RUBRICS DEVELOPED TO VALIDATE THE PO's

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1.BLOOMS TAXONOMY

Bloom's taxonomy is considered as the global language for education. Bloom's Taxonomy is frequently used by teachers in writing the course outcomes as it provides a readymade structure and list of action verbs.

The stages ascend in complexity and what they demand of students. First students need to simply remember information provided to them — but reciting something doesn't demonstrate having learned it, only memorization. With understanding comes the ability to explain the ideas and concepts to others. The students are then challenged to apply the information and use it in new ways, helping to gain a deeper understanding of previously covered material and demonstrating it moving forward.

Questioning information is a vital part of learning, and both analysis and evaluation do just this. Analyzing asks a student to examine the information in a new way, and evaluation demands the student appraise the material in a way that lets them defend or argue against it as they determine. The final step in the revised taxonomy is creating, which entails a developing new product or point of view. How does this learned information impact your world? How can it be used to impact not just your education but the way you interact with your surroundings?

By utilizing Bloom's Taxonomy, students are not going to forget the information as soon as the class ends — rather, they retain and apply the information as they continue to grow as a student and in their careers, staying one step ahead of the competition.

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

2.OUTCOME BASED EDUCATION (OBE)?

Institutions adopting OBE try to bring changes to the curriculum by dynamically adapting to the requirements of the different stakeholders like Students, Parents, Industry Personnel and Recruiters. OBE is all about feedback and outcomes.

Three levels of outcomes from OBE are:

1.Program Educational Objectives (PEOs)
2.Program Outcomes (POs)
3.Course Outcomes (COs)

Why OBE?

1.International recognition and global employment opportunities.
2.More employable and innovative graduates with professional and soft skills, social responsibility and ethics.
3.Better visibility and reputation of the technical institution among stakeholders.
4.Improving the commitment and involvement of all the stakeholders.
5.Enabling graduates to excel in their profession and accomplish greater heights in their careers.
6.Preparing graduates for the leadership positions and challenging them and making them aware of the opportunities in the technology development.

Benefits of OBE for Faculty Members

1.Faculty members are referred to as Change of Agents in OBE.
2.Teaching will become a far more creative and innovative career.
3.Faculty members will no longer feel the pressure of having to be the ―source of all knowledge.
4.Faculty members shape the thinking and vision of students towards a course.

3.PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Program Educational Objectives (PEOs) should be defined by the Head of the Department in consultation with the faculty members. PEOs are a promise by the department to the aspiring students about what they will achieve once they join the programme. PEO assessment is not made compulsory by NBA as it is quite difficult to measure in Indian context. NBA assessors usually do not ask for PEO assessment. PEOs are about professional and career accomplishment after 4 to 5 years of graduation. PEOs can be written from different perspectives like Career, Technical Competency and Behaviour. While writing the PEOs do not use the technical terms as it will be read by prospective students who wants to join the programme. Three to five PEOs are recommended.

The Programme Educational Objectives (PEOs) that are formulated for the B. Pharmacy programme are listed below:

PEO 1: To produce graduates with sound theoretical knowledge and technical skills required for their career opportunities in various domains.
PEO 2: To incite the students towards research and to address the challenges with their innovative contributions for the benefit of the mankind.
PEO 3: To instill the essence of professionalism, ethical commitment to become a health care professional with sound integrity and adherence to the core human values in the service of the society.

4.PROGRAM OUTCOMES (POs)

A Program Learning Outcome is **broad** in scope and be able to do at the end of the programme. POs are to be in line with the graduate attributes as specified in the Washington Accord. POs are to be specific, measurable and achievable.

NBA has defined 11 POs and you need not define those POs by yourself and it is common for all the institutions in India.

1. Pharmacy Knowledge: Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.

2. **Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.

3. **Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.

4. **Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.

5. **Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.

6. **Professional Identity:** Understand, analyze and communicate the value of their professional roles in society (e.g., health care professionals, promoters of health, educators, managers, employers, employees).

7. **Pharmaceutical Ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.

8. **Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.

9. **The Pharmacist and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.

10. **Environment and sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

11. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

5.COURSE OUTCOMES (COs)

A **Course Outcome** is a formal statement of what students are expected to learn in a course. When creating Course Outcomes remember that the outcomes should clearly state what students will do or produce to determine and/or demonstrate their learning. Course learning outcome statements refer to specific knowledge, practical skills, areas of professional development, attitudes, higher-order thinking skills, etc. that faculty members expect students to develop, learn, or master during a course.

A well-formulated set of Course Outcomes will describe what a faculty member hopes to successfully accomplish in offering their particular course(s) to prospective students, or what specific skills, competencies, and knowledge the faculty member believes that students will have attained once the course is completed. The learning outcomes need to be concise descriptions of what learning is expected to take place by course completion.

6.DEVELOPING COURSE OUTCOMES

When creating course outcomes consider the following guidelines as you develop them either individually or as part of a multi-section group:

Limit the course outcomes to **6** statements for the entire course [more detailed outcomes can be developed for individual units, assignments, chapters, etc. if the instructor(s) wish (es)].

