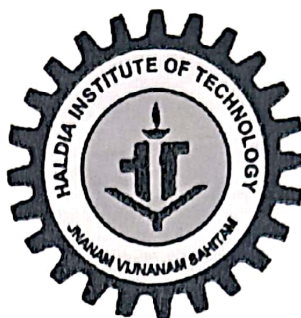


Haldia Institute of Technology

[An Autonomous Institute under MAKAUT]



Report on

Academic Audit (2024-2025) Department of Mechanical Engineering

Schedule of the Academic Audit on 10th September 2025

Auditor 1: **Dr. S. Mitra**
Professor
Department of Production Engineering, JU, Kolkata.

Auditor 2: **Dr. S. Bhaumik**
Professor
Dept. of Aerospace Engineering & Applied Mechanics, (IEST) Shibpur, Howrah.

S.No	Time	Auditor – I Departments	Auditor – II Departments
1	10.30 AM to 01.30 PM	File Check 1-13	File Check 14-26
2	01.00 PM to 02.00 PM	Lunch	
3	02.00 PM to 03.00 PM	CO, PO & PSO Attainment	Students Project Analysis
4	03.00 PM to 04.00 PM	Workshop & Lab Visit Placement and Internship	
5	04.00 PM to 04.30 PM	Report writing and Closing Meeting	

List of Files Audited:

S.No	F. No	Description
I - Curricular Aspects		
1	AE/F1.1	Department Vision, Mission, PEO, PSOs
2	AE/F1.2	Department PEO, Academic calendar & adherence
3	AE/F1.3	Department SWOT analysis
4	AE/F1.4	Field Project Internship and In plant training and industrial visits
5	AE/F1.5	Board of Studies Minutes, Regulations, Curriculum and Syllabus for all Regulations
6	AE/F1.6	Feedback on curriculum enrichment (Feedback from all stake holders)
7	AE/F1.7	Curriculum enrichment for (Employability & Skill Development)
8	AE/F1.8	Value Added Courses (Please verify students certificate in value added course)
II – Teaching learning & support system Aspects		
9	AE/F2.1	Students strength and Faculty Students Ratio (as per NBA format)
10	AE/F2.2	Record of Teaching and Non-Teaching staff profile

S.No	F. No	Description
11	AE/F2.3	Students mentoring file and action taken (Please verify the document and comment)
12	AE/F2.4	CO-PO mapping and CO attainment (Please verify the attainment for all years with proof)
13	AE/F2.5	Student Satisfaction Survey on overall institutional performance (Please verify the feedback), survey on infrastructure and facilities.
14	AE/F2.6	Students achievement in examination (result analysis) (Please verify students secured more than 8.25 CGPA & more than 6.75, single attempt pass without backlog for 2nd and 3rd year)
15	AE/F2.7	Continuous Assessment Analysis (Both Theory and Practical courses), Evaluation, Question, CO compliance etc. Result publication.
16	AE/F2.8	End Semester Exam Result Analysis
17	AE/F2.9	Feedback on Teaching Learning process & Syllabus
18	AE/F2.10	Course file (Theory and laboratory courses) (Please verify Internal Test Note (Theory), Class note, Assignment)
19	AE/F2.11	All Lab Maintenance, Stock Register, Stock Verification Record and Calibration details
20	AE/F2.12	Lab Manual, Records, Observation and Time Table (Please verify 2 Nos./subject/class for all the practical courses)
21	AE/F2.13	Students' attendance (Please verify the Master attendance)
22	AE/F2.14	No. of Research Supervisors and Scholar details and Ph.D awarded (Please verify the proof)
23	AE/F2.15	Research paper publications (International / National Journal and Conference) (Please verify No. of Publication and Quality of publication)
24	AE/F2.16	Books, chapters and Conference Proceedings published by faculty (Please verify the documents)
25	AE/F2.17	Conference, Seminar etc organized by the Department (Please verify number of programmes organized with proof)
26	AE/F2.18	Details of IPR filing (Please verify status filed, published and awarded)

Key Findings & Suggestions

1. Department Vision, Mission, PEO and PSOs

The observation of the 2023-24 audit has been acted upon. The Board of Studies (BOS) of the Department of Mechanical Engineering, in its meeting held on 06/11/2024, reviewed and approved the revised Vision, Mission, Program Educational Objectives (PEOs) and Program Specific Outcomes (PSOs) after a thorough analysis of inputs from students, alumni, faculty, employers and industry experts. The revised statements are applicable from AY 2024-25. The Visiting Team suggests that the department (i) display and circulate the revised statements to all stakeholders, (ii) document the PEO–Mission and PSO–PO correlations, and (iii) put in place a defined method to measure PEO attainment through alumni and employer surveys.

