for final approval.
- Once it is approved, the draft is used as a guide to design a curriculum for the students, focusing on academic and behavioural aspects.
- Institutions need to analyze the student learning outcomes periodically to identify the learning gaps and rectify them.

PROGRAMME OUTCOMES (POs)

Programme Outcomes are statements conveying the purpose of a programme. It describes the expectations from students to learn and perform at the end of their graduation. Also, it deals with the general aspect of graduation and the competencies and expertise a graduate will possess after completion of the programme. The following are the steps to establish effective program outcomes.

- The Deans of Academic Affairs consult with heads from all the departments to draft the programme outcomes.
- Programme Outcomes are separately drafted for science, arts, and commerce disciplines.
- The deans and heads interact with experienced faculty, alumnae, industrialists, and employers to identify necessary job-oriented skills, industry requirements, and trends.
- After analyzing all the views, the final draft is to be prepared and forwarded to the Administrative Committee and, further, to the Board of Studies and Academic Council for approval.
- The authorities should have a constant check over the approved programme outcomes and ensure the focus is on enhancing professional skill development, problem-solving skills, industry-specific skill development, and creative enhancement.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

Program Specific Outcomes are drafted by the department offering the programme. It is defined to ensure students are gaining skills and knowledge essential to the field. It describes the outcome of the programme and makes graduate students of a particular programme understand their professional abilities, which they can utilize for society in a better way. The steps to be followed to draft programme specific outcomes are given below.

- The heads of the departments should have brainstorming sessions with department faculty, alumnae, and industrialists and prepare a rough draft of the programme specific outcomes.
- After analyzing the views and considering the required suggestions, the heads, in consultation with the department experts, prepare the final draft.
- It is presented to the Board of Studies and then forwarded to the Academic Council for approval.
- The relevance of the programme specific outcomes to the current trend of the programme should be verified periodically by the heads of the departments.

COURSE OUTCOMES (COs)

Course Outcomes are drafted for each course by the course instructors. It identifies the specific knowledge and skills that can be gained through the course and what the students should be able to do at the successful completion of the course. The steps given below are followed to draft course outcomes.

- The heads of the departments, along with the faculty, interact and discuss with alumnae, industrialists, and employers to identify the courses that are relevant to the present and future job markets.
- Once all the courses for the entire programme are selected, it is the right time to draft the course outcomes for each course.
- Faculty who are in charge of a course are expected to prepare a rough draft and have brainstorming sessions with peer group.
- After considering all the views, prepare a final draft and send it to the heads of the departments. The same will be presented to the Board of Studies and further to the Academic Council.
- The suitability of the course outcomes should be verified by the course instructors regularly.

Guidelines for writing course outcomes

COs should contain the following features:

1. Begin with an action verb and describe something (knowledge, skill or competence) that is observable and measurable. Too many verbs in one learning outcome- will be confusing to staff and students. Ensure that you are clear what it really you want the student to be able to demonstrate and at the same time envisage how you will assess this.

2. Focus on what you expect students to be able to demonstrate on completion of the course. Do not set too many learning outcomes. It is important to identify the essential things students will know and be able to do at the end of the course. If you have too many learning outcomes this will cause problems with assessment as you will either not be able to assess all of them or you will overload the students with too much assessment. Try to ensure each course has between 4-6 learning outcomes.
3. Be capable of being assessed and addressed by the assessment strategy in the course. The main reason that learning outcomes are not capable of being assessed is because they are written too broadly and are pitched more at program level, or written using vague or passive terms such as "appreciate, understand, be familiar with". It is very difficult to assess these outcomes. Instead focus on what the student will actually be able to demonstrate.
4. Be capable of being understood by students, faculty and external agencies and stakeholders. The language used to write learning outcomes needs to be clear unambiguous and written in a way that communicates what a student will know and be able to do at the end of the course. This will ensure that all internal and external stakeholders are clear on what they can expect of students at the end of a course

Tips for Assigning the values while mapping COs to POs.

1. Select action verbs for a CO from different Bloom's levels based on the importance of the particular CO for the given course.
2. Stick on to single action verbs while composing COs but you may go for multiple action verbs if the need arises.
3. You need to justify for marking of the values in CO-PO matrix. Use a combination of words found in the COs, POs and your course syllabus for writing the justification. Restrict yourself to one or two lines.
4. Values to CO-PO (technical POs in particular) matrix can be assigned by (a) Judging the importance of the particular CO in relation to the PO s. If the CO matches strongly with a particular PO criterion then assign 3, if it matches moderately then assign 2 or if the match is low then assign 1else mark with "- "symbol. (b) If an action verb used in a CO is repeated at multiple Bloom's levels, then you need to judge which Bloom's level is the best fit for that action verb.

BLOOM'S TAXONOMY VERBS

Bloom's Taxonomy provides a framework for categorizing educational goals and objectives, which can be translated into actionable tasks through the use of specific verbs. These verbs help educators design activities, assessments and lesson plans that target various levels of cognitive processes. Here are the verbs associated with each level of Bloom's revised taxonomy. These verbs guide the creation of learning objectives and activities that align with different levels of cognitive processes, encouraging a progression from basic recall to higher-order thinking and problem-solving skills.

Action Verbs for Course Outcomes

Lower Order of Thinking (LOT)			**Higher Order of Thinking (HOT)**		
Remember	**Understand**	**Apply**	**Analyse**	**Evaluate**	**Create**
Define	Explain	Solve	Analyse	Reframe	Design
Describe	Describe	Apply	Compare	Criticize	Create
List	Interpret	Illustrate	Classify	Judge	Plan
State	Summarise	Calculate	Distinguish	Recommend	Formulate
Match	Compare	Sketch	Explain	Grade	Invent
Tabulate	Discuss	Prepare	Differentiate	Measure	Develop
Record	Estimate	Chart	Appraise	Test	Organize
Label	Express	Choose	Conclude	Evaluate	Produce
Recite	Report	Interpret	Categorize	Defend	Assemble
Repeat	Select	Modify	Contrast	Support	Construct
Reproduce	Translate	Operate	Deduce	Prioritize	Compose
Duplicate	Identify	Produce	Discriminate	Rate	Build
Draw	Visualize	Schedule	Investigate	Select	Compose

PEOs, POs and COs currently followed by the institution

Programme Educational Objectives (PEOs) ARTS and SCIENCE

PEOs	Upon completion of B.A/B.Sc. Degree programme, the graduates will be able to	Mission addressed
PEO 1	apply appropriate theory and scientific knowledge to participate in activities that support humanity and economic development nationally and globally, developing as leaders in their fields of expertise.	**M1& M2**
PEO 2	inculcate practical knowledge for developing professional empowerment and entrepreneurship and societal services.	**M2, M3, M4 & M5**
PEO 3	pursue lifelong learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards.	**M3, M4, M5 & M6**

Programme Educational Objectives (PEOs) - COMMERCE

PEOs	Upon completion of B. Com. Degree programme, the graduates will be able to	Mission Addressed
PEO 1	apply appropriate theory and knowledge to participate in activities that support humanity and economic development nationally and globally, developing as leaders in their fields of expertise.	**M1, M2 & M4**
PEO 2	acquaint with the business world by imparting knowledge, skill and attitude thereby becoming employable in the job market	**M1, M3, M4 & M5**
PEO 3	pursue lifelong learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards.	**M4, M5 & M6**