- Focus on overarching knowledge and/or skills rather than small or trivial details.
- Focus on knowledge and skills that are central to the course topic and/or discipline.
- Create statements that have a student focus rather than an instructor centric approach (basic e.g., ‑upon completion of this course students will be able to list the names of the 28 states and 8 union territories‖ versus ‑one objective of this course is to teach the names of the 28 states and 8 union territories).
- Focus on the learning that *results* from the course rather than describing activities or lessons that are in the course.
- Incorporate and/or reflect the institutional and departmental missions.
- Include various ways for students to show success (outlining, describing, modelling, depicting, etc.) rather than using a single statement such as ―at the end of the course, students will know ―as the stem for each expected outcome statement.

The keywords used to define CO's are based on Bloom's Taxonomy.

When developing learning outcomes, here are the core questions to ask yourself:

- *What do we want students in the course to learn?*
- *What do we want the students to be able to do?*
- *Are the outcomes observable, measurable and are they able to be performed by the students?*

Course outcome statements on the course level describe:

*1.*What faculty members want students to *know* at the end of the course

*2.*What faculty members want students *to be able to do* at the end of the course?

Course outcomes have three major characteristics

1.They specify an action by the students/learners that is ***observable***

2.They specify an action by the students/learners that is ***measurable***

3.They specify an action that is done by the ***students / learners*** rather than the faculty members

Effectively developed expected learning outcome statements should possess all three of these characteristics. When this is done, the expected learning outcomes for a course are designed so that they can be assessed. When stating expected learning outcomes, it is important to use ***verbs*** that describe exactly what the student(s) / learner(s) will be able to *do* upon completion of the course.

Characteristics of Effective Course Outcomes

Well written course outcomes:

- Describe what you want your students to learn in your course.
- Are aligned with program goals and objectives.
- Tell how you will know an instructional goal has been achieved.
- Use action words that specify definite, observable behaviours.
- Are assessable through one or more indicators (papers, quizzes, projects, presentations, journals, portfolios, etc.)
- Are realistic and achievable.
- Use simple language

Examples of Effective Course Outcomes

After successful completion of the course, Students will be able to:

- *Critically review the methodology of a research study published in a scholarly sociology journal.*
- *Describe and present the contributions of women to American history.*
- *Recognize the works of major Renaissance artists.*
- *Facilitate a group to achieve agreed-upon goals.*
- *Determine and apply the appropriate statistical procedures to analyze the results of simple experiments.*
- *Develop an individual learning plan for a child with a learning disability.*
- *Produce a strategic plan for a small manufacturing business.*
- *Analyse a character's motivation and portray that character before an audience.*
- *Differentiate among five major approaches to literary analysis*
- *List the major ethical issues one must consider when planning a human-subjects study.*

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A more detailed model for stating learning objectives requires that objectives have three parts: **a condition**, **an observable behavior**, and **a standard**.

The table below provides three examples.

S No	Condition	Observable Behaviour	Standard
1	Given a list of drugs	The student will be able to Classify each item as amphetamine or barbiturate.	With at least 70% accuracy.
2	Immediately following a Fifteen-minute discussion on a topic.	The student will be able to Summarize in writing the major issues being discussed.	Mentioning at least three of the five major topics.
3	Given a pharmaceutical plasma data	The student will be able to determine various pharmacokinetic parameters.	Within a period of five minutes.

7. CO-PO COURSE ARTICULATION MATRIX MAPPING

Course Articulation Matrix shows the educational relationship (Level of Learning achieved) between Course Outcomes and Program Outcomes for a Course. This matrix strongly indicates whether the students are able to achieve the course learning objectives.

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 articulation 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.

The matrix can be used for any course and is a good way to evaluate a course syllabus.

R17 Regulation: Components of the curriculum and their relevance to the POs	
Curriculum Components	**POs**
Basic Science	1,3,4,6,9,11
Humanities and Social Science	1,2,3,4,5,6,7,8,9,11
Pharmaceutical Science	1,2,3,4,5,6,7,8,9,10,11
Professional Core	1,2,3,4,5,6,7,8,9,10,11
Open Elective	1,2,3,4,6,7,8,9,10,11
Mandatory Course	1,3,4,5,6,7,11

- **Values to CO-PO (technical POs in particular) matrix can be assigned by**
  i. 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 1 else mark with -‖ symbol.
  ii. 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.
- **Method for articulation**
  iii. Identify the key competencies of POs to each CO and make a corresponding mapping table with assigning √ mark at the corresponding cell. One observation to be noted is that the first five POs are purely of technical in nature, while the other POs are non-technical.
  iv. Justify each CO - PO mapping with a justification statement and recognize the number of **Key Competencies (KC)** features mentioned in the justification statement that are matching with the given Key Attributes for Assessing Program Outcomes. Use a combination of words found in the COs, POs and your course syllabus for writing the justification.
  v. Make a table with number of key competencies for CO – PO mapping with reference to the maximum given Key Attributes for Assessing Program Outcomes.
  vi. Make a table with percentage of key competencies for CO – PO mapping with reference to the maximum given Key Attributes for Assessing Program Outcomes.
  vii. Finally, Course Articulation Matrix (CO - PO Mapping) is prepared with COs and
  viii. POs on the scale of 0 to 3, 0 being no correlation (marked with — - ‖),
  ix. 1 being the low/slight correlation, 2 being medium/moderate correlation and 3 being
  x. Substantial/ high correlation based on the following strategy

