Rayat Shikshan Sanstha's

Abasaheb Marathe Arts and New Commerce, Science College, Rajapur.

Course Outcomes, Program Outcomes and Program Specific Outcomes Attainment Reports of the Institute 2023 - 2024 Batch

1.	B.Sc. - Bachelor of Science 1. Botany 2. Chemistry
2.	B.Com. - Bachelor of Commerce 1.Accountancy
3.	B.A. - Bachelor of Arts 1. Marathi 2. Hindi 3.English 4. Economics 5. Geography 6. Political Science 7. History
4.	M.Com. - Master of Commerce 1. Accountancy

Name of the Programme: B.Sc. - Bachelor of Science

Name of Department: Botany

Program Outcomes (POs)

Specific core discipline knowledge

1. Students can recall details and information about the evolution, anatomy, morphology, systematics, genetics, physiology, ecology, and conservation of plants and all other forms of life.
2. Students can recall details of the unique ecological and evolutionary features of the local and Indian flora.

Communication skills

3. Students can communicate effectively using oral and written communication skills

Problem solving and research skills

4. Students can generate and test hypotheses, make observations, collect data, analyze and interpret results, derive conclusions, and evaluate their significance within a broad scientific context

BSc BOTANY: PROGRAM SPECIFIC OUTCOMES

1. To recognize and identify major groups of non-vascular and vascular plants and their phylogenetic relationships.
2. To understand the phylogeny of plants and study various systems of classification.
3. To explore the morphological, anatomical, embryological details as well as economic importance of algae, fungi, bryophytes, pteridophytes, gymnosperms and angiosperms.
4. To understand physiological processes and adaptations of plants.
5. To provide knowledge about environmental factors and natural resources and their importance in sustainable development.
6. To be able to carry out phytochemical analysis of plant extracts and application of the isolated compounds for treatment of diseases.
7. To be able to deal with all microbes and the technologies for their effective uses in industry and mitigation of environmental concerns.
8. To explain how current medicinal practices are often based on indigenous plant knowledge and to get introduced to different perspectives on treating ailments according to ethnomedicinal principles.
9. To understand patterns of heredity and variation among individuals, species and populations and apply principles for improvement of quality and yield.
10. To be able to apply statistical tools to gain insights into significantly different data from different sources.
11. To acquire recently published knowledge in molecular biology, such as rDNA technology; PTC and bioinformatics and their applications.

COURSE OUTCOMES

USBO501 PLANT DIVERSITY – III

1. To gain knowledge about microbial diversity and techniques for culturing and visualization.
2. To understand the salient features of three major groups of algae, their lifecycle patterns with a suitable example; to be able to identify them.
3. To learn the general characteristics and classification of two major groups of fungi along with life cycles of each group; to be able to identify them.
4. To understand the scope and importance of Plant Pathology and apply the concepts of various control measures of commonly widespread plant diseases.

USBO502 PLANT DIVERSITY – IV

1. To provide plant description, describe the morphological and reproductive structures of seven families and also identify and classify according to Bentham and Hooker's system.
2. To gain proficiency in the use of keys and identification manuals for identifying any unknown plants to species level.
3. To relate anomalies in internal stem structure with function and appreciate the salient features of the root stem transition zone.
4. To get exposure to pollen study and learn to apply it in various fields.

USBO503 FORM AND FUNCTIONS- II

1. To acquire knowledge about two important organelles and molecular mechanisms of translation
2. To understand water relations of plants, inorganic and organic solute transport, and apply the knowledge to manage mineral nutrition and survival in challenging abiotic stresses.
3. To understand succession in plant communities and study remediation technologies in order to apply knowledge acquired for cleanup of polluted sites.
4. To get exposure to principles and techniques of plant tissue culture and apply these studies for improving agriculture and horticulture and to become an entrepreneur.

USBO504 CURRENT TRENDS IN PLANT SCIENCES – II

1. To get exposure to the technique of mushroom cultivation and explore the possibility of entrepreneurship in the same.
2. To learn ethnobotanical principles, applications and utilize indigenous plant knowledge for the cure of common human diseases and improvement of agriculture.
3. To gain knowledge about the latest molecular biology techniques for isolation and characterization of genes.
4. To learn principles and application of commonly used techniques in instrumentation.
5. To gain proficiency in the monograph study and pharmacognostic analysis of six medicinal plants.

