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Program learning outcomes assessment plan and report

Program learning outcomes assessment plan and report, BSc. Physics 2022-2023 Males and Females (Combined)

Table 1: Summary of PLOs assessment results for academic years 2019/2020 up to 2022/2023

	Direct Assessment					Indirect Assessment							Total Achievement of PLOs			Total achievement of each Domain
	Course CLOs				Exit Exam	Program Evaluation Survey				CES	Graduate Survey	Employers annual survey	2021/2022-02			
PLOs	201920	2020/21	2021/22	2022/23	2021-2	2019/20	2020/21	2021/22	2022/23	2022/23	2021-02	2021-02	Males	Females	Combined	
K1	82.3	84.1	89.4	84.0	60	75	71	77	79	86	78	63	84.7	79.9	85.0	85.4
K2	81.2	82.5	88.1	86.5	72.7	72	68	66	73	86	67	58	83.4	78.9	84.6	
K3	85.2	81.6	89.0	88.4	71.4	67	75	79	77	87	71	60	87.8	82.5	86.0	
K4	83.3	81.0	86.2	88.1	66.7	73	75	69	73	87	71	66	86.2	80.5	84.7	
K5	86.1	84.6	89.7	86.0	66.7	68	85	73	81	88	69	60	88.2	84.0	86.6	
S1	80.3	79.6	83.9	85.2	66.7	67	67	88	66	83	76	77	83.9	76.6	82.2	84.5
S2	80.5	78.5	81.2	86.4	72.7	85	82	82	85	83	71	69	84.0	77.0	81.6	
S3	79.3	89.1	91.7	97.4	66.7	79	81	74	75	86	64	71	82.4	76.2	89.4	
S4	84.4	80.6	88.2	90.1	75	77	76	74	76	89	85	77	89.7	79.1	85.8	
S5	81.6	79.0	87.9	86.1	75	80	71	77	80	86	77	70	86.9	76.3	83.7	
V1	87.3	89.6	85.3	87.4	-	91	88	89	85	90	86.6	89	88.4	86.2	87.4	88.4
V2	88.5	84.9	91.5	92.6	-	85	77	91	87	92	85	92	89.0	88.1	89.4	

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<u>Report on Program Learning Outcomes (PLOs), BSc. Physics</u>

Introduction

Program learning outcomes (PLOs) for the past four academic years, starting from 2018/2019 up to 2021/2022, were measured based on the direct and indirect measurement methods. In the direct method, course learning outcomes (CLOs) for all courses offered during the mentioned period as well as PLOs assessed from the questionnaires of evaluation of the program by students, graduates, stakeholders and course evaluation by students.

Assessment and analysis of students' achievement of PLOs were conducted using various sources of data including direct measurement from courses as well as exit exam, indirect assessment from senior students, alumni and employers surveys. The results of achievements of PLOs are used to discover weaknesses and to make decisions for improvements. The main points describing PLOs assessment Plan at the Program are:

1- PLOs are measured using measurable performance indicators with specific weights.
2- The direct method: selected course grades related to the concerned outcome through theoretical exams, assignments, quizzes, research projects as well as exit exam results.
3- Indirect Method: include results of questioners of student evaluation, graduate evaluation, and employer's evaluation.

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4- Determination of KPIs and benchmarks for administration of each assessment (CEI) process.

5- Collection of data, information, and evidences for detection of the overall level of achievement according to the stated timeline of the assessment plan.

6- Presentation of the data collected and detection of target achievement level within PLOs assessment report and APR.

7- Interpret evidence and make changes by documenting whether PLOs are actually being achieved or not and develop a plan for an ongoing learning outcomes assessment.

8- Alert faculty members as well as decision makers about weaknesses and strengths in order to carryout program development plan.

The updated Program Learning Outcomes (12 PLOs) have been assessed directly from related courses and indirectly from students, alumni, staff and employer surveys.

A) Direct PLOs assessment

In this assessment method, course grades related to the concerned outcome through written theoretical exams, assignments, quizzes, research projects as well as exit exam results. For clear insight about the assessment mechanism, the assessment plan set forth attached herein with this report.

1. PLOs are matched with the outcomes of 37 (17 in the first and 20 in the second term) courses involved in this assessment, where students have mastered the learning outcomes.