0 – $0 \leq C \leq 5\%$ – No correlation;
1 – $5 < C \leq 40\%$ – Low / Slight;
2 – $40\ \% < C < 60\%$ – Moderate.
3 – $60\% \leq C < 100\%$ – Substantial / High

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Key Attributes for Assessing Program Outcomes:

POs	Programme outcomes	Key components	No of Key components
PO1	Pharmacy Knowledge: - Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.	Core and basic Knowledge, understanding and application of 1. Pharmaceutical sciences 2. Biomedical sciences 3. Behavioral, social, and administrative pharmacy sciences, 4. Manufacturing practices	4
PO2	Planning Abilities: - Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.	Implementation of effective planning for 1. Developing of effective plan 2. Time management 3. Resource management 4. Delegation skills 5. Organizational skills 6. Plan and execute Pharmacy related experiments or investigations	6
PO3	Problem analysis: Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.	1. Solve the Problem or identify opportunity by utilizing the principles of scientific enquiry 2. Solve the Problem or identify opportunity by thinking analytically 3. Solve the Problem or identify opportunity by thinking clearly and critically 4. Find/ identify, analyze and evaluate the Problems 5. apply information systematically to Solve the Problem or identify opportunity 6. Interpretation of results 7. Validation 8. Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of problems 9. Use knowledge, understanding and skills required for identifying problems and issues. 10. Analysis and evaluation using	11

		methodologies as appropriate to the subject(s) for formulating evidence-based solutions and arguments. 11. Apply one's disciplinary knowledge and transferable skills to new/unfamiliar contexts.	
PO4	Modern tool usage: Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.	1. Learn, select, and apply appropriate methods and procedures 2. Select, and apply appropriate resources 3. Learn, select, and apply appropriate modern pharmacy-related Computer softwares 4. Learn, select, and apply appropriate modern pharmacy-related Simulation packages	4
PO5	Leadership skills: Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well-being.	1. Ability to work with all levels of people in an organization 2. Ability to get along with others 3. Demonstrated ability to work well with a team 4. Understand professional and societal responsibilities 5. Ability to work for the improvement of health and well- being 6. Leadership & effective team management 7. Building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision.	7
PO6	Professional Identity: Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).	Student can Understand, analyze and communicate the value of their professional roles in society as a 1. Health care professionals 2. Promoters of health 3. Educators 4. Managers 5. Employers 6. Employees	6

PO7	Pharmaceutical Ethics: Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.	1. apply ethical principles in professional and social contexts 2. apply ethical principles while making decisions 3. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles 4. Comprises four components: ability to make informed ethical choices, knowledge of professional codes of ethics, evaluates the ethical dimensions of professional practice, and demonstrates ethical behavior	4
PO8	Communication: Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.	Students should demonstrate the ability to communicate effectively in writing / Orally." with the pharmacy community 1. Clarity (Writing) 2. Grammar/Punctuation (Writing) 3. References (Writing) 4. Speaking Style (Oral) 5. Subject Matter (Oral) 6. Subject Matter (Writing)	6
PO9	The Pharmacist and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.	1. Knowledge and understanding of commercial and economic context of pharmacy practice processes; 2. Awareness of the framework of relevant legal requirements governing pharmacy activities, including personnel, health, safety, and risk (including environmental risk) issues; 3. Understanding the need for a high level of professional responsibilities. 4. Demonstrate competencies and actions required for keeping oneself professionally engaged and participate in learning to update knowledge and practice.	4
PO10	Environment and sustainability: Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	Impact of the professional pharmacy solutions (Not technical) 1. Socio economic 2. Inculcate sense of responsibility towards environment. 3. Implementation of knowledge and sustainable development	3

PO11	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.	1. Identification of learning needs 2. Learning the current and advanced pharmacy concepts 3. Personal continuing education efforts 4. Ongoing learning – stays up with pharmaceutical industry trends/ new technology 5. Self-assessment and use of feedback system 6. Continued personal development 7. Begin work on related/advance degree	7

8. LEARNING OUTCOMES FOR THE COURSE:

Course Name: Novel drug delivery systems

Course Code: PS704

Course Objectives:

Upon completion of the course student shall be able:

• To understand various approaches for development of novel drug delivery systems.

• To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation.