USBO601 PLANT DIVERSITY – III

1. To identify, describe and study in detail the life cycles of three Bryophytes.
2. To and study in detail classification and general characters of three classes of Pteridophytes and identify as well as describe the life cycles of one example from each class.
3. To study evolutionary aspects and economic utilization of Bryophytes and Pteridophytes.
4. To identify, describe and study in detail the life cycles of three Gymnosperms.

USBO602 PLANT DIVERSITY – IV

1. To study contribution of Botanical gardens, BSI to Angiosperm study and provide plant description, describe the morphological and reproductive structures of seven families.
2. To gain exposure to a phylognetic system of classification.
3. To gain insight into the anatomical adaptations of different ecological plant groups.
4. To understand development plant of male and female gametophytes, embryonic structure and development.
5. To understand the different aspects and importance of Biodiversity and utilize them for conservation of species so as to prevent further loss or extinction of Biodiversity and preserve the existing for future generations.

USBO603 FORMS AND FUNCTION – III

1. To study various plant biomolecular structures and appreciate the structures, role, functions and applications of enzymes.
2. To gain insight into the Nitrogen and plant hormone metabolism with applications of the same in agriculture and horticulture.
3. To understand principles of genetic mapping, mutations and solve problems based on them, gain knowledge of various metabolic disorders and their implications.

4. To generate and test hypotheses, make observations, collect data, analyze and interpret results, derive conclusions, and evaluate their significance within a broad scientific context, using suitable statistical techniques.

USBO604 Current Trends in Plant Science – II

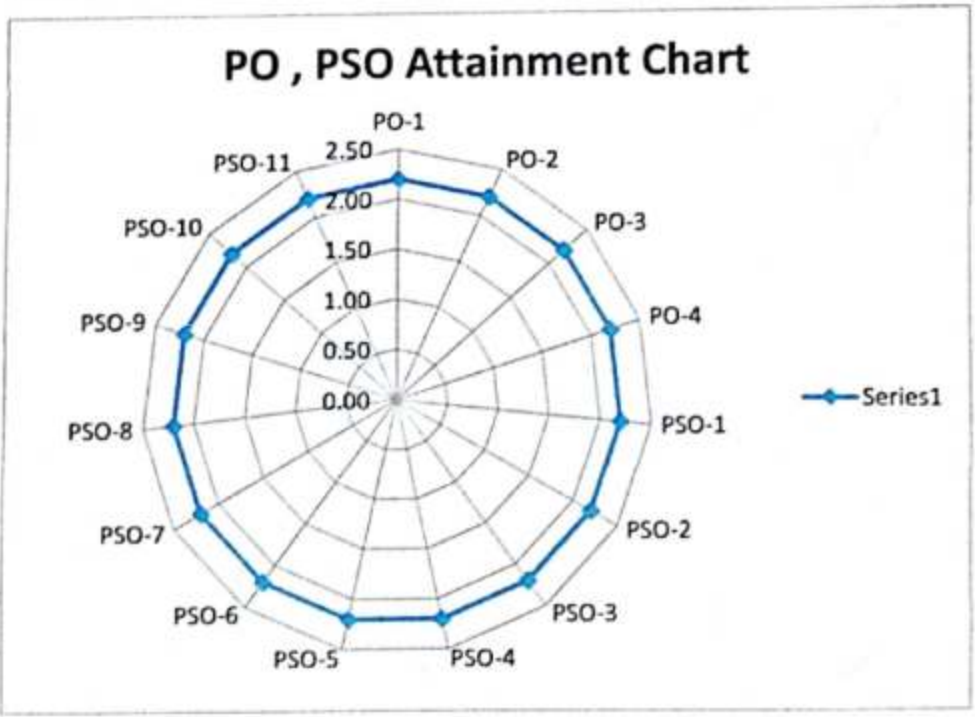
1. To gain insight into recent molecular biology techniques for DNA analysis and amplification and Barcoding techniques and applications therein.
2. To understand and apply tools of Bioinformatics for data retrieval and phylogenetic analysis.
3. To learn about the sources of economically important plants in the field of fats and oils and apply it for extraction, dealing with entrepreneurship in the field.
4. To gain knowledge and proficiency in preservation of post-harvest produce and explore the possibility of entrepreneurship in the field.