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2. PLOs assessment sheets developed by DQD (electronic rubric sheet) for data collection were distributed and consequently CLOs and PLOs data collected accordingly.

3. The learning outcomes values were assessed from all exam items for each course. Then, the distribution of these items in the course blueprint was followed to get the value of each learning outcome.

4. Course learning outcomes (CLOs) were matched with PLOs and data collected from different courses, aggregated together by calculation of the mean of percentages for the same PLO. Table 2 shows example of data collection sheet for direct measurements from courses covering K1 for academic year 2021/2022, second term. This process is repeated for all PLOs one after another until the end.

5. PLOs were assessed regarding achievements of male and female students as well as combined one to explore any differences.

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Table 2: data collection from courses covering PLO K1, 2022/2023-03.

PLO	Courses covering K1	Actual BM (%)	Internal BM (%)	External BM (%)	Target BM (%)
K1	PHYS 112	65.9	70.0		80.0
	PHYS 221	93.2	75.0		80.0
	PHYS 213	58.0	50.0		70.0
	PHYS 230	77.3	66.0		75.0
	PHYS 272	86.7	80.0		80.0
	PHYS 310	67.0	90.0		75.0
	PHYS 352	85.7	80.0		75.0
	PHYS 326	83.4	80.0		80.0
	PHYS 337	70.0	65.0		80.0
	PHYS 372	88.9	85.0		75.0
	PHYS 409	77.7	85.7		75.0
	PHYS 411	63.5	75.5		75.0
	PHYS 435	87.0	70.0		90.0
	PHYS 445	75.0	75.0		75.0
	PHYS 480	86.1	80.0		80.0
	PHYS 413	65.0	65.0		70.0
	PHYS 441	75.8	65.0		75.0
	PHYS 460	52.9			65.0
	PHYS 488	76.7	72.0		75.0
Average Value (%)		**75.6**	**73.8**	**NA**	**76.3**

B) Indirect PLOs assessments

In this indirect method of assessing PLOs, we use results from feedback of questioners given to students, graduates, staff members and employers (stakeholders). Data collection from evaluations were collected according to the steps listed below:

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1. PLOs were assessed from the feedback of employer, students and graduate surveys, where 5-points survey scale is adopted. Data from all these surveys as well as data collected from the direct method were put together in one table for assessment of PLOs achievements.

2. The mean of responses from different sources were calculated and arranged together for each PLO.

3. Comparison between the obtained PLOs assessment results and the previous year results was done to show progress over time of individual PLOs

4. Comparison between the obtained PLOs assessment and the defined level of performance achievements was done to identify the under achieved PLOs.

PLOs for each of the three learning domains have been collected for the concerned academic year/term as shown in table 3 through table 6.

Table 3: Program learning outcomes for the academic year 2019/2020

	Direct Assessment		Indirect Assessment								Total of Each Domain
	CLOs	Exit Exam	Program evaluation Survey				CES	Graduate survey	Employe rs annual survey	Total Achievement of PLOs	
PLO	2019-20	201902	201901	201902	202001	202002	202203	2022-23	2022-23	202201	
K1	80	60	75	71	77	79	86	78	63	79.6	
K2	78	73	72	68	66	73	86	67	58	78.7	
K3	84	71	67	75	79	77	87	71	60	81.8	**86.1**
K4	81	67	73	75	69	73	87	71	66	82.8	
K5	85	67	68	85	73	81	88	69	60	88.9	
S1	77	67	67	67	88	66	83	76	77	75.4	**85.4**
S2	77	73	85	82	82	85	83	71	69	75.8	

S3	76	67	79	81	74	75	86	64	71	77.6	
S4	82	75	77	76	74	76	89	85	77	82.2	
S5	80	75	80	71	77	80	86	77	70	78.4	
V1	88		91	88	89	85	90	86.6	89	86.2	**88.7**
V2	89		85	77	91	87	92	85	92	87.0	