Programme Outcomes (POs) (SCIENCE)

POs	Upon completion of B.Sc. Degree Programme, the graduates will be able to:	PEOs addressed
PO 1	obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science.	PEO 1
PO 2	create innovative ideas to enhance entrepreneurial skills for economic independence.	PEO2
PO 3	reflect upon green initiatives and take responsible steps to build a sustainable environment.	PEO 2
PO 4	enhance leadership qualities, team spirit and communication skills to face challenging competitive examinations for a better developmental career.	PEO 1 & PEO 3
PO 5	communicate effectively and collaborate successfully with peers to become competent professionals.	PEO 2 & PEO 3
PO 6	absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality	PEO 2 & PEO 3
PO 7	participate in learning activities throughout life, through self-paced and self-directed learning to develop knowledge and skills.	PEO 1 & PEO 3

Programme Outcomes (POs) (ARTS)

PO	Upon completion of B.A. Degree programme, the graduates will be able to:	PEOs addressed
PO 1	obtain efficiently the knowledge and skills to face life challenges.	PEO 1
PO 2	implement the contributions of great thinkers/ writer/ activist and transform the society in accordance with local, national and global needs.	PEO 1
PO 3	enhance leadership qualities, team spirit and communication skills for a better developmental career.	PEO 2
PO 4	apply the comprehensive learning to attain self- confidence and self-reliance in their chosen career and higher education.	PEO 2
PO 5	communicate effectively and collaborate successfully with peers to become competent professionals.	PEO 2 & PEO 3
PO 6	prioritize cultural, ethical and moral values through learning experiences for a sustainable development.	PEO 2 & PEO 3
PO 7	participate in learning activities throughout life, through self-paced and self-directed learning to develop knowledge and skills.	PEO 1 & PEO 3

Programme Outcomes (POs) COMMERCE

POs	Upon completion of B.Com Degree Programme, the graduates will be able to:	Mapping with PEOs
PO 1	obtain knowledge and skills to pursue higher studies in the relevant field of Commerce.	PEO 1
PO 2	develop various managerial and accounting skills for better professional opportunities in public and private sectors.	PEO 2
PO 3	strengthens their capacities of creativity in varied areas of commerce and industry ideas to enhance entrepreneurial skills for economic independence.	PEO 1& PEO 2
PO 4	enhance leadership qualities, team spirit , communication skills and build confidence to face the challenges of the corporate world.	PEO 1 & PEO 2
PO 5	communicate effectively and collaborate successfully with peers to become competent professionals	PEO 2 & PEO 3
PO 6	absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality	PEO 1, PEO 2 & PEO 3
PO 7	participate in learning activities throughout life, through self-paced and self-directed learning to develop knowledge and skills.	PEO 3

Mapping of Vision /Mission / Programme Education objectives of the Institution

Vision	Mission	Programme Education Objectives
Imbibing the Spirit of the Holy Cross, the institution envisions a harmonious society by empowering young women for global competency and ecological sustainability through holistic approach with innovative skills.	1. To provide quality education and to promote scholarly activities catering to global competencies. 2. To nurture participatory leadership to enhance social consciousness and social responsibility. 3. To uphold ethical values of honesty, personal accountability and transparency through professional commitment. 4. To create global professionals and entrepreneurs with innovative spirit and zeal. 5. To create empowered women of competence, commitment and compassion. 6. To instill in students the awareness of inter-connectedness between human and nature	The graduates will apply appropriate theoretical knowledge to participate in activities that support humanity and economic development nationally and globally, developing as leaders in their fields of expertise. **M1 & M2** The graduates will pursue life-long learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards. **M3 & M4** The graduates will inculcate practical knowledge for developing professional empowerment and entrepreneurship and societal services. **M5 & M6**

Mapping of PEO'S and PO'S (Science /Arts)

SCIENCE

PEOs	PO1	PO 2	PO3	PO4	PO5	PO6
PEO 1	S	S	M	S	S	S
PEO 2	M	M	S	S	S	S
PEO 3	M	S	M	S	S	S

ARTS

PEOs	PO1	PO 2	PO3	PO4	PO5	PO6
PEO 1	S	S	S	S	S	S
PEO 2	S	S	M	M	S	S
PEO 3	M	M	S	S	S	S

Strong -S (3), Medium – M (2), Low – L (1)

COMMERCE

PEOs	PO1	PO 2	PO3	PO4	PO5	PO6
PEO 1	S	S	S	S	S	S
PEO 2	S	S	M	M	S	S
PEO 3	M	M	S	S	S	S

Strong -S (3), Medium – M (2), Low – L (1)

COMMUNICATION TO FACULTY AND STUDENTS

- The Vision, Mission, POs, PSOs and COs should be communicated to the faculty members and students through Printed syllabus, OBE Manual, Learning management System and College website. The vision, mission and graduate attributes should be incorporated in the Handbook.
- POs, PSOs and Semester wise COs should be displayed in the Classroom Notice Board in all the classes.
- Soft copies of syllabus with PSOs and COs should be shared with the students through google class room, Learning Management System, blogs or any other social media platform used to communicate to the students.
- A hard copy of the syllabus should be maintained in every department for ready reference.
- Orientation to first year students regarding Vision, Mission, POs and PSOs from the Student Induction Program (SIP) itself.
- Teachers who handle various courses should explain the course outcomes and relate such outcomes to POs and PSOs while introducing the course at the beginning of a semester.
- Curricular and co-curricular activities should be organized in par with the Vision, Mission, POs and PSOs.

LEARNING OUTCOME BASED CURRICULUM FRAMEWORK (LOCF)

LOCF should be designed in accordance with the vision and mission of the college that fosters not only quality education but also a holistic development and lifelong learning of students. The graduate attributes, Programme Educational Objectives (PEOs), Programme Outcomes (POs), Programme Specific Outcomes (PSOs) and Course Outcomes (COs) are defined to facilitate the direct and indirect attainment of each student.

1. Syllabus with LOCF (CBCS)

Learning Outcome-Based Curriculum Framework is a student-centric teaching and learning methodology where the course delivery and assessment are planned to achieve, stated objectives and outcomes. It focuses on measuring performance of the student i.e. outcomes at different levels. The main feature of the CBCS is to make undergraduate education student-centric allowing students to choose inter- disciplinary, intra- disciplinary, multidisciplinary, value added and skill-oriented courses (even from other disciplines according to their learning needs, interests and attitude) with optimal flexibility for students on par with global standards.

2. Outcome Based Education (OBE)

Knowledge levels for assessment of Outcomes based on Blooms Taxonomy

Programme	Assessment	Lower Order Thinking									Higher order thinking			Total number of questions
		K1			K2			K3			K4, K5, K6			
	Part	A	B	C	A	B	C	A	B	C	A	B	C	
I UG	Internal	2	2		1	1	1	1	-	2	-	-	-	10
	External	5	2	1	3	2	2	2	1	2	-	-	-	20
II UG	Internal	1	-	1	1	2		1	-	1	1	1	1	10
	External	5	1	1	4	1	1	-	3	1	1	-	2	20
III UG	Internal	1	1	-	-	1	-	1	-	1	2	1	2	10
	External	5	1	1	4	1	1	-	3	1	1	-	2	20

The levels of assessment are flexible and it should assess the cognitive levels and outcome attainment.