CO Attainment:

Paper No	Course Name	CO attainmentscore	Level	Status
Paper-I	USBO501 : PLANT DIVERSITY - III	1	Average	Partially Attained
Paper-II	USBO502 : PLANT DIVERSITY - IV	2.3	Excellent	Attained
Paper-III	USBO503 : FORM & FUNCTION - III	1.6	Good	Attained
Paper-IV	USBO504 : CURRENT TRENDS IN PLANT SCIENCES-II	3	Very Good	Attained
Paper-I	USACHO501 : HORTICULTURE & GARDENING – I	3	Excellent	Attained
Paper-I	USBO601 : PLANT DIVERSITY - III	1	Average	Partially Attained
Paper-II	USBO602 : PLANT DIVERSITY - IV	2.3	Good	Attained
Paper-III	USBO603 : FORM & FUNCTION - III	3	Excellent	Attained
Paper-IV	USBO604 : CURRENT TRENDS IN PLANT SCIENCES-II	3	Excellent	Attained
Paper-IV	USBOP8 : PRACTICAL OF USBO603 TO USBO604	1	Average	Partially Attained
Paper-I	USACHO601 : HORTICULTURE & GARDENING – I	3	Excellent	Attained

PO, and PSO Attainment

PO/PSO	Outcome Value (2023-24)	Level	Attainment
PO1	2.20	Very Good	Attained
PO2	2.20	Very Good	Attained
PO3	2.20	Very Good	Attained
PO4	2.20	Very Good	Attained
PSO1	2.20	Very Good	Attained
PSO1	2.20	Very Good	Attained
PSO2	2.20	Very Good	Attained
PSO3	2.20	Very Good	Attained
PSO4	2.20	Very Good	Attained
PSO5	2.20	Very Good	Attained
PSO6	2.20	Very Good	Attained
PSO7	2.20	Very Good	Attained
PSO8	2.20	Very Good	Attained
PSO9	2.20	Very Good	Attained
PSO10	2.20	Very Good	Attained
PSO11	2.20	Very Good	Attained



Remedial Actions Taken: Slow and advanced learners, Department Library Books and Extra notes are planned for next batch.

Principal
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Procedure for Defining Learning Outcomes and Measuring their Attainment

The following steps are being adopted for defining learning outcomes and measuring their attainment.

Step 1 : Defining the vision and mission of the college

Step 2 : Defining Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) of programme

Step 3 : Defining Course Outcomes (COs) of each course in a programme

Step 4 : Defining relation between COs and POs/PSOs for each course to obtain overall CO mapping with each POs and PSOs (Course Articulation Matrix)

Step 5 : Calculating overall level of relation of a course with POs and PSOs (Program Articulation Matrix)

Step 6 : Defining the methodology for measuring the attainment of learning outcomes and setting up the target level

Step 7 : Measuring attainment levels of learning outcomes

Step 8 : Comparison of obtained attainment level with the target and action taken.

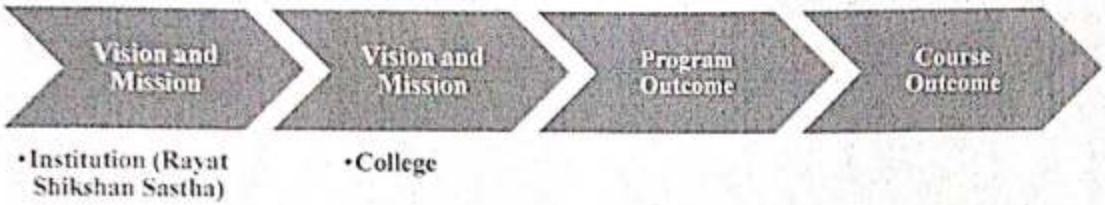
The above steps are elaborated below:

Steps 1, 2 and 3: Defining the Vision and Mission of the Department, Defining Programme Outcomes (POs) and Programme Specific Outcomes (PSO) of programme, Defining Course Outcomes (COs) of each course in a Programme.

College has defined vision, mission, and goals. The vision is envisaged in the form of vision document, perspective plan and college development plan. College's vision and mission ensures consistency with parent institution's (Rayat Shikshan Sanstha) vision and mission.