Course Outcomes:

At the end of the course the student will develop ability to

CO	Course outcome	Blooms taxonomy level
PS704.1	**Recognize** suitable approaches of designing Controlled drug delivery system based on the property of polymer.	Knowledge
PS704.2	**Identify** suitable methods used to fabricate microcapsules and implants	Apply
PS704.3	**Distinguish** the role of various components in the preparation of TDDS & GRDDS	Understand
PS704.4	**Analyze** the effect of various factors in the formulation approaches of different drug delivery system.	Analyze
PS704.5	**Summarize** the concept of different nano carriers use to formulate targeted drug delivery system	Understand
PS704.6	**Choose** different methods to fabricate various devices of controlled drug delivery system.	Apply

Identification of key competencies of POs to each CO:

NOVEL DRUG DELIVERY SYSTEM		1	2	3	4	5	6	7	8	9	10	11
PS704.1	Recognize suitable approaches of designing Controlled drug delivery system based on the property of polymer.	√	-	-	-	√	-	-	√	-	√	√
PS704.2	Identify suitable methods used to fabricate microcapsules and implants	√	√	√	√	√	-	-	√	-	√	√
PS704.3	Distinguish the role of various components in the preparation of TDDS & GRDDS	√	-	-	-	√	-	-	√	-	√	√
PS704.4	Analyse the effect of various factors in the formulation approaches of different drug delivery system.	√	√	√	-	√	-	-	√	-	√	√
PS704.5	Summarize the concept of different nanocarriers use to formulate targeted drug delivery system	√	-	-	-	√	-	-	√	-	√	√
PS704.6	Choose different methods to fabricate various devices of controlled drug delivery system.	√	√	√	√	√	-	-	√	-	√	√

JUSTIFICATIONS FOR CO – PO MAPPING:

CO		Justification	No.of Key components mapped	Actual No.of Key components
PS704.1	PO1	1. Pharmaceutical sciences 2. Biomedical sciences	2	4
	PO5	2. Ability to get along with others 4. Understand professional and societal responsibilities 5. Ability to work for the improvement of health and well-being 6. Leadership & effective team management	4	7
	PO8	Students should demonstrate the ability to communicate effectively in writing / Orally." with the pharmacy community 3. References (Writing) 4. Speaking Style (Oral) 5. Subject Matter (Oral) 6. Subject Matter (Writing)	4	6
	P10	Impact of the professional pharmacy solutions (Not technical) 2. Inculcate sense of responsibility towards environment. 3.Implementation of knowledge and sustainable development	2	3
	PO11	1. Identification of learning needs 2. Learning the current and advanced pharmacy concepts 4. Ongoing learning – stays up with pharmaceutical industry trends/ new technology 7. Begin work on related/advance degree	4	7
PS704.2	PO1	1. Pharmaceutical sciences 2. Biomedical sciences 4. Manufacturing practices	3	4
	PO2	1. Developing of effective plan 3. Resource management 4. Delegation skills 5. Organizational skills	4	6
	PO3	3. Solve the Problem or identify opportunity by thinking clearly and critically 4. Find/ identify ,analyze and evaluate the Problems 5. Apply information systematically to Solve the Problem or identify opportunity 8. Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of problems 9. Use knowledge, understanding and skills required for identifying problems and issues.	5	11
	PO4	1. Learn, select, and apply appropriate methods and procedures 2. Select, and apply appropriate resources	2	4

	PO5	2. Ability to get along with others 4. Understand professional and societal responsibilities 5. Ability to work for the improvement of health and well-being 6. Leadership & effective team management	**4**	**7**
	PO8	Students should demonstrate the ability to communicate effectively in writing / Orally." with the pharmacy community 4. Speaking Style (Oral) 5. Subject Matter (Oral) 6. Subject Matter (Writing)	**3**	**6**
	P10	Impact of the professional pharmacy solutions (Not technical) 2. Inculcate sense of responsibility towards environment. 3.Implementation of knowledge and sustainable development	**2**	**3**
	PO11	1. Identification of learning needs 2. Learning the current and advanced pharmacy concepts 3. Personal continuing education efforts 4. Ongoing learning – stays up with pharmaceutical industry trends/ new technology 7. Begin work on related/advance degree	**5**	**7**
PS704.3	**PO1**	1. Pharmaceutical sciences 2. Biomedical sciences 4. Manufacturing practices	**3**	**4**
	PO2	1. Developing of effective plan 3. Resource management 4. Delegation skills 5. Organizational skills	**4**	**6**
	PO3	3. Solve the Problem or identify opportunity by thinking clearly and critically 4. Find/ identify ,analyze and evaluate the Problems 5. Apply information systematically to Solve the Problem or identify opportunity 8. Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of problems 9. Use knowledge, understanding and skills required for identifying problems and issues.	**5**	**11**
	PO4	1. Learn, select, and apply appropriate methods and procedures 2. Select, and apply appropriate resources	**2**	**4**
	PO5	2. Ability to get along with others 4. Understand professional and societal responsibilities 5. Ability to work for the improvement of health and well-being 6. Leadership & effective team management	**4**	**7**
	PO8	Students should demonstrate the ability to communicate effectively in writing / Orally." with the pharmacy community 4. Speaking Style (Oral) 5. Subject Matter (Oral)	**3**	**6**