Table 4: Program learning outcomes for the academic year 2020/2021

	Direct Assessment		Indirect Assessment							Total Achievement of PLOs	Total of Each Domain
	CLOs	Exit Exam	Program evaluation Survey				CES	Graduate survey	Employers annual survey		
PLO	2020-21	201902	2020-01	2020-02	2021-01	2021-02	2022-01	2021	2021	202201	
K1	76	55	88	82	87	82	88	77	75	82.3	
K2	75	66	75	81	69	73	84	75	78	81.2	
K3	77	63	79	75	81	77	83	81	65	85.2	**83.6**
K4	73	78	72	81	69	80	83	78	61	83.3	
K5	78	65	87	85	73	81	79	86	71	86.1	
S1	72	63	77	67	88	66	90	78	66	80.3	
S2	71	52	82	82	82	85	81	74	67	80.5	
S3	84	51	79	81	74	75	84	75	73	79.3	**81.2**
S4	72	61	83	76	74	66	87	85	76	84.4	
S5	72	55	69	71	77	80	85	82	70	81.6	
V1	82	-	82	88	91	85	91	92.6	85	87.3	**87.9**
V2	84	-	80	88	92	91	94	90	90	88.5	

Table 5: Program learning outcomes for the academic year 2021/2022

	Direct Assessment		Indirect Assessment							Total Achievement of PLOs	Total of Each Domain
	CLOs	Exit Exam	Program evaluation Survey				CES	Graduate survey	Employers annual survey		
PLO	2021-22	2020-02	2021-01	2021-02	2022-01	2022-03	2022-03	2021-02	2021-02	202201	
K1	79	65	80	71	77	65	82	90	75	89.4	
K2	74	85	89	68	66	67	74	85	75	88.1	
K3	77	64	87	75	79	75	85	86.3	69	89.0	**88.5**
K4	77	65	96	75	69	71	77	85	75	86.2	
K5	85	61	88	85	73	78	85	90	60	89.7	
S1	70	60	82	67	88	68	83	89	67	83.9	
S2	73	63	81	82	82	82	73	85	60	81.2	
S3	86	75	79	77	75	80	86	88	78	91.7	**86.6**
S4	78	62	97	76	74	67	78	87	66	88.2	
S5	77	65	91	71	77	65	75	95	75	87.9	
V1	85	-	96	88	91	90	91	86	79	85.3	**88.4**
V2	89	-	80	77	75	81	92	98	75	91.5	

Table 7 shows the PLOs achieved for the domains of Knowledge and Understanding, Skills and Values, whereas Table 8 shows the achieved results for each PLO from 2019/2020 to 2022/2023.

The results achieved for Knowledge and Understanding are well mastered by the students, which in the range from 81.4% to 86.9%.

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Table 6: Program learning outcomes for the academic year 2022/2023

	Direct Assessment		Indirect Assessment							Total Achievement of PLOs	Total of Each Domain
	CLOs	Exit Exam	Program evaluation Survey				CES	Graduate survey	Employers annual survey		
PLO	2022-23	2022-23	2022-01	2022-02	2022-01	2023-03	2022-01	2021	2021	202201	
K1	76	60	85	87	79	82	83	77	79	84.0	
K2	78	73	82	80	73	73	86	81	81	86.5	
K3	85	71	78	77	77	77	86	88	78	88.4	86.6
K4	87	67	83	85	73	80	85	84	77	88.1	
K5	82	67	74	84	81	81	89	86	75	86.0	
S1	79	67	77	81	66	66	81	81	81	85.2	
S2	77	73	85	88	85	85	88	74	78	86.4	
S3	89	67	79	82	75	75	92	89	70	97.4	89
S4	78	75	87	78	76	66	95	85	72	90.1	
S5	79	75	80	77	80	80	85	82	75	86.1	
V1	82		92	95	85	85	97	86.6	85	87.4	90
V2	95		95	99	87	91	98	85	87	92.6	

The results achieved for Skills are the least for the three domains; however, they are still considered very good, which are in the range from 77.9% to 86.5%.

The results obtained by the students for Values in the range from 84.6% to 88.9%, indicate that they have been very well achieved.