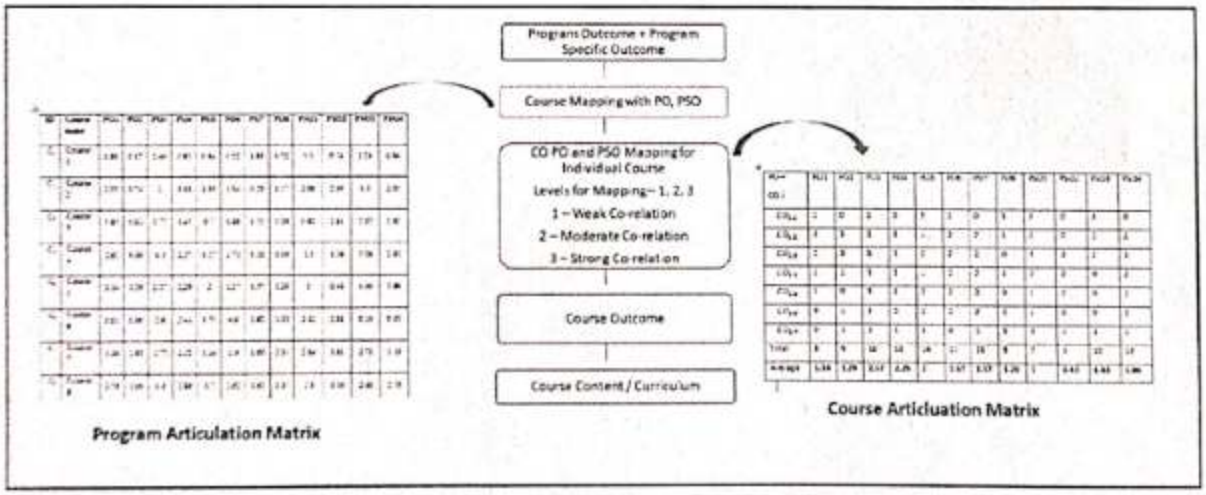
POs are assertions regarding the knowledge, skills, and characteristics that a university graduate should possess after successfully completing the programme. POs deal with the overall element of graduation for a certain programme, as well as the competences and expertise that a graduate will have after completing it. Every programme provided by the university has its own set of POs. PSOs are statements that specify what graduates of a particular programme should be capable of. Each programme also has its own set of specific outcomes.

COs are measurable statements which state what students are expected to learn in a specific course. For each of course of programme these measurable statements are defined.



The Model is implemented effectively by defining PO, PSO, and CO, CO-PO mapping, designing attainment levels and target attainment levels, calculating CO-PO attainments, and developing teaching learning strategies at the course and programme levels.

Overall process of mapping of COs with POs and PSOs is shown in following diagram with formulation of Course Articulation matrix and Program Articulation matrix.



Step 4: Defining relation between COs and POs/PSOs for each course to obtain overall CO mapping with each POs/PSOs (Course Articulation Matrix)

In this step, COs of each course are mapped with POs and PSOs. A correlation is established between COs and POs/PSOs in the scale of 1 to 3, 1 being the low, 2 being moderate (medium) and 3 being substantial (high). The meaning of '0' is no correlation between CO and PO/PSO.

For example, programme XYZ (say) has 8 POs and 4 PSOs. Then, course articulation matrix for a course-1 (say) with seven COs is as follow.

PO→ CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	0	1	0	3	1	0	3	0	0	3	0
CO2	3	3	3	3	1	2	2	1	2	0	2	2
CO3	2	3	3	3	2	2	2	0	3	3	2	3
CO4	1	1	3	3	1	2	2	1	0	0	0	2
CO5	1	0	3	3	2	2	2	0	1	0	0	2
CO6	0	1	3	3	2	2	2	1	1	0	0	2
CO7	0	1	2	1	3	0	1	3	0	0	3	2

In the same way we have course articulation matrices for all the courses in that programme.

Step 5: Calculating overall level of relation of a course with POs and PSOs (Program Articulation Matrix)

The CO levels corresponding to each PO/PSO in course articulation matrix are averaged to obtain overall level of relation of course with each PO and PSO. For example, the overall relation of course-1 (say) are reported the following matrix.

PO→ CO↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
CO1	1	0	1	0	3	1	0	3	0	0	3	0
CO2	3	3	3	3	1	2	2	1	2	0	2	2
CO3	2	3	3	3	2	2	2	0	3	3	2	3
CO4	1	1	3	3	1	2	2	1	0	0	0	2
CO5	1	0	3	3	2	2	2	0	1	0	0	2
CO6	0	1	3	3	2	2	2	1	1	0	0	2
CO7	0	1	2	1	3	0	1	3	0	0	3	2
Average	**1.14**	**1.29**	**2.57**	**2.29**	**2**	**1.57**	**1.57**	**1.29**	**1**	**0.43**	**1.43**	**1.86**

Similarly, the overall level of relation of all the courses in the programme is established. These levels are reported in the matrix form and this matrix is called as the programme articulation matrix. For example if the programme *XYZ* has 12 courses then the programme articulation matrix will be as follows.