		6. Subject Matter (Writing)		
	P10	Impact of the professional pharmacy solutions (Not technical) 2. Inculcate sense of responsibility towards environment. 3.Implementation of knowledge and sustainable development	**2**	**3**
	PO11	1. Identification of learning needs 2. Learning the current and advanced pharmacy concepts 3. Personal continuing education efforts 4. Ongoing learning – stays up with pharmaceutical industry trends/ new technology 7. Begin work on related/advance degree	**5**	**7**
PS704.4	**PO1**	1. Pharmaceutical sciences 2. Biomedical sciences 4. Manufacturing practices	**3**	**4**
	PO2	1. Developing of effective plan 3. Resource management 4. Delegation skills 5. Organizational skills	**4**	**6**
	PO3	2. Solve the Problem or identify opportunity by thinking analytically 3. Solve the Problem or identify opportunity by thinking clearly and critically 4. Find/ identify ,analyze and evaluate the Problems 5. Apply information systematically to Solve the Problem or identify opportunity 8. Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of problems 9. Use knowledge, understanding and skills required for identifying problems and issues.	**6**	**11**
	PO5	2. Ability to get along with others 4. Understand professional and societal responsibilities 5. Ability to work for the improvement of health and well-being 6. Leadership & effective team management	**4**	**7**
	PO8	Students should demonstrate the ability to communicate effectively in writing / Orally." with the pharmacy community 4. Speaking Style (Oral) 5. Subject Matter (Oral) 6. Subject Matter (Writing)	**3**	**6**
	P10	Impact of the professional pharmacy solutions (Not technical) 2. Inculcate sense of responsibility towards environment. 3.Implementation of knowledge and sustainable development	**2**	**3**
	PO11	1. Identification of learning needs 2. Learning the current and advanced pharmacy concepts 3. Personal continuing education efforts 7. Begin work on related/advance degree	**4**	**7**

PS704.5	**PO1**	1. Pharmaceutical sciences 2. Biomedical sciences	**2**	**4**
	PO3	3. Solve the Problem or identify opportunity by thinking clearly and critically 4. Find/ identify ,analyze and evaluate the Problems 9. Use knowledge, understanding and skills required for identifying problems and issues. 11. Apply one's disciplinary knowledge and transferable skills to new/unfamiliar contexts.	**4**	**11**
	PO5	2. Ability to get along with others 4. Understand professional and societal responsibilities 5. Ability to work for the improvement of health and well-being 6. Leadership & effective team management	**4**	**7**
	PO8	Students should demonstrate the ability to communicate effectively in writing / Orally." with the pharmacy community 3. References (Writing) 4. Speaking Style (Oral) 5. Subject Matter (Oral) 6. Subject Matter (Writing)	**4**	**6**
	P10	Impact of the professional pharmacy solutions (Not technical) 2. Inculcate sense of responsibility towards environment. 3.Implementation of knowledge and sustainable development	**2**	**3**
	PO11	1. Identification of learning needs 2. Learning the current and advanced pharmacy concepts 3. Personal continuing education efforts 4. Ongoing learning – stays up with pharmaceutical industry trends/ new technology 7. Begin work on related/advance degree	**5**	**7**
PS704.6	**PO1**	1. Pharmaceutical sciences 2. Biomedical sciences 4. Manufacturing practices	**3**	**4**
	PO2	1. Developing of effective plan 3. Resource management 4. Delegation skills 5. Organizational skills	**5**	**6**
	PO3	3. Solve the Problem or identify opportunity by thinking clearly and critically 4. Find/ identify ,analyze and evaluate the Problems 5. Apply information systematically to Solve the Problem or identify opportunity 8. Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of problems 9. Use knowledge, understanding and skills required for identifying problems and issues.	**5**	**11**
	PO4	1. Learn, select, and apply appropriate methods and procedures	**2**	**4**

		2. Select, and apply appropriate resources		
	PO5	2. Ability to get along with others 4. Understand professional and societal responsibilities 5. Ability to work for the improvement of health and well-being 6. Leadership & effective team management	**4**	**7**
	PO8	Students should demonstrate the ability to communicate effectively in writing / Orally." with the pharmacy community 3. References (Writing) 4. Speaking Style (Oral) 5. Subject Matter (Oral) 6. Subject Matter (Writing)	**4**	**6**
	P10	Impact of the professional pharmacy solutions (Not technical) 2. Inculcate sense of responsibility towards environment. 3.Implementation of knowledge and sustainable development	**2**	**3**
	PO11	1. Identification of learning needs 2. Learning the current and advanced pharmacy concepts 3. Personal continuing education efforts 4. Ongoing learning – stays up with pharmaceutical industry trends/ new technology 7. Begin work on related/advance degree	**5**	**7**

NUMBER OF KEY COMPETENCIES FOR CO – PO MAPPING:

Program outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
No. Key Components	**4**	**6**	**11**	**4**	**7**	**6**	**4**	**6**	**4**	**3**	**7**
PS704.1	2	-	-	-	4	-	-	4	-	2	4
PS704.2	3	4	5	2	4	-	-	3	-	2	5
PS704.3	3	4	5	2	4	-	-	3	-	2	5
PS704.4	3	4	6	-	4	-	-	3	-	2	4
PS704.5	2	-	4	-	4	-	-	4	-	2	5
PS704.6	3	4	5	2	4	-	-	4	-	2	5
Total achieved	**16**	**16**	**25**	**6**	**24**	**-**	**-**	**21**	**-**	**12**	**28**
Total Targeted	**24**	**24**	**55**	**12**	**42**	**-**	**-**	**36**	**-**	**18**	**42**