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Table 7: The achieved results of PLOs K, S and V learning domains

Learning Domain	Academic Year (Value for each domain)				Average for each PLO
	2019/2020	2020/2021	2021/2022	2022/2023	
K(%)	83.6	82.8	88.0	86.6	85.3
S(%)	81.2	81.4	86.0	89.0	84.4
V(%)	87.9	87.2	88.4	90.0	88.4
Total Average for all PLOs (%)					86.1

Table 8: The achieved results for each PLO from 2019/2020 to 2022/2023

PLOs	Academic Year				Achieved Results (%)		
	19-20	20-21	21-22	22-23	AVG PLO	AVG for each PLO	Total AVG of all PLOs
K1	82.3	84.1	89.4	84.0	85.0		
K2	81.2	82.5	88.1	86.5	84.6		
K3	85.2	81.6	89.0	88.4	86.0	85.4	
K4	83.3	81.0	86.2	88.1	84.7		
K5	86.1	84.6	89.7	86.0	86.6		
S1	80.3	79.6	83.9	85.2	82.2		
S2	80.5	78.5	81.2	86.4	81.6		
S3	79.3	89.1	91.7	97.4	89.4	84.5	86.1
S4	84.4	80.6	88.2	90.1	85.8		
S5	81.6	79.0	87.9	86.1	83.7		
V1	87.3	89.6	85.3	87.4	87.4	88.4	
V2	88.5	84.9	91.5	92.6	89.4		

Figures 1 up to 4 depict the achieved results for each of the program learning outcome in academic years of 2019/2020, 2020/2021, 2021/2022 and 2022/2023.
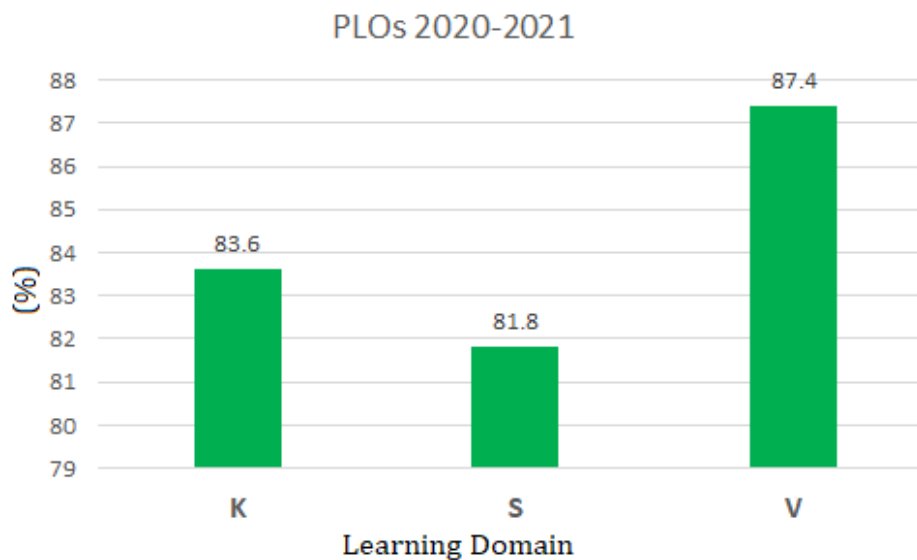
Fig 1: Achieved results of PLOs in academic year 2019/2020

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Fig 2: Achieved results of PLOs in academic year 2020/2021
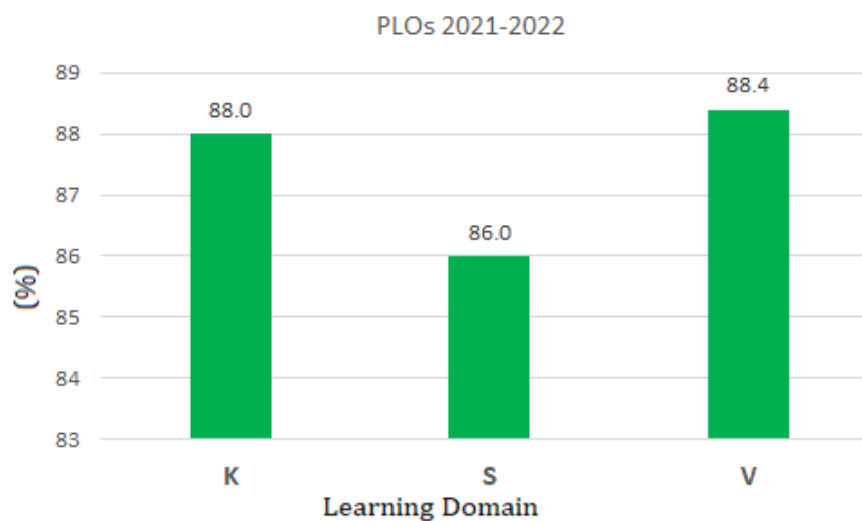
PLOs 2021-2022