Program Articulation Matrix

ID	Course name	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4
C_1	Course 1	1.14	1.29	2.57	2.29	2.00	1.57	1.57	1.29	1.00	0.43	1.43	1.86
C_2	Course 2	2.05	0.74	2.00	1.18	2.89	1.84	0.58	1.57	2.06	2.99	0.90	2.05
C_3	Course 3	1.85	0.83	1.77	1.45	0.70	0.98	1.21	1.28	0.91	2.91	2.82	1.85

C_4	Course 4	2.61	0.39	0.30	2.27	0.57	2.73	0.16	0.09	1.30	1.16	1.08	2.61
C_5	Course 5	0.86	0.17	2.46	0.83	0.84	0.52	1.88	0.22	1.50	0.74	1.24	0.86
C_6	Course 6	0.01	0.06	2.60	2.43	1.71	0.90	1.92	1.33	2.42	2.08	0.16	0.01
C_7	Course 7	1.18	2.68	2.75	2.22	1.36	1.40	1.68	2.31	2.64	1.81	2.71	1.18
C_8	Course 8	2.76	1.06	0.60	2.86	1.70	2.62	1.62	1.37	2.90	1.54	2.41	2.76
C_9	Course 9	1.40	0.50	2.43	2.34	1.88	0.67	0.82	1.42	1.83	2.45	1.82	1.40
C_{10}	Course 10	2.59	0.28	1.17	0.61	0.05	1.77	1.87	1.73	2.60	2.14	0.99	2.59
C_{11}	Course 11	2.86	1.24	0.48	2.73	1.42	1.51	0.07	2.53	0.45	0.96	1.22	2.86
C_{12}	Course 12	1.05	2.25	0.15	2.10	2.11	2.47	0.68	2.05	1.33	1.32	0.87	1.05
C_{13}	Course 13	2.51	0.81	0.34	2.07	1.81	0.68	0.38	2.98	1.17	1.23	1.48	2.51
C_{14}	Course 14	1.20	2.91	2.08	1.18	0.35	2.55	2.64	2.20	1.46	1.46	1.82	1.20
C_{15}	Course 15	1.07	0.31	1.29	1.65	1.13	0.90	1.13	1.99	1.64	0.14	1.54	1.07
C_{16}	Course 16	1.71	2.17	0.43	2.70	2.68	1.71	1.75	1.50	2.50	0.45	1.37	1.71
C_{17}	Course 17	1.83	2.89	0.92	0.02	1.38	2.04	2.69	1.09	1.82	0.44	1.94	1.83
C_{18}	Course 18	1.59	1.40	1.96	1.85	2.40	2.36	0.09	1.80	1.74	2.09	0.40	1.59
C_{19}	Course 19	2.86	0.50	2.09	2.37	2.84	1.94	1.53	0.27	2.02	2.54	0.61	2.86
C_{20}	Course 20	1.33	1.70	0.64	2.51	1.36	0.86	2.22	1.78	1.81	0.15	1.38	1.33
C_{21}	Course 21	2.04	0.47	2.63	0.97	2.80	1.75	2.95	2.80	0.99	2.90	0.93	2.04
C_{22}	Course 22	2.70	2.95	1.00	1.93	1.00	2.43	2.23	1.17	0.26	1.70	2.95	2.70
C_{23}	Course 23	0.80	0.89	1.94	0.77	1.84	2.96	1.08	1.18	2.94	0.49	2.30	0.80
C_{24}	Course 24	2.83	1.83	0.63	2.93	2.65	2.35	2.18	0.64	0.88	1.24	1.27	2.83

Step 6: Defining the methodology for measuring the attainment of learning outcomes and setting up the target level.

In this step, methodology for measuring the attainment level of learning outcomes is defined and the target levels for the batch are defined.

- **Methodology for the attainment of learning outcomes for this year**

Details of a programme:

- Programme name XYZ
- Programme has n_1 POs, say, $PO_1, PO_2, \dots, PO_{n_1}$
- Programme has n_2 PSOs, say, $PSO_1, PSO_2, \dots, PSO_{n_2}$

  Let $n = n_1 + n_2$, total number of POs and PSOs. For convenience, let us denote the POs & PSOs, $PO_1, PO_2, \dots, PO_{n_1}, PSO_1, PSO_2, \dots, PSO_{n_2}$ by $P_1, P_2, \dots, P_n$
- Programme has m courses, say, $C_1, C_2, \dots, C_m$
- Each course C_i has k_i course outcomes (COs) denoted as $CO_{i,1}, CO_{i,1}, \dots, CO_{i,k_i}, i = 1,2, \dots, m$.