Weightage of K – Levels in Question Paper

S. No	Level	Parameter	Description
1	KI	Knowledge/Remembering	It is the ability to remember the previously learned
2	K2	Comprehension/Understanding	The learner explains ideas or concepts
3	K3	Application/Applying	The learner uses information in a new way
4	K4	Analysis/Analysing	The learner distinguishes among different parts
5	K5	Evaluation/Evaluating	The learner justifies a stand or decision
6	K6	Synthesis /Creating	The learner creates a new product or point of view

DOMAINS OF LEARNING

The concept of "domains of learning" refers to the categorization of different types of learning and cognitive processes. These domains were first proposed by Benjamin Bloom and his colleagues in the mid-20th century and have since been used widely in educational contexts to guide curriculum development, teaching strategies and assessment methods. Understanding and addressing all three domains can lead to a more comprehensive approach to education and learning. These domains are divided into three main categories:

1. **Cognitive Domain**: This domain involves mental skills and the acquisition of knowledge. It's often associated with intellectual capabilities and encompasses processes such as thinking, understanding, learning, and remembering. The cognitive domain is typically organized into six levels, from the simplest to the most complex:

    - **Knowledge**: Recall of facts, basic concepts and information.
    - **Comprehension**: Understanding of the meaning of the information.
    - **Application**: Using knowledge in new situations.
    - **Analysis**: Breaking information into parts to understand its structure.
    - **Synthesis**: Combining elements to form a new structure.
    - **Evaluation**: Judging the value of information or ideas.
2. **Affective Domain**: This domain involves emotions, attitudes, appreciations, and values. It focuses on the emotional component of learning and includes the way individuals deal with things emotionally, such as feelings, values, appreciation, enthusiasms, motivation and attitudes. The affective domain is structured into five levels:

    - **Receiving**: Awareness and willingness to hear.
    - **Responding**: Active participation through responses or actions.
    - **Valuing**: Recognizing the worth of something and showing commitment.
    - **Organization**: Integrating new values into one's own value system.
    - **Characterization**: Acting consistently with new values and beliefs.
3. **Psychomotor Domain**: This domain involves physical movement, coordination, and the use of motor skills. It pertains to the learning of skills that require physical activity and is often linked to hands-on learning and the development of manual or physical abilities. The psychomotor domain is often organized into levels such as:

    - **Perception**: Using sensory cues to guide physical activity.
    - **Set**: Readiness to act, including mental, physical and emotional set.
    - **Guided Response**: Early stages of learning a complex skill, including imitation and trial and error.
    - **Mechanism**: Intermediate stage of learning where movements become more habitual.

- **Complex Overt Response**: Skilful performance of complex movements.
- **Adaptation**: Skills are well-developed, and movements can be modified to fit special requirements.
- **Origination**: Creating new movement patterns to fit a particular situation or problem.

Cognitive	Affective	Psychomotor
knowledge	**attitude**	**skills**
1. Recall data	1. Receive (awareness)	1. Imitation (copy)
2. Understand	2. Respond (react)	2. Manipulation (follow instructions)
3. Apply (use)	3. Value (understand and act)	3. Develop Precision
4. Analyse (structure/elements)	4. Organise personal value system	4. Articulation (combine, integrate related skills)
5. Synthesize (create/build)	5. Internalize value system (adopt behaviour)	5. Naturalization (automate, become expert)
6. Evaluate (assess, judge in relational terms)		

Cognitive domain

The cognitive levels are part of the cognitive domain in Bloom's Taxonomy, which categorizes and orders thinking skills and objectives. Originally introduced in 1956 by Benjamin Bloom and colleagues, Bloom's Taxonomy was later revised in 2001 by a group of cognitive psychologists led by Lorin Anderson. The revised taxonomy presents six levels of cognitive skills, arranged from the simplest to the most complex. Here are the six cognitive levels along with their definitions and examples of activities at each level:

1.Remembering:

The ability to recall facts and basic concepts. Examples are reciting a poem, listing historical dates, naming parts of a plant etc. The keywords used are define, list, name, identify, recall, recognize etc.

2.Understanding:

This is the ability to explain ideas or concepts. Summarizing a story, explaining the steps of a scientific process, interpreting a graph are some common examples. Explain, describe, discuss, summarize, interpret, compare etc. are some of the key words which represent this cognitive level.

3.Applying:

The ability to use information in new situations. Using a formula to solve a problem, applying a theory to a real-life scenario, constructing a model are some common examples. Apply, use, solve, demonstrate, calculate, show are some words which represent this level.

4.Analyzing:

Ability to break information into parts to explore understandings and relationships. Some examples are analyzing the themes of a novel, examining the components of a scientific experiment, comparing different theories. The words commonly used are analyze, differentiate, compare, contrast, examine, test etc.

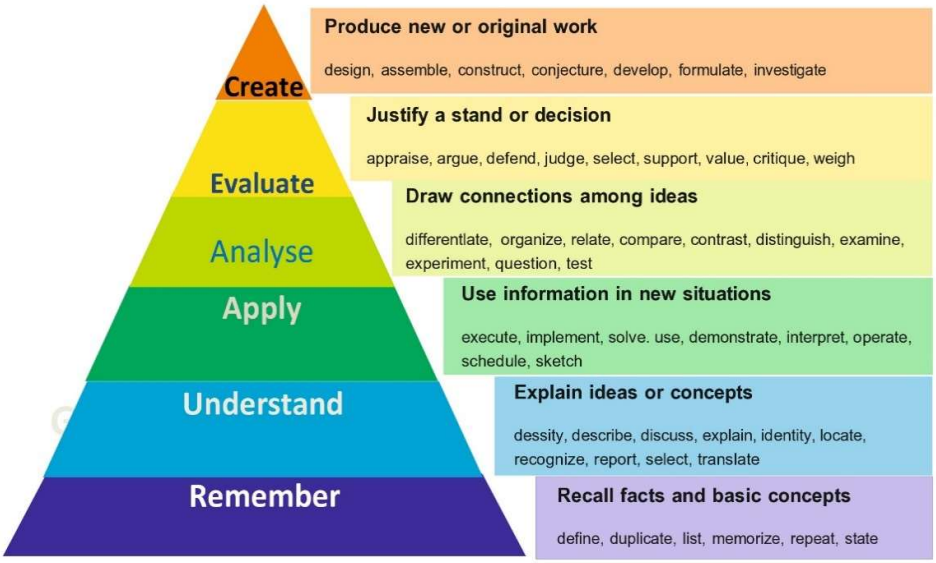
5.Evaluating:

This is nothing but the justification of a decision or course of action. Evaluating the credibility of sources, assessing the effectiveness of a solution, critiquing an art piece are some common examples. Some key words are evaluate, judge, argue, decide, critique, justify etc.

6.Creating:

Creating is the ability to produce new or original work. Designing an experiment, composing a piece of music, writing a novel are some common examples. Create, design, construct, develop, formulate, invent are some of the key words used to represent this cognitive level.