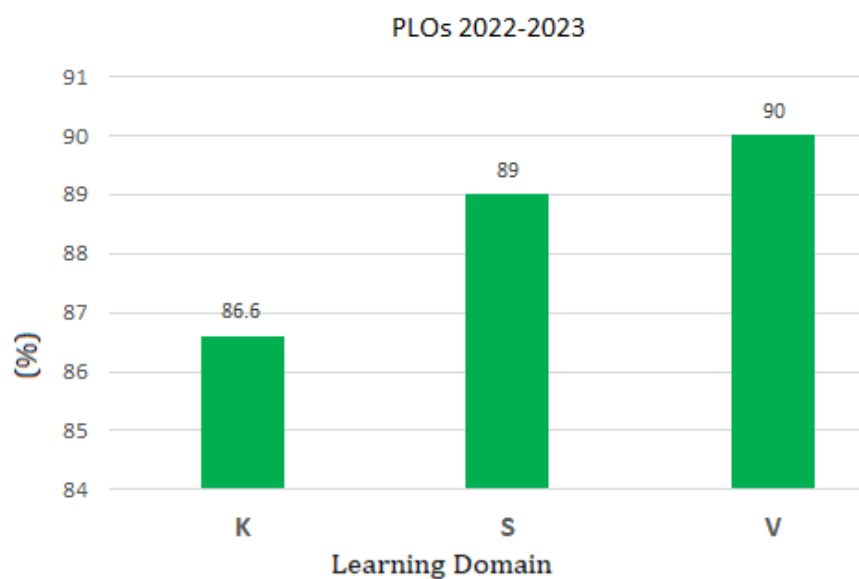Fig 3: Achieved results of PLOs in academic year 2021/2022

PLOs 2022-2023

Fig 4: Achieved results for the PLOs in academic year 2022/2023

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As summarized in Figures 5 and 6, the highest values for K (88.5%), S (89.1%) and V (90%) are achieved in the academic years 021/2022, 2022/2023 and 2022/2023 respectively. Whereas the lowest value of 82.8% for K, 81.2% for S and 87.3% for V; are achieved in the academic years of 2020/2021, 2019/2020, and 2020/2021 respectively.

Furthermore, from Figures 5 and 6, the lowest value achieved for PLOs S (81.2%) and V (87.3%) are achieved in the academic years 2019/2020 and 2020/2021respectively.
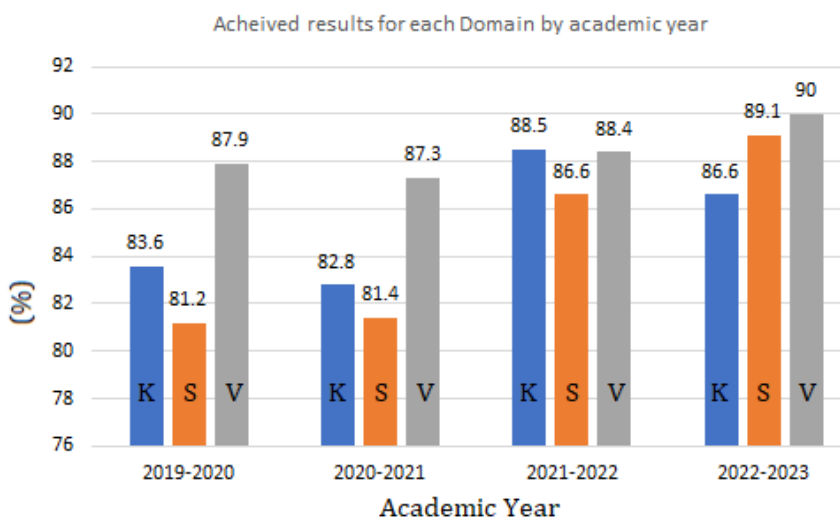
Fig 5: Achieved results for each PLO domain by academic year