Course articulation matrices and programme articulation matrix are obtained as discussed in previous steps. Let $X_{i,j,l}$ be the level of correlation of CO, $CO_{i,j}$ (j^{th} CO of course C_i) with P_l where $i = 1,2,\dots,m, j = 1,2,\dots,k_i, l = 1,2,\dots,n$. Let $Y_{i,l}$ be the overall CO levels of course C_i with P_l and is calculates as $Y_{i,l} = \frac{1}{k_i}\sum_{j=1}^{k_i} X_{i,j,l}$ $where\ i = 1,2,\dots,m,\ l = 1,2,\dots,n$

Attainment of COs

The CO attainment levels are measured based on the results of the internal assessment and external examination conducted by the university. The CO attainment level based on internal assessment and external assessment are computed separately.

Attainment levels based on internal/external assessment method are defined as follows:-

Level 1: 30% of students scored more than class average for that assessment method
Level 2: 40% of students scored more than class average for that assessment method
Level 3: 50% of students scored more than class average for that assessment method

Let ALC_E and ALC_I be the CO attainment level of the course based on external assessment and internal assessment respectively. The overall CO attainment of the course is calculated by taking 80% weightage to external assessment and 20% weightage to external assessment.

$$\boldsymbol{ALC = 0.8 * ALC_E + 0.2 * ALC_I.}$$

Let $ALC_1, ALC_2, \dots, ALC_m$ be the CO attainment levels of the courses $C_1, C_2, \dots, C_m$ respectively.

Attainment of POs and PSOs

The attainment of POs and PSOs are calculated using direct and indirect method. In direct method the attainment of POs and PSOs are calculated through the attainment levels of COs. The CO attainment values $(ALC_1, ALC_2, \dots, ALC_m)$ and the overall level of relation of course with each PO and PSO $(Y_{i,l}, i = 1,2,\dots,m,\ l = 1,2,\dots,n)$ are used to compute direct attainment level of each PO and PSO. The direct attainment level of the l^{th}, PO/PSO is calculated as follows.

$$DALP_l = \frac{1}{\sum_{i=1}^{m} Y_{i,l}} \sum_{i=1}^{m} Y_{i,l} * ALC_i \ , l = 1,2,\dots,n$$

For determining indirect attainment level of POs and PSOs, every year college conducts feedback surveys on curriculum of all stakeholders (Parent, teachers, students, alumni and employers). The feedback on the points related to the curriculum and its execution are used to calculate indirect level of attainment. Let $IALP_l$ be the indirect attainment level for the l^{th}, PO/PSO.

Overall attainment level of the l^{th}, PO/PSO is calculated by taking 80% weightage to direct attainment level and 20% weightage to indirect attainment level that is,

$$ALP_l = 0.8 * DALP_l + 0.2 * IALP_l \, , l = 1,2, \dots , n.$$

The overall PO attainment levels are categorized as below.

Level I: greater than 0 and less than 1.0 (0>1)-Poor

Level II: 1.0>1.5-Average

Level III: 1.5>2.0-Good

Level IV: 2.0>2.5- Very Good

Level V: 2.5>3.0-Excellent

For every programme, the target level is set. We have set level IV as target level that is we are aiming minimum level-IV (very good) in the performance of abilities of students.

Step 7: Measuring attainment levels of learning outcomes

This step includes the calculation of attainment levels of learning outcomes after result declaration.

Step 8: Comparison of obtained attainment level with target and action taken.

In this step the target levels of PO attainment are compared with obtained PO attainment levels.

PO	Overall Attainment	Attainment Level	Target Level	Remark
PO1	2.40	Level-4	Level-4	Fully attained
PO2	2.16	Level-4	Level-4	Fully attained
PO3	1.81	Level-3	Level-4	Partially attained
PO4	2.12	Level-4	Level-4	Fully attained
PO5	2.50	Level-4	Level-4	Fully attained
PO6	2.47	Level-4	Level-4	Fully attained
PO7	1.61	Level-3	Level-4	Partially attained
PO8	1.57	Level-3	Level-4	Partially attained
PSO1	2.46	Level-4	Level-4	Fully attained
PSO2	1.63	Level-3	Level-4	Partially attained

PSO3	1.72	Level-3	Level-4	Partially attained
PSO4	2.4	Level-4	Level-4	Fully attained

If the target level is not achieved, some remedial actions are taken to achieve the target level in the next year. The remedial actions include additional assignment/tutorials/remedial teaching.

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