PERCENTAGE OF KEY COMPETENCIES FOR CO – PO MAPPING:

Program outcomes	1	2	3	4	5	6	7	8	9	10	11
No. Key Components	4	6	11	4	7	6	4	6	4	3	7
PS704.1	50	-	-	-	57	-	-	67	-	67	57
PS704.2	75	67	45	50	57	-	-	50	-	67	71
PS704.3	75	67	45	50	57	-	-	50	-	67	71
PS704.4	75	67	54	-	57	-	-	50	-	67	57
PS704.5	50	-	36	-	57	-	-	67	-	67	71
PS704.6	75	67	45	50	57	-	-	67	-	67	71

COURSE ARTICULATION MATRIX (CO – PO MAPPING):

COs and POs and COs and PSOs on the scale of 0 to 3, 0 being no correlation,
1 being the low correlation, 2 being medium correlation and 3 being high correlation.

0 – $\mathbf{0} \leq \boldsymbol{C} \leq 5\%$ – No correlation;
1 – $5 < \boldsymbol{C} \leq 40\%$ – Low / Slight;
2 − $40\ \% < \boldsymbol{C} < 60\%$ – Moderate.
3 – $60\% \leq \boldsymbol{C} < 100\%$ – Substantial / High

Program outcomes	1	2	3	4	5	6	7	8	9	10	11
PS704.1	2	-	-	-	2	-	-	3	-	3	2
PS704.2	3	3	2	2	2	-	-	2	-	3	3
PS704.3	3	3	2	2	2	-	-	2	-	3	3
PS704.4	3	3	2	-	2	-	-	2	-	3	2
PS704.5	2	-	1	-	2	-	-	3	-	3	3
PS704.6	3	3	2	2	2	-	-	3	-	3	3
Total	16	12	9	6	12	-	-	15	-	18	16
Average	2.6	3	1.8	2	2	-	-	2.5	-	3	2.6

9. COURSE CO – PO ATTAINMENT

- **The Program Outcomes (POs) are accomplished through curriculum**
    - Course Outcomes (COs) are defined for each course and they are mapped to POs
    - A set of performance evaluation criteria is used for quantitative assessment of COs.
    - Thus, the attainment of COs provides evidence of attainment of POs

i. Assessment Tools and Processes Used for Assessing the Attainment of Course Outcomes: -

Assessment processes of Course Outcome

The assessment process is divided into two parts:

a. Internal Assessment

b. University Exam Assessment.

A 25% weightage is allocated for Internal Assessment, while a 75% weightage is designated for University Exam Assessment. This weightage distribution aligns with the standards set in the University curriculum.

INTERNAL ASSESSMENT

Theory Subjects

1. Mid Exams:

- Mid exams are conducted twice during a semester course.

- The I Mid exam covers the syllabus of the first two units entirely and half of the third unit.

- The II Mid exam covers the remaining half of the third unit and the complete fourth and fifth units.

- Question papers for Mid exams consist of Descriptive questions (10 Marks) and Objective questions (10 Marks).

- The Mid exam question paper encompasses all the course outcomes.

- The attainment of Course outcomes are assessed based on students' performance in Mid exams.

2. Assignments:

- According to the University Curriculum, assignments (5 Marks) are designed to assess students' individual writing skills.

- Assignments also aim to increase interest in surveying information from various National

and International authors' books and to enhance knowledge in pharmacy subjects.

- Assessment of course outcomes include the marks obtained in assignments.

3. Overall, this internal assessment process contributes to 25% of the direct assessment for the course.

Practical Subjects

1. Continuous mode Internal Assessment:

-Continuous mode Internal Assessment is conducted for 15 marks.

- This assessment includes:

- Attendance.
- Synopsis.
- Regular practical skills, observations, and calculations.
- Regular record writing and correction by the in-charge.
- Regular Viva-voce sessions.

- Each of these components contributes to the overall assessment of the student's progress and understanding in the course.

2. Mid Sem Internal Examination:

- The Mid Sem internal examination is conducted for 10 marks.

- This assessment includes:

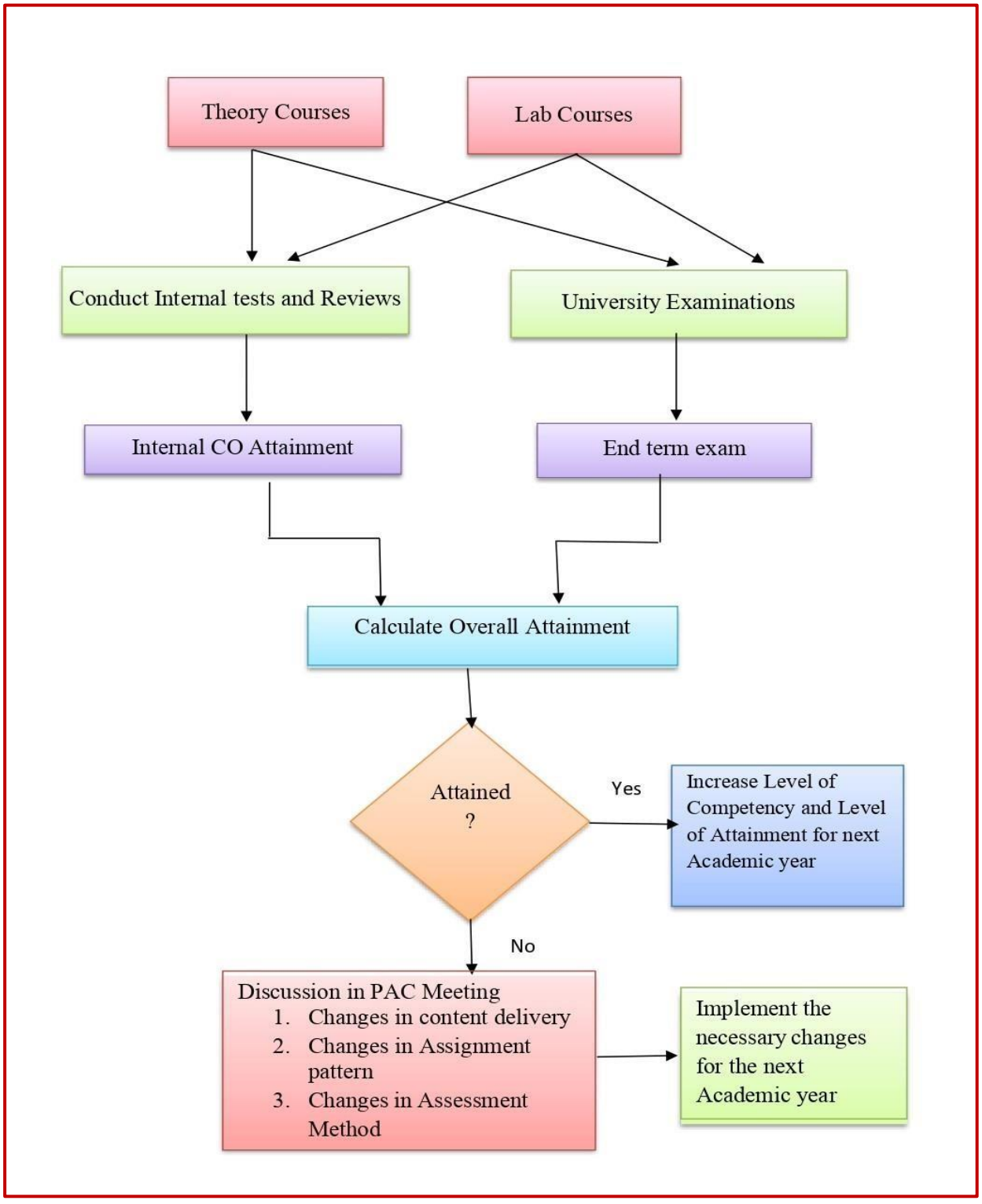
- Synopsis.
- Performance in experiments.
- Perform calculations related to the experiments.
- Viva-voce sessions.

- Each of these components is essential for evaluating the students' understanding, application of concepts, and practical skills within the course.

SEMESTER END EXAMINATION

The University conducts a final semester exam that covers the complete syllabus of the course. This exam holds significant importance as it is a crucial tool for assessing course outcomes. The final semester exam is conducted for 75 marks. Assessment of course outcomes include the results obtained in the university exams. Students' performance in this exam reflects their overall understanding and knowledge acquired throughout the semester.

The Process for Assessment and Attainment of COs is described in the flowchart



Process of Assessment and Attainment of CO

Following Procedure is followed for the assessment of attainment of COs through Internal Assessment marks and end semester marks setting of attainment levels

As per the curriculum prescribed by JNTUH, Hyderabad, the weightages of internal examination marks and end semester examination marks were considered for all the curriculums.

For R17 regulations, it was decided to calculate the Course Outcome (CO) attainments with 25% weightage given to the Internal Examination and 75% weightage to the University End Semester Examination.

Eg:-

The calculation was as follows: 25% of 2 + 75% of 3 = 0.5 + 2.25 = 2.75.

Since an average or median marks for assessment was not declared by the university, target levels were finalized at the institute level.

Separate levels of attainment were then finalized for the internal examination and the end semester examination based on these weightages and calculations.