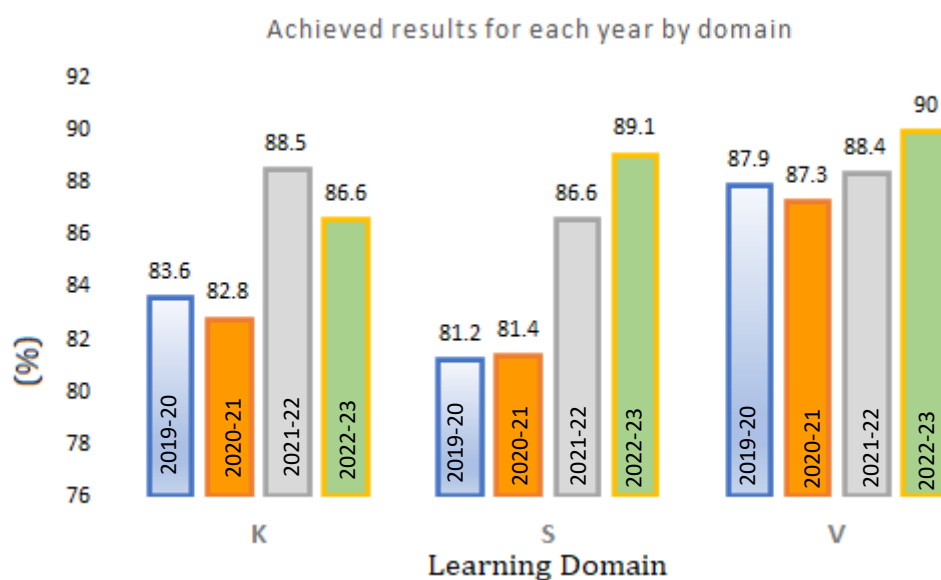|	Form No	HU-QMS-F-12/01
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Fig 6: Achieved results for each academic year by PLO domain

In general, the results achieved for all academic years are very close and comparable but most importantly they are all scored above 80%; this clearly indicate that all PLOs are very well achieved by the students.

The overall achieved average results for the three domains altogether through the four academic years is 86.1%, which is very good and even better than the previous result of 82.8%.

Figure 7 shows the overall achieved results for the three domains during the four academic years.

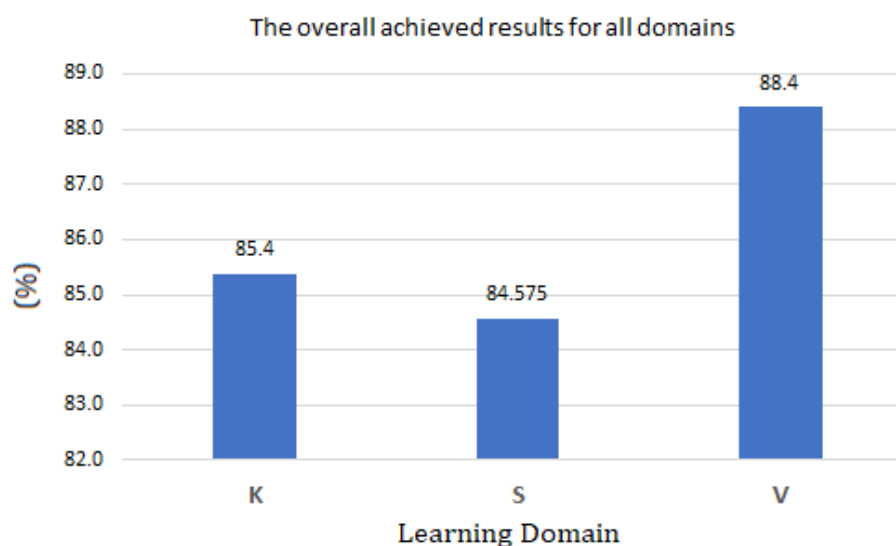|	Program learning outcomes assessment plan and report	Form No	HU-QMS-F-12/01
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Fig 7: The overall achieved results for all domains in years 2019-20 up to 2022-23

Therefore, as shown in Figure 7, the domain of values has achieved the highest average result 88.4% within the four academic years (previous result is 86%), comes next the domain of knowledge and understanding achieving an average of 85.4% (the previous result is 82.3%), and finally comes the domain of skills achieving an average of 84.5% (the previous result is 79.7%)

As a general conclusion, the performance targets related to all domains are well achieved. The achieved average value for the domain of skills has remarkably improved compared to last year's results of 79.7%. Moreover, intensifying homework exercises and encouraging students for peer learning will help improving the skills gained by the students as well as the other PLOs.