These cognitive levels provide a structured framework for educators to develop curricula, assessments and instructional strategies that progressively build students higher-order thinking skills. Each level builds upon the previous one, promoting deeper and more advanced learning through the hierarchy.


Create
Produce new or original work
design, assemble, construct, conjecture, develop, formulate, investigate
Evaluate
Justify a stand or decision
appraise, argue, defend, judge, select, support, value, critique, weigh
Analyse
Draw connections among ideas
differentlate, organize, relate, compare, contrast, distinguish, examine, experiment, question, test
Apply
Use information in new situations
execute, implement, solve. use, demonstrate, interpret, operate, schedule, sketch
Understand
Explain ideas or concepts
dessity, describe, discuss, explain, identity, locate, recognize, report, select, translate
Remember
Recall facts and basic concepts
define, duplicate, list, memorize, repeat, state

OUTCOME-BASED TEACHING AND LEARNING

Outcome-based teaching and learning (OBTL) is a curriculum design process that begins with the development of outcome statements. These statements define what learners should know or be able to do by the end of a course or program. OBTL is a framework that focuses on first identifying the intended outcomes or goals of a module or program. Then, teaching, learning, and assessment are aligned to maximize the likelihood that students achieve those outcomes. Unlike traditional education models that emphasize what HEIs provide to students, outcome-based education requires students to demonstrate their knowledge and abilities according to the specified outcomes. OBTL is a student-centered approach that starts by clearly stating the intended learning outcomes (ILOs). These outcomes detail what the learner is supposed to be able to do and at what standard, rather than focusing on what the teacher will teach.

OUTCOME-BASED ASSESSMENT

Outcome-Based Assessment (OBA) is an educational evaluation method that focuses on measuring students' achievement of specific learning outcomes. In an OBA framework, assessments are designed to determine whether students have acquired the knowledge, skills, and competencies outlined in the intended learning outcomes (ILOs). Key features of OBA are defining specific, measurable outcomes that students are expected to achieve, creating assessments that directly measure the achievement of these outcomes, focusing on what students can do and demonstrating their learning through performance-based tasks and using assessment results to improve teaching strategies and learning activities. This approach ensures that the evaluation process is directly aligned with the educational goals, providing a clear picture of students' progress and areas that need improvement. OBA aims to enhance the quality of education by ensuring that all aspects of the teaching and learning process are aligned with the desired outcomes, leading to more effective and meaningful learning experiences for students.

Direct Assessment

Direct assessment is a method that evaluates students' knowledge and skills through observable and measurable means. It constitutes 80% of the overall assessment and involves various tools to measure the Course Outcomes (CO) and Program Outcomes (PO).

CO Assessment

1. Theory Courses:
   a) Continuous Internal Assessment:
      (i) Class Test: Conducted at least twice per course to assess understanding.
      (ii) GD/Open Book Test/Article Review/Book Review: A minimum of three evaluations per course to engage students in different formats of learning.
      (iii) Online Home Assignment: One assignment per course to promote continuous learning.
      (iv) Seminar (PG): One seminar per course to develop presentation and research skills.

b) Internal Evaluation:

(i) Two internal tests per course to monitor progress.

(ii) Two quizzes per course to reinforce learning.

c) End Semester Exam: Conducted once per course to evaluate comprehensive understanding.

2. Practical Courses:

a) Internal Evaluation

(i) During Practical Days & Record: Regular assessment in every practical class.

(ii) Model Practical Exam: One practical exam per course to prepare for final assessments.

b) End Semester Exam: Conducted once per course to assess practical skills.

3. Project:

a) Internal Evaluation - Reviews: Conducted twice per program to monitor project progress.

b) End Semester Viva-Voce: One comprehensive viva-voce per program to evaluate project outcomes.

4. Internship Program/Industrial Training:

End Semester Viva: One per program to assess practical industry exposure.

5. Life Skill Training:

a) Internal Evaluation:

Album, Group Song, Mime, Skit, Case Study: One per course to develop and assess various life skills.

b) End Semester Exam: Conducted once per course to evaluate overall life skills training.

6. Community Engagement Course (UBA, RUN):

a) Internal Evaluation:

Attendance (Field Work) & Participation: One evaluation per course to assess engagement and participation.

b) External Evaluation:

Group Project Report/Case Study: One evaluation per course to assess community engagement projects.

7. Summer Training Program:

a) Internal Evaluation:

Training with Report: One evaluation per course to assess summer training effectiveness.

b) External Evaluation:

Viva Voce: One evaluation per course to assess overall training outcomes.

Indirect Assessment

Indirect assessment accounts for 20% of the overall assessment and involves gathering feedback from various stakeholders to reflect on students' learning and skills. This method primarily includes:

1. Exit Survey: Collects graduating students' reflections on their educational experience and learning outcomes.
2. Alumnae Feedback: Gathers insights from alumni to understand the long-term impact of the educational program on their careers and further studies.
3. Parents Feedback: Involves parents in providing feedback on their perceptions of students' development and learning achievements.

Indirect assessment relies on surveys and interviews, enabling stakeholders to express their opinions on graduates' knowledge and skills, providing valuable insights for continuous improvement of the educational program.

CO - PO ASSESSMENT TOOLS

The various direct and indirect assessment tools used to evaluate COs & POs and the frequency with which the assessment processes are carried out are detailed in Table.

Direct Assessment Tools Used for the Evaluation of CO and PO Assessment

<table>
<tr><td colspan="6">CO and PO ASSESSMENT TOOLS</td></tr>
<tr><td rowspan="15">Direct (80% Weightage)</td><td rowspan="15">CO Assessment</td><td>Course Type</td><td colspan="2">Assessment Tools</td><td>Minimum Frequency</td></tr>
<tr><td rowspan="7">Theory</td><td rowspan="4">Continuous Internal Assessment</td><td>Class Test</td><td>Minimum of two</td></tr>
<tr><td>GD/ Open Book test/ Article Review/ Book Review</td><td>Minimum of three</td></tr>
<tr><td>Online Home Assignment</td><td>One per course</td></tr>
<tr><td>Seminar (PG)</td><td>One per course</td></tr>
<tr><td rowspan="2">Internal Evaluation</td><td>Internal test- I & II</td><td>Two per course</td></tr>
<tr><td>Quiz I & Quiz II</td><td>Two per course</td></tr>
<tr><td colspan="2">End Semester Exam</td><td>One per course</td></tr>
<tr><td rowspan="3">Practical</td><td rowspan="2">Internal Evaluation</td><td>During Practical Days & Record</td><td>Every practical class</td></tr>
<tr><td>Model Practical Exam</td><td>One per course</td></tr>
<tr><td colspan="2">End Semester Exam</td><td>One per course</td></tr>
<tr><td rowspan="2">Project</td><td colspan="2">Internal Evaluation - Reviews</td><td>Twice per program</td></tr>
<tr><td colspan="2">End Semester Viva- Voce</td><td>One per program</td></tr>
<tr><td>Internship Program/ Industrial Training</td><td colspan="2">End Semester Viva</td><td>One per program</td></tr>
</table>

		Life Skill Training	Internal Evaluation	Album	One per course
				Group Song, Mime, Skit	One per course
				Case Study	One per course
			End Semester Exam		One per course
		Community Engagement Course (UBA, RUN)	Internal Evaluation	Attendance (Field Work) & Participation	One per course
			External Evaluation	Group Project Report/ Case Study	One per course
		Summer Training Program	Internal Evaluation	Training with report	One per course
			External Evaluation	Viva Voce	One per course

OBE ATTAINMENT: DIRECT AND INDIRECT ATTAINMENT

OBE attainment process starts from writing appropriate course outcomes (COs) for each course of the program. The COs are written by the faculty members using action verbs of different cognitive levels following Bloom taxonomy. A correlation is established between COs and POs in the scale of 1 to 3, 1 being the slight (Low), 2 being moderate (Medium) and 3 being high (Strong).