2. Course Outcomes (CO)

The BOS resolved that the CO statements of all courses are now written following the ABCD (Audience–Behaviour–Condition–Degree) rule, with the CO–PO and CO–PSO articulation matrices re-furnished. This addresses the 2023-24 concern about inconsistently articulated COs. During the next cycle, the department should verify through course files that each CO is aligned with the Modified Bloom's Taxonomy (CL × KC), with a teaching-learning activity and with a specific assessment instrument.

3. PO/PSO Attainment 2024-25 and Gap Analysis

The table below gives the PO/PSO attainment for 2024-25 against the set value of 3, together with the 2023-24 values for comparison. The attainment is reported in the revised 11-PO framework (GAPC V4.0) adopted by the BOS. For a like-for-like comparison, the 2023-24 values have been re-aligned as follows: PO6 is compared with the earlier PO6; PO7 with the earlier PO8 (Ethics); PO8 with PO9; PO9 with PO10; PO10 with PO11; and PO11 with PO12. The earlier PO7 (Environment and Sustainability, 2.02) is no longer a stand-alone outcome and is integrated across the revised POs.

PO / PSO	Outcome	2023-24	2024-25	Change	Gap vs set value 3	% of set value	Priority
PO1	Engineering Knowledge	2.28	2.18	-0.10	0.82	72.6%	Sustain
PO2	Problem Analysis	2.24	2.20	-0.04	0.80	73.3%	Sustain
PO3	Design/Development of Solutions	2.07	2.07	0.00	0.93	69.1%	Sustain
PO4	Conduct Investigations of Complex Problems	2.22	1.99	-0.23	1.01	66.3%	Medium
PO5	Modern Tool Usage	2.05	1.76	-0.29	1.24	58.7%	High
PO6	The Engineer and Society (incl. Environment & Sustainability)	2.02	1.59	-0.43	1.41	52.9%	High
PO7	Ethics	2.01	1.55	-0.46	1.45	51.6%	High
PO8	Individual and Team Work	1.89	1.59	-0.30	1.41	53.0%	High
PO9	Communication	1.95	1.80	-0.15	1.20	59.9%	High
PO10	Project Management and Finance	1.74	1.47	-0.27	1.53	48.9%	High
PO11	Life-Long Learning	1.77	1.86	+0.09	1.14	62.0%	Medium
PSO1	Program Specific Outcome 1 (revised statement)	1.98	2.12	+0.14	0.88	70.7%	Sustain
PSO2	Program Specific Outcome 2 (revised statement)	2.00	2.11	+0.11	0.89	70.3%	Sustain
PSO3	Program Specific Outcome 3 (revised statement)	1.93	1.85	-0.08	1.15	61.7%	Medium

Priority: High – gap above 1.20; Medium – gap above 1.00 up to 1.20; Sustain – gap up to 1.00. Change is 2024-25 minus 2023-24.

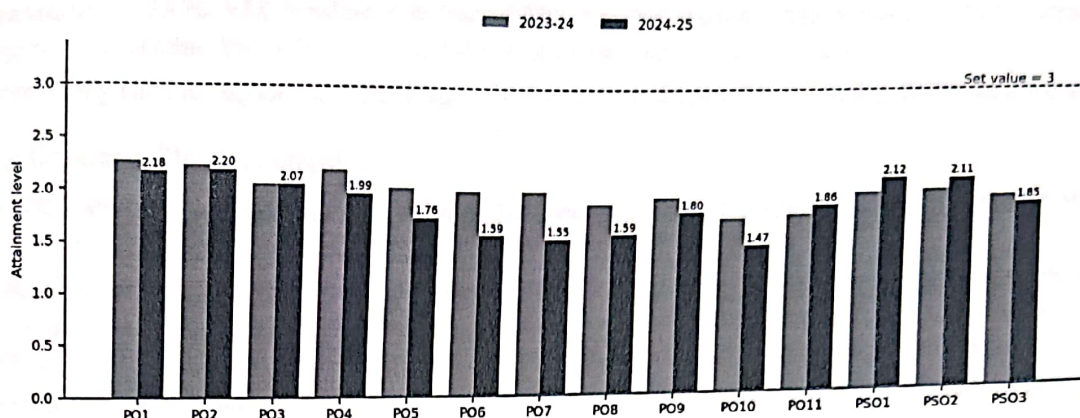


Figure 1: PO/PSO attainment, 2023-24 vs 2024-25

None of the 14 outcomes has reached the set value of 3. The knowledge-based outcomes PO1–PO4 (mean 2.11) are stronger than PO5–PO11 (mean 1.66). The largest gaps are in PO10 (1.47), PO7 (1.55), PO6 and PO8 (1.59 each) and PO5 (1.76), and these should receive priority.