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In order to maintain the achieved results and look forward for further improvements, we need to improve all program learning outcomes continuously by improving teaching and assessment methods.

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List of Strengths and Recommendations for each PLOs, Males

1. Knowledge and Understanding			
No	**PLOs**	**Strengths**	**Recommendations**
K1	Recognize basic scientific concepts, principles and the developmental progress of the program-related Knowledge in basic sciences.	The result achieved by students for this PLO is very good (85%). The result is better compared with the previous result (76.9%).	Students should be encouraged by faculty members to read course materials such as books. Enhancement of assessment methods with regular feedbacks.
K2	Describe the main theoretical and practical aspects of classical physics.	Students' performance in this PLO is very good (86%). It is well improved compared with the previous result (80.6%).	Faculty members should adopt effective teaching strategies as well as demonstrative learning methods. Encourage students to read course materials such as books.
K3	Recall the main theoretical and practical aspects of modern physics.	Very good result achieved by students for this PLO (82.4%). The result is well improved compared with the previous result (77.8%).	Faculty members should adopt effective teaching strategies as well as demonstrative learning methods. Encourage students to read course materials such as books.
K4	Identify basic scientific facts, concepts, principles, and techniques of experimental and theoretical physics.	The students achieved very good results for this PLO (84.7%). There is good improvement compared with the last year's result (81.5%).	Faculty members should adopt effective teaching strategies as well as demonstrative learning methods. Encourage students to read course materials such as books.
K5	Acquire the needed program-related knowledge in humanities, sciences, technology, and scientific terminologies.	The performance of the students in this PLO is very good (86.6%). It is better than the previous result (81.6%).	Faculty members should adopt effective teaching strategies as well as demonstrative learning methods. Encourage students to read course materials such as books.
2. Skills			
S1	Evaluate physical quantities by recalling the principles and laws of classical and modern physics.	Very good result achieved by students for this PLO (82.2%). The result is very well improved compared to the previous result (74.9%).	Students should be encouraged by faculty members to read course materials such as books. Enhancement of assessment methods with regular feedbacks.
S2	Solve problems using different technical and theoretical approaches.	Very good result achieved for this PLO (81.6%). Well	Students should be encouraged by faculty members to read course materials such as books. Enhancement

		improve compared with the previous result (72.9%).	of assessment methods with regular feedbacks.
S3	Apply advanced mathematical and experimental techniques in theoretical and practical physics.	This PLO achieved excellent result of 89.4%. It is highly improved compared to the previous result (77.3%).	Students should be encouraged by faculty members to read course materials such as books. Enhancement of assessment methods with regular feedbacks.
S4	Employ techniques and tools to carry out experimental measurements and present data in understandable manner.	This PLO achieved excellent result of 85.8%. It is highly improved compared to the previous result (77.1%).	Faculty members should adopt effective teaching strategies as well as demonstrative learning methods. Encourage students to read course materials such as books.
S5	Collect and analyze information, critically and utilize them to solve physical problems.	Very good result is achieved for this PLO (83.4%). The result is below the previous one (85.1%).	Faculty members should adopt effective teaching strategies as well as demonstrative learning methods. Encourage students to read course materials such as books.
3. Values			
V1	Exercise sense of leadership and responsibility while working with others in terms of ethics and time management.	The performance of students in this PLO is excellent (87.4%). This result is above the previous result (85.5%).	To improve student's performance in this PLO it is essential to let students to participate in group work as well communicate with others to carry out assignments in terms of commitment and punctuality.
V2	Learn independently and develop continuously on the personal and professional level.	The achieved result for this PLO is excellent (88.4%). It is above the previous result (84.5%).	In order to encourage students to learn independently, they should be encouraged to read course materials such as books and surf the internet to learn new ideas and concepts.

Dr. A. Wahab M. A. Hussein   **Program coordinator, BSc. Physics**