A mapping matrix is prepared for every course in the program. The course outcomes and their mapping with POs are reviewed by faculty members before they are finalized in the Board of studies.

The process of calculating attainment is depicted with a sample.

Department of Chemistry

Vision

Impart quality education, scientific skills, academic excellence, research attitude and skills to face global challenges.

Mission

- To develop intellectual and professional skills of the students
- To provide a firm foundation in chemical concepts, laws and theories
- To sharpen the scientific knowledge
- To enhance critical thinking, problem solving ability, scientific temper and innovation
- To apply chemistry in medicine, biology, industry and environment

Programme Educational Objectives (PEOs)

PEOs	Upon completion of B.A/B.Sc. Degree Programme, the graduates will be able to	Mapping with Mission
PEO 1	apply appropriate theory and scientific knowledge to participate in activities that support humanity and economic development nationally and globally, developing as leaders in their fields of expertise.	M1& M2
PEO 2	use practical knowledge for developing professional empowerment and entrepreneurship and societal services.	M2, M3, M4 & M5
PEO 3	pursue lifelong learning and continuous improvement of the knowledge and skills with the highest professional and ethical standards.	M3, M4, M5 & M6

Programme Outcomes (POs)

POs	Upon completion of B.Sc. Degree Programme, the graduates will be able to:	Mapping with PEOs
PO1	obtain comprehensive knowledge and skills to pursue higher studies in the relevant field of science.	PEO1
PO2	create innovative ideas to enhance entrepreneurial skills for economic independence.	PEO2
PO3	reflect upon green initiatives and take responsible steps to build a sustainable environment.	PEO2
PO4	enhance leadership qualities, team spirit and communication skills to face challenging competitive examinations for a better developmental career.	PEO1 & PEO3
PO5	communicate effectively and collaborate successfully with peers to become competent professionals.	PEO2 & PEO3
PO6	absorb ethical, moral and social values in personal and social life leading to highly cultured and civilized personality	PEO2 & PEO3
PO7	participate in learning activities throughout life, through self-paced and self-directed learning to improve knowledge and skills.	PEO1 & PEO3

Programme Specific Outcomes (PSOs)

PSOs	Upon completion of B.Sc Chemistry programme, the graduates will be able to:	Mapping with POs
PSO - 1	understand the fundamentals, theories and principles of organic, inorganic and physical chemistry.	PO1
PSO - 2	analyze physical and chemical properties of chemical compounds and their uses.	PO1& PO7
PSO - 3	interpret the mechanism of various chemical reactions.	PO3 &PO4
PSO - 4	synthesize organic and inorganic compounds using classical and modern methods.	PO2
PSO - 5	design and carry out scientific experiments, record and interpret the results with accuracy	PO1& PO4

PSO - 6	use concepts, tools and techniques related to chemistry to other branches of science.	PO5
PSO - 7	develop skills in the safe-handling of chemicals and their usage in day today life.	PO1&PO7
PSO - 8	develop entrepreneurial skills, empowered to fulfil the professional requirement and become self-dependent.	PO2& PO6

Mapping of PO'S and PSO'S

POs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	**PSO7**	**PSO8**
PO1	S	S	S	S	S	S	S	S
PO2	S	S	M	M	S	S	M	S
PO3	M	M	M	S	S	S	S	S
PO4	S	S	S	M	M	S	M	M
PO5	S	M	M	M	S	S	S	S
PO6	M	M	M	M	S	S	S	S
PO7	S	S	S	S	S	S	S	S

SEMESTER – I

CORE COURSE – I : GENERAL CHEMISTRY - I

Course Outcomes

On the successful completion of the course, student will be able to:		
CO 1	remember the atomic structure, periodic properties, bonding, electronic configuration and properties of compounds.	**K1**
CO 2	understand and classify the elements in the periodic table, types of bonds, reaction intermediates, electronic effects in organic compounds and types of reagents.	**K2**
CO 3	apply the theories to calculate energy of spectral transition, electronegativity, percentage ionic character and bond order.	**K3**
CO 4	analyse the relationship existing between electronic configuration, bonding, geometry of molecules, structure reactivityand electronic effects	**K4**
CO 5	evaluate the trends in periodic properties, assess the properties of elements, and explain hybridization in molecules, nature of H – bonding and organic reaction mechanisms.	**K5**

K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate

MAPPING WITH PROGRAMME OUTCOMESAND PROGRAMME SPECIFIC OUTCOMES

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**	**PSO 5**	**PSO 6**	**PSO 7**	**PSO 8**
CO1	3	2	3	3	2	2	3	3	2	2	2	2	3	3	2
CO2	3	2	3	3	2	2	3	3	3	2	2	2	3	3	2
CO3	3	2	2	3	2	2	3	3	3	3	2	3	3	2	2
CO4	3	2	2	3	2	2	3	3	3	3	2	2	3	2	2
CO5	3	2	2	3	2	2	3	3	3	3	2	2	3	2	2
TOTAL	15	10	12	15	10	10	15	15	14	13	10	11	15	12	10
AVERAGE	3	2	2.4	3	2	2	3	3	2.8	2.6	2	2.2	3	2.4	2

3 – Strong, 2- Medium, 1- Low

EVALUATION OF ATTAINMENT OF OUTCOMES

COs attainment: Attainment of course outcomes for each course is calculated through different components included in Continuous Internal Assessments and End semester examination.

Bench marks and Criteria for the attainment of COs:

To meet the expected level of attainment a student must score more than 50% of the marks to assess the attainment of COs. The threshold limit can be fixed based on the level of students.
Attainment level 1: If at least 60% of the students met the expected level of attainment.
Attainment level 2: If at least 70% of the students met the expected level of attainment.
Attainment level 3: If at least 80% of the students met the expected level of attainment.