A. Internal Examination

Attainment Level 1: **60%** students scoring more than 60% marks out of the relevant maximum marks is considered to be attainment of "1"

Attainment Level 2: 70% students scoring more than 60% marks out of the relevant maximum marks is considered to be attainment of "2"

Attainment Level 3: 80% students scoring more than 60% marks out of the relevant maximum marks is considered to be attainment of "3"

B. End Semester Examination

Attainment Level 1: **60%** students scoring more than 40% marks out of the relevant maximum marks is considered to be attainment of "1"

Attainment Level 2: 70% students scoring more than 40% marks out of the relevant maximum marks is considered to be attainment of "2"

Attainment Level 3: **80%** students scoring more than 40% marks out of the relevant maximum marks is considered to be attainment of "3"

CO attainment is calculated for all courses and corrective measures are taken to improve course outcomes.

ii. Assessment Tools and Processes Used for Assessing the Attainment of Each PO

Program Outcomes of the Program are attained by using two methods:

- **Direct Assessment**
- **Indirect Assessment**

Assessment Process of Program Outcomes:

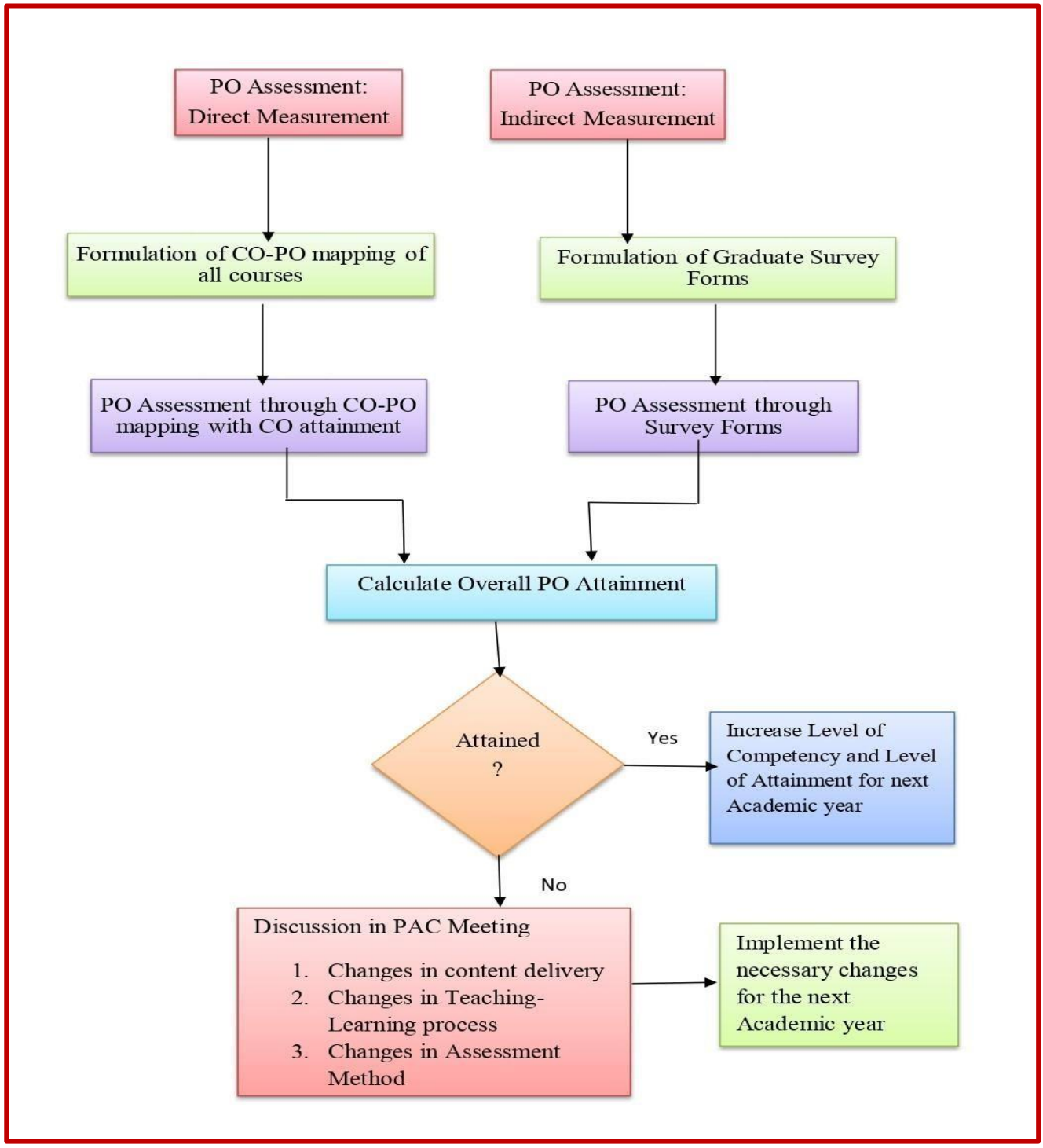
The assessment process includes both the direct and indirect measurement.

PO Attainment	**Direct Assessment**	**CO attainment of courses**	**80%**
	Indirect Assessment	**Graduate Exit Survey**	**20%**

The attainment of Program Outcomes (POs) is calculated based on the Course Outcomes (COs) attainment. The POs attainment is determined by multiplying the COs attainment value by the COs contribution factor, where the COs contribution factor is 3, 2, and 1 for High, Medium, and Low contribution, respectively, towards POs. The POs attainment is then calculated and observations are recorded.

The overall attainment of POs is calculated by taking 80% of direct attainment and 20% of indirect attainment. Indirect assessment is made based on graduate exit surveys.

The Process for Assessment and Attainment of POs is described in the flowchart



Process of assessment and attainment of PO