Reason for the fall in attainment compared with 2023-24

Attainment has fallen in 10 of the 14 outcomes (PO1, PO2, PO4–PO10 and PSO3), is unchanged in PO3 (2.07), and has risen only in PO11, PSO1 and PSO2. The mean of the 14 outcomes has come down from 2.01 to 1.87. The Visiting Team notes that this fall is **mainly due to the change in the CO–PO/PSO articulation matrices**. In response to the 2023-24 audit, which found the matrices over-correlated with superfluous mappings that inflated attainment, the department rationalised the matrices and retained mappings only where a demonstrable contribution exists. The steepest falls are in PO7 Ethics (–0.46), PO6 Engineer and Society (–0.43), PO8 Team Work (–0.30), PO5 Modern Tool Usage (–0.29) and PO10 Project Management and Finance (–0.27) – precisely the attributes the previous Visiting Team had flagged as weakly or excessively mapped. The present values are therefore a more realistic picture of student achievement and the earlier figures are better regarded as over-estimates. The department is advised to state this change explicitly in the attainment file, so that the two years are not read as a decline in learning.

At the same time, the reduced values expose genuine gaps in the PO5–PO10 group. The BOS (Resolution 4.1) records that the attainment aspects of these outcomes are already incorporated in the syllabus. The attainment figures show that presence in the syllabus alone is not enough: these outcomes need explicitly planned, rubric-assessed activities within courses.

Good Practices Observed (Strengths)

- **Revised Vision, Mission, PEOs and PSOs** approved by the BOS on the basis of structured stakeholder feedback.
- **NEP 2020 / NCrF-aligned curriculum.** The UG programme has been restructured to 165 credits distributed across HSMC, BS, ES, PC, PE, OE and PW categories as per NBA guidelines and the National Credit Framework. Credits are derived from notional learning hours (1 credit = 30 hours), with a total of 4920 notional hours (1230 hours per year). Indian Knowledge System and Values & Ethics, Biology for Engineers, Industrial Safety and the Constitution of India have been introduced as mandatory/foundation courses.
- **Rubrics have been prepared** for theory, practical, internship, seminar, project and all other sessional courses and are placed in the annexure of the detailed curriculum. This closes the earlier observation on the absence of uniform assessment rubrics for laboratory, project and seminar courses.
- **Experiential learning built into the structure:** 960 hours of vocational training/internship (evaluated in Semester VII), a progressive Project-I, II and III sequence (problem formulation → design/experiment → feasibility, economic viability and eco-friendliness), a 630-hour multidisciplinary laboratory (AICTE IDEA Lab, IoT Lab, Computing Lab) and a comprehensive viva voce.
- **Emerging-technology coverage widened** through electives such as Industrial Robotics & Automation, AI & Data Science, Mechatronics, Electric Vehicle Technology, Energy Storage, Fuel Cell Technology, Additive Manufacturing, Finite Element Analysis and Computational Fluid Dynamics, answering the earlier concern on robotics, AI and advanced manufacturing.
- **Employability and skill development:** three industry-partnered value-added courses of 40 hours each (AutoCAD, 3D Printing with FDM, SolidWorks) and eleven courses mapped to employability, entrepreneurship and skill-development outcomes.

- **Transition to GAPC V4.0 handled with traceability:** new and revised syllabi follow the 11-PO framework, while legacy curricula retain the 12-PO format so that past attainment data remain traceable.
- **Community service:** regular exposure of high-school students to Additive Manufacturing, CNC machining and IoT.