Attainment process:

Step 1: The faculty should fix a question paper pattern (blue print) of the type of questions that would be asked, the different cognitive levels it would address and the course outcome that the student would attain. The pattern and question paper prepared by respective faculty should be verified by the HoDs. A sample format is given below:

B.Sc. (Name of the program)
Semester (Mention the semester)
Major Core xxx – (Mention the course)
Course Code: xxxx
Assessment summary for End Semester Examination

Course Outcome	**Cognitive Level**	**End Semester examination of questions and marks Based on K level and CO**
CO 1	Remember	3 (3)
CO 2	Understand	8 (41)
CO 3	Apply	3 (3)
CO 4	Analyse	5 (15)
CO 5	Evaluate	1 (8)
Total		20 (70)

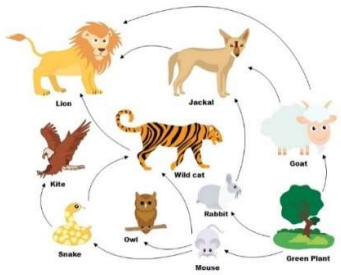
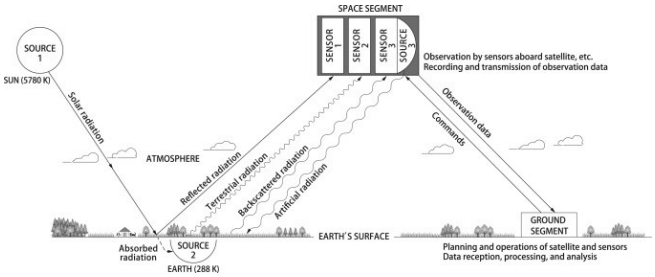
QUESTION PAPER – Blue print

PART	Q.No.	COGNITIVE LEVEL (CL) with No. of question and Marks						**Total marks**
		K1 – R	K2 – U	K3 – AP	K4- AN	K5 – E	K6 - C	
Part A 10 x 1 = 10 marks	1.	1 (1)						**1**
	2.			1 (1)				**1**
	3.	1 (1)						**1**
	4.				1 (1)			**1**
	5.				1 (1)			**1**
	6.	1 (1)						**1**
	7.			1 (1)				**1**
	8.				1 (1)			**1**
	9.		1 (1)					**1**
	10.			1 (1)				**1**
Part B 5 x 4 = 20 marks	11.a		1 (4)					**4**
	11.b							
	12.a		1 (4)					**4**
	12.b							
	13.a		1 (4)					**4**
	13.b							
	14.a				1 (4)			**4**
	14.b							
	15.a		1 (4)					**4**
	15.b							
Part C 5 x 8 = 40 marks	16.a		1 (8)					**8**
	16.b							
	17.a		1 (8)					**8**
	17.b							
	18.a				1 (8)			**8**
	18.b							
	19.a					1 (8)		**8**
	19.b							
	20.a		1 (8)					**8**
	20.b							
No. of CL based Questions with marks		3 (3)	8 (41)	3 (3)	5 (15)	1 (8)		**70**
No. of CO based Questions with marks		CO 1 3 (3)	CO 2 8 (41)	CO 3 3 (3)	CO 4 5 (15)	CO 5 1 (8)		**70**
Total		**3**	**41**	**3**	**15**	**8**		**70**

The question paper is prepared based on the above blue print.

Sample question paper format:

HOLY CROSS COLLEGE (AUTONOMOUS) **Accredited with 'A+' Grade (CGPA 3.35 - IV Cycle) by NAAC** **Nagercoil – 629 004** **Kanyakumari District, Tamilnadu.**			
B.Sc. Zoology			
Semester V			
Major Core VII - Ecology and Toxicology			
Course Code: ZC2053			
Question Paper			
Time: 3 hrs.			**Max. marks: 70**
Q. No.	Questions	K Level	Course Outcome Level
Part A (10 x 1 = 10 marks)			
	Answer all the questions		
1.	Study of the relationship of a group of organisms which are associated together as a unit in relation to its environment is --------- a. Autoecology b. Synecology c. Terrestrial ecology d. Population	**R**	**CO-1**
2.	The morphological changes that occur in daphnia as a result of change in temperature is called ---------- a. Cyclomorphosis b. Regeneration c) Rensch's rule d) Menkin's rule	**Ap**	**CO-3**
3.	The ratio between birth rate and death rate is ---------- a) Mortality b) Natality c) Vital index d) Growth rate	**R**	**CO-1**

4.	Identify the diagram.  	**An**	**CO-4**
5.	Match the following and choose the correct answer 1. Effect of an abrupt transition between two communities 2. Region of transition between two communities. 3. A position occupied by a species in a community 4. A distinct species occupying a particular habitat. **A B C D** a) 1 2 3 4 b) 4 3 2 1 c) 2 1 4 3 d) 3 2 4 1	**R**	**CO-1**
6.	What does this image indicate? Give a one-word answer.  	**An**	**CO-3**
7.	Match the following and choose the correct answer. A. Systemic effect — 1. Site of contact B. Immediate effect — 2. Permanent C. Irreversible effect — 3. 24 hrs. D. Local effect — 4. Body system **A B C D** a) 1 3 2 4 b) 4 3 2 1 c) 2 3 4 1 d) 3 2 4 1	**Ap**	**CO-3**

8.	**Assertion(A):** Knock knee syndrome is caused by fluoride. **Reason(B):** Soil, water and air contain fluorine as fluoride. a. Statement 'A' and Statement 'B' are correct. b. Statement 'A 'and 'B' are wrong. c. Statement 'A' is correct and Statement 'B' wrong. d. Statement 'A' is wrong and Statement 'B' correct.	**An**	**CO-4**
9.	What is the cause of red tide? a) Algal bloom b) Aflatoxin c) Acid rain. d) Eutrophication	**U**	**CO-2**
10.	The G20 environment meeting was held on 28th July 2023 in Chennai. What was the main area discussed? Answer in one sentence.	**Ap**	**CO-4**
Part B (5 x 4 = 20 marks)			
11.	a. Discuss the different branches of ecology. (OR) b. Explain mutualism and commensalism as an interspecific relationship.	**U**	**CO-2**
12.	a. Explain population growth and regulation. (OR) b. Explain nitrogen cycle and its role in the environment.	**U**	**CO-2**
13.	a. Explain the structure of a community. (OR) b. Enumerate the types of animal distribution.	**U**	**CO-2**
14.	a. Differentiate toxicokinetics and toxicodynamics. (OR) b. Distinguish between; i. LC_{50} and LD_{50} ii. *in vivo* and *ex vivo* toxic experiments	**An**	**CO-4**
15.	a. Explain Bhopal episode and Chernobyl disaster. (OR) Compare bioaccumulation, biomagnification and biotransformation.	**U**	**CO-2**

Part C (5 x 8 = 40 marks)			
16.	a. Discuss the biological effects of temperature. (OR) b. Summarize the adaptations of desert living animals.	**U**	**CO-2**
17.	a. Explain the structure of an ecosystem. (OR) b. Discuss population growth and regulation.	**U**	**CO-2**
18.	a. Analyse the concept of climax and pattern of succession. (OR) Appraise the applications of remote sensing in agriculture, food and fisheries management.	**An**	**CO-4**
19.	Assess the toxic effects of heavy metals and radiations to living organisms. (OR) Evaluate the effect of toxicants on hematological and biochemical parameters of fish.	**E**	**CO-5**
20.	a. Explain the types of pollutants and its effect on the environment. (OR) b. Explain the different methods of Waste water treatment.	**U**	**CO-2**

Step 2: Considering the percentage of marks (related to each COs) asked in Internal test and end semester examination, the average weightage percent of each CO was calculated as an average of internal test/external exams for further calculation of direct attainment.