Areas of Concern (Shortcomings)

- **PO/PSO attainment is below the set value of 3 in every outcome.** The lowest values are in Project Management and Finance, Ethics, Engineer and Society, Team Work and Modern Tool Usage.
- **Rubrics exist but their use must be demonstrated.** Evidence is needed in course files that rubric scores are recorded for laboratory, project, seminar and internship work, and that they feed into CO and PO/PSO attainment. Rubrics for PO6–PO10 type skills (ethics, teamwork, communication, project management) deserve particular attention.
- **Environment and Sustainability** is no longer a stand-alone PO. Its fulfilment is now to be shown through course, project and activity-level evidence, which is not yet documented systematically (see Remark 3).
- **Research and faculty development** need further strengthening (see Remarks 1 and 2).
- The department should keep a record of the earlier concerns on remedial/enrichment classes, active-learning methods (flipped classroom, problem-based learning), industry-sponsored projects, consultancy, alumni engagement and communication of action taken on feedback, and report their status in the next audit.

Suggestive Note for Improvement

- **PO10 Project Management and Finance (1.47):** add project planning, scheduling and cost estimation to Project-I to III, Engineering Economics and Principles and Practices of Management, with industry case studies and expert sessions. Open electives such as Project Management and Project Planning & Cost Estimation may be encouraged.
- **PO6, PO7 and PO8 (1.55–1.59):** use team-based projects with defined roles and assess individual and team contribution through rubrics; include ethics, societal and environmental impact statements in project and internship evaluation.
- **PO5 Modern Tool Usage (1.76):** strengthen hands-on use of CAD, simulation and automation tools in laboratories and projects, linking them with the value-added courses.
- **PO9 Communication (1.80) and PSO3 (1.85):** introduce technical-writing and presentation practice with rubrics across laboratories, seminar and project courses.
- **PO4 (1.99):** include open-ended experiments and data-interpretation tasks in laboratory courses.
- **Process:** check that the revised CO–PO/PSO mapping gives PO6–PO10 enough courses and assessments; set year-wise interim targets towards the set value of 3 and review whether 3 is realistic; track the same outcomes for the next two years.

Specific Remarks

1. **NPTEL / online courses.** Every faculty member should complete **at least one NPTEL (SWAYAM) course**, preferably with certification, in every academic year, in a subject of his or her teaching or research area or in an emerging area such as AI in manufacturing, EV, additive manufacturing or sustainability. Certificates should be placed in the staff profile file (AE/F2.2).
1. **Research.** The department should raise its research output through more publications in good-quality (Scopus/Web of Science) journals, Ph.D. supervision and completion, sponsored research and consultancy projects, book chapters, and IPR filing (patents and copyrights). Inter-faculty and industry-linked research groups may be formed, and UG projects should be linked with faculty research and aimed at publication. Year-wise targets should be set and reported in files AE/F2.14 to AE/F2.18.
2. **Sustainable Development Goals (SDGs).** The department should map its courses, projects, internships and outreach activities to the UN SDGs and show their fulfilment with evidence. Natural linkages exist with SDG 4 (quality education – school outreach), SDG 7 (affordable and clean energy – renewable energy, energy storage, fuel cell), SDG 9 (industry, innovation and infrastructure – additive manufacturing, automation, robotics), SDG 11 and 13 (EV technology) and SDG 12 (responsible production – eco-friendly project design). An SDG-wise record of projects and activities, with outcomes, should be maintained from the next academic year. This will also serve as evidence for the Environment and Sustainability dimension now integrated into the revised POs.

3. **Attainment.** The fall in PO/PSO attainment compared with 2023-24 is due to the change in the articulation matrices (rationalised mapping) and not to a decline in teaching-learning. The department should nevertheless act on the gaps identified above.

Recommendations

1. The Visiting Team appreciates the department for revising the Vision, Mission, PEOs and PSOs, restructuring the curriculum in line with NEP 2020/NCrF and the 11-PO framework, and preparing rubrics for all types of courses.
2. The department should implement the rubrics uniformly and use them as evidence in CO and PO/PSO attainment, with special focus on PO5-PO10.
3. The CO-PO/PSO articulation matrices, now rationalized, should be maintained on the basis of actual contribution and assessment data, and the change from 2023-24 should be recorded in the attainment report.
4. The NEP/NCrF framework should be completed through multiple entry/exit options, Minor/Honours pathways and clear credit equivalence of internships and multidisciplinary laboratory work.
5. Course codes in the attainment records should be matched with the syllabus.
6. All faculty members should complete at least one NPTEL course every year, research output should be increased, and SDG-wise fulfillment should be documented as detailed in the Specific Remarks.



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Professor & Head

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Copy To:

- The Principal HIT
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- The Dean SOE
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- Prof. Dr. S. Mitra, Professor, Department of Production Engineering, JU, Kolkata.
- All faculty members [by name].....
- Office file