EXAMINATION – Sample

EXTERNAL																			
			CO 1 (6)				CO 2 (29)				CO 3 (22)				CO 4 (13)				70
S. NO	Register Number	Name of the student	Part - A	Part-B	Part-C	CO 1 Total	Part-A	Part-B	Part-C	CO 2 Total	Part - A	Part-B	Part-C	CO 3 Total	Part-A	Part - B	Part-C	CO 4 Total	Grand Total
1	2021AUZ092	VINNARASIA	2	4	-	**6**	1	8	13	**22**	2	3	14	**19**	2	-	0	**2**	**49**
2	2021AUZ133	AADHARSHA G K	0	4	-	**4**	1	8	14	**23**	2	2	14	**18**	1	-	4	**5**	**50**
3	2021AUZ134	ABI ESTHER R	2	4	-	**6**	0	9	14	**23**	2	4	13	**19**	4	-	7	**11**	**59**
4	2021AUZ135	ABINAYA SREE S	2	4	-	**6**	1	6	14	**21**	2	3	11	**16**	4	-	2	**6**	**49**
5	2021AUZ136	ABISHA I	2	4	-	**6**	1	4	11	**16**	2	2	12	**16**	4	-	2	**6**	**44**
6	2021AUZ138	ANTOMONISHA S	2	4	-	**6**	1	5	13	**19**	2	3	14	**17**	4	-	6	**10**	**54**
7	2021AUZ139	ANUFLOWERCYA	2	4	-	**6**	1	7	14	**22**	1	4	14	**19**	4	-	7	**11**	**58**
8	2021AUZ140	ANUSHA K	0	0	-	**0**	0	2	0	**2**	0	0	3	**3**	1	-	0	**1**	**7**
9	2021AUZ141	DEENU F	2	2	-	**4**	1	6	13	**20**	2	2	10	**14**	3	-	1	**4**	**42**
10	2021AUZ142	DHARSHININ	2	4	-	**6**	0	10	15	**25**	0	4	16	**20**	2	-	4	**6**	**58**
11	2021AUZ144	KARUNYAR	1	4	-	**5**	1	7	15	**23**	2	0	7	**9**	3	-	8	**11**	**40**
12	2021AUZ145	KENISH MITHIYAL J	1	3	-	**4**	1	7	11	**19**	0	2	12	**14**	1	-	4	**5**	**42**
13	2021AUZ146	MATHIJAM	1	4	-	**5**	1	11	8	**20**	2	0	11	**13**	2	-	4	**6**	**48**
14	2021AUZ147	NISOLIN RAJEEI	2	4	-	**6**	0	9	15	**24**	2	4	14	**20**	3	-	8	**11**	**61**
15	2021AUZ150	REMITHASNI S	2	3	-	**5**	0	5	6	**11**	2	3	6	**11**	3	-	2	**5**	**32**
16	2021AUZ151	SARANYAK	2	4	-	**6**	1	12	15	**28**	2	4	15	**21**	4	-	7	**11**	**66**
17	2021AUZ152	SELVA	2	4	-	**6**	0	12	15	**27**	1	3	15	**19**	4	-	0	**4**	**56**

		LEKSHMI S																	
18	2021AUZ153	SHAFNA SHERIN M	2	3	-	**5**	1	6	5	**12**	2	2	10	**14**	4	-	2	**6**	**37**
19	2021AUZ154	UBASANA J	2	4	-	**6**	0	12	15	**27**	2	4	14	**20**	4	-	6	**10**	**63**
20	2021AUZ155	VARSHINI J	2	4	-	**6**	1	5	14	**20**	1	3	15	**19**	3	-	2	**5**	**50**
21	2021AUZ407	AKISHA MOL S	1	2	-	**3**	1	10	8	**19**	2	4	6	**12**	3	-	0	**3**	**37**
22	2021AUZ408	SOWMIYA T	2	2	-	**4**	1	7	13	**21**	2	3	10	**15**	3	-	7	**10**	**47**
23	2021AUZ443	ABISHA R	2	3	-	**5**	1	3	14	**18**	2	4	11	**17**	3	-	3	**6**	**46**
24	2021AUZ449	BERCLIN S	2	4	-	**6**	1	12	13	**26**	2	4	14	**20**	4	-	8	**12**	**64**
25	2021AUZ450	PRADISHA S	2	3	-	**5**	1	4	14	**19**	2	4	16	**22**	3	-	0	**3**	**49**
26	2021AUZ451	SAHAYA MINI A	2	4	-	**6**	1	8	14	**23**	2	4	13	**19**	3	-	2	**5**	**53**
Percentage of students scoring more than the target						**96**				**89**				**92**				**54**	**92**
Level						**3**				**3**				**3**				**2**	**3**

Measuring Course Outcomes attained through External Examinations: Target

Attainment level 1: 50% students scoring 50% and more marks
Attainment level 2: 60% students scoring 50% and more marks
Attainment level 3: 70% students scoring 50% and more marks

Measuring Course Outcomes attained through Internal Tests:

Attainment level 1: 50% students scoring 50% and more marks
Attainment level 2: 60% students scoring 50% and more marks
Attainment level 3: 70% students scoring 50% and more marks

DIRECT CO ATTAINMENT -INTERNAL AND EXTERNAL -sample

CO	Assessment through continuous internal assessment test (Average) %	Assessment through End Semester Examination %
CO1	50	96
CO2	92	89
CO3	75	92
CO4	73.5	54

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

$$\text{CO x in \%} = \frac{\text{Marks obtained by the students in COx}}{\text{Maximum marks allotted in COx}} \text{X100}$$

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

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

$$\text{CO x Attainment in \%} = \frac{\text{No.of Students scored more than or equal to 50\% of Marks in COx}}{\text{No of Students}} X100$$

Where, x= [1 to N], N= Number of Course Outcome

Course Outcome	Assessment Tool	Percentage of students scoring more than the target	Attainment level	Attainment of Course Outcome
CO1	Internal Test (40%)	50	1	(0.4x1) + (0.6x3) = 2.2
	End Semester Examination (60%)	96	3	
CO2	Internal Test (40%)	92	3	(0.4x3) + (0.6x3) = 3
	End Semester Examination (60%)	89	3	
CO3	Internal Test (40%)	75	3	(0.4x3) + (0.6x3) = 3

	End Semester Examination (60%)	92	3	
CO4	Internal Test (40%)	74	3	(0.4x3) + (0.6x1) = 1.8
	End Semester Examination (60%)	54	1	

Formula : Direct Attainment = 0.4 x Internal Test Average +0.6 x End Semester Examination average

CO ATTAINMENT LEVEL

Attainment level 1: 50% students scoring 50% and more marks
Attainment level 2: 60% students scoring 50% and more marks
Attainment level 3: 70% students scoring 50% and more marks

Indirect attainment

Course exit survey (Sample)

Course exit survey can be conducted on the defined COs or related to course outcomes of that course.

Questionnaire for students on Course Exit Survey

Program :
Semester :
Course title :
Course code :
Name :
Register Number :

CO	I am able to	Strongly agree 100	Agree 75	Neutral 50	Disagree 25	Strongly disagree 0
CO - 1	define abiotic, biotic and limiting factors, community structure, ecological succession, wild life conservation and toxicants.					
CO - 2	comprehend the physical and chemical properties of environment, biological effects, biogeochemical cycles, wild life conservation, environmental pollution and toxicology.					
CO - 3	identify the biotic factors, characteristics of communities, endangered species and causes for environmental problems.					
CO - 4	assess the structure and function of ecosystem, community, habitat for sustainable management of environmental system and for the remediation.					
CO - 5	evaluate the impact of environment changes on the biosphere.					

Indirect Method of CO Assessment: (Survey Based) - Weightage: (20%)

Course Outcomes	Number of Student response Rating					Total response	Attainment %	Attainment grade
	100	75	50	25	0			
CO1	15	10	3	-	-	28	15x100+10x75+3x50/28=86	86/100x3=2.57
CO2								
CO3								
CO4								
CO5								

100- Strongly agree, 75-Agree , 50 – Neutral, 25- Disagree, 0 -Strongly disagree

CO ATTAINMENT TEMPLATE

Course Outcomes	Direct Attainment	Indirect attainment
CO1	2.2	2.57
CO2		
CO3		
CO4		
CO5		

CO ATTAINMENT AND ATTAINMENT GAP TEMPLATE

CO	Target	Direct attainment	Indirect attainment	Total CO attainment	Gap (Target-Total)
CO - 1	2	2.2	2.57	2.27	+0.27
CO - 2					
CO - 3					
CO - 4					
CO - 5					

Target to be fixed by the course in-charge

Formula : Total CO attainment = (0.80xdirect) + (0.20x indirect)

POs AND PSOs ATTAINMENT

Step 1: The course outcomes for all courses were mapped with defined POs and PSOs with correlation levels -, 1, 2, and 3. The correlation levels were defined as: No correlation – Correlation level "-", Low - Correlation level 1 Moderate - Correlation level 2 , High - Correlation level 3. Attainment of each COs for all courses was calculated as described above.

Step 2: Attainment values of respective COs were mapped against their correlated POs and PSOs. Average values for each PO/PSO were considered as final attainment for the respective course. Similarly, attainment values of COs with each correlated POs and PSOs have been calculated for all courses.

Mapping with Programme Outcomes: sample

Course outcome attainment COs (A)		B									
		PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4
CO1	2.2	3	1	3	2	2	1	3	3	3	3
CO 2	3	3	3	3	2	3	2	3	3	2	2
CO 3	3	3	2	3	2	2	2	2	3	3	1
CO 4	1.8	3	2	3	2	3	2	3	3	3	3
CO 5	0.8	3	2	3	2	3	3	3	3	3	3
Total	10.8	15	10	15	10	13	10	14	15	14	12
Average	1.8	3	2	3	2	2.6	2	2.8	3	2.8	2.6

CO-PO attainment

Calculation of PO1 = (Column A x Column B) / Sum (Column B) = 2.16
Calculation of PO2 = (Column A x Column B) / Sum (Column B) = 2.24
Calculation of PO3 = (Column A x Column B) / Sum (Column B) = 2.16
Calculation of PO4 = (Column A x Column B) / Sum (Column B) = 2.16
Calculation of PO5 = (Column A x Column B) / Sum (Column B) = 2.09
Calculation of PO6 = (Column A x Column B) / Sum (Column B) = 2.08

CO-PSO attainment

Calculation of PSO1 = (Column A x Column B) / Sum (Column B) = 2.1
Calculation of PSO2 = (Column A x Column B) / Sum (Column B) = 2.16
Calculation of PSO3 = (Column A x Column B) / Sum (Column B) = 1.96
Calculation of PSO4 = (Column A x Column B) / Sum (Column B) = 1.95

Indirect assessment was based on various surveys for POs and PSOs attainments like Graduate Exit Survey, Alumni Survey, and parent's feedback and taking their average.

Indirect attainment

Graduate exit survey

Kindly rate the following criteria on a scale of 1-5.

S.No	Questions	PO	Criteria Rating				
			Excellent	Very Good	Good	Average	Poor
1	How will you rate your ability to utilize scientific knowledge to pursue higher studies in the relevant field ?	1					
2	What is the level of competency you have developed to create innovative ideas and enhance entrepreneurial skills for economic independence?	4					
3	How far the skills that you have learnt were helpful to face challenging competitive examinations that offer rewarding careers?	2					
4	Leadership qualities gained because of the initiatives taken by the college and the respective departments to reflect upon green initiatives and take responsible steps to build a sustainable environment.	3					
5	Capability to handle ethical issues with social responsibility	5					
6	Confidence to communicate effectively and collaborate successfully with peers to become competent professionals.	6					

5. Excellent 4. Very Good 3. Good 2. Average 1. Poor

Alumni Survey Form

Kindly rate the following criteria on a scale of 1-5.

5.Excellent 4. Very Good 3. Good 2.Average 1.Poor (Criteria Rating)

Overall Rating for attainment of your PEOs & POs.

1. The curriculum has supported the higher education/ employability/ entrepreneurship need.
2. Benefit from value added and certificate courses seminars /conferences /workshops and internship conducted during your course.
3. Communication and presentation skills and leadership qualities obtained from the co-curricular and extracurricular activities has enriched the career.
4. Competence to function as a team and to show professional efficiency in your job.
5. Extent of Ethical, social and environmental values inculcated, helping you to relate issues with societal needs.

Step 3: Final Attainment of POs and PSOs:

- **Direct attainment**: Obtained by taking averages of all CO-PO and CO-PSO attainment matrices defined for all courses for all semesters.
- **Indirect attainment**: Obtained from attainment values of POs and PSOs of surveys including

Graduate exit, Alumni, and Parents feedback. Final attainments were calculated by considering 80% of direct assessment & 20% of the indirect assessment.

PROGRAM LEVEL PO & PSO DIRECT ATTAINMENT:

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

$$\text{POm Direct Attainment} = \frac{\sum_{i=1}^{x} POm\ \ Attainment\ \ of\ \ course(i)}{x}$$

Where, m = Program Outcomes varies from 1 to 12
X =Number of Courses mapped with POm

$$\text{PSOm Direct Attainment} = \frac{\sum_{i=1}^{x} PSOm\ \ Attainment\ \ of\ \ course(i)}{x}$$

Where, m = Program Specific Outcomes varies from 1 to 4
X = Number of Courses mapped with PSOm

PO- DIRECT AND INDIRECT ATTAINMENT –Template

PO	Direct attainment (Based on CO-PO attainment)	Indirect attainment (Based on exit survey)	Total PO attainment
PO - 1			
PO - 2			
PO - 3			
PO - 4			
PO - 5			

Total PO attainment: (0.80 x direct) + (0.20 x indirect)

ACTION TAKEN

Levels of achievement are set by the OBE committee in discussion with the experts based on last three year's results. These levels will be reviewed and will be updated each year by incorporating the previous year's result.

OBE attainment results will be analyzed department wise and necessary actions will be taken to improve the level of attainment if it is low or no attainment. In addition, each department will pursue initiatives to improve the quality of teaching and syllabus to increase the target value.

CONCLUSION

Student progress mapping helps teachers identify the academic strength and weakness and assess the outcome attainment of each student. OBE attainment is reviewed department wise and remedial measures are taken when the attainment value is less than the target value in terms of curriculum, teaching, learning and evaluation. Overall, this assessment process enables the college to identify areas for improvement, address curricular gaps, and bridge the same to enhance the overall quality of education provided to the students.