# Plan for Assessment of Student Learning 2025-2030

## Department of Agricultural and Biosystems Engineering

COLEGIO DE CIENCIAS AGRÍCOLAS
UPR - RUM

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# Introduction

The Department of Agricultural and Biosystems Engineering at the University of Puerto Rico, Mayagüez (UPRM), administers the Bachelor of Science in Agricultural Science with a concentration in Agricultural and Environmental Systems. This program is designed to prepare professionals with the technical skills and knowledge needed to address challenges in agriculture and environmental management.

The Departmental Plan for Assessment of Student Learning outlines the approach to evaluating and enhancing the educational experiences we offer. This plan aligns with the institutional goals of UPRM and focuses on measuring student learning outcomes to ensure that students acquire the competencies necessary for professional and academic success. Through regular evaluation, the department seeks to identify strengths and areas for development in our academic program, contributing to continuous improvement and accountability. This assessment plan also supports departmental goals, ensuring that we meet the evolving needs of students and maintain the quality of our programs in line with UPRM's mission.

# Departmental Mission and Alignment with Strategic Plans

## Department Mission

***To prepare professionals through education and research, and to support society by implementing new knowledge and technology in the fields of agricultural and environmental systems and agricultural engineering.***

## Alignment with UPR Strategic Issues and UPRM Goals

The department's approach to assessing student learning aligns with the strategic priorities of both the University of Puerto Rico (UPR) Strategic Plan 2023-2028 and the UPRM Strategic Plan 2012-2022, ensuring that evaluation of student outcomes supports continuous improvement in academic quality, operational effectiveness, and societal impact. Key areas of alignment include:

1. **Academic Innovation and Student Success**
   In alignment with UPR's Strategic Issue 1, promoting academic innovation to support student success, the department assesses learning outcomes to ensure that students acquire the relevant skills and knowledge needed for professional success. This commitment supports UPRM's goal to lead in higher education by maintaining that student learning reflects industry standards and educational best practices.
2. **Continuous Improvement through Strategic Assessment**
   In alignment with UPR's Strategic Issue 2, which focuses on administrative innovation for process improvement, the department implements a structured assessment process to regularly evaluate and improve student learning outcomes. This approach supports

UPRM's goal to institutionalize a culture of strategic planning and assessment, ensuring that assessment data feeds curriculum adjustments and enhances instructional quality.

3. **Enhancement of Learning through Research Opportunities**
   The department provides students with research opportunities through faculty-led projects, supporting UPR's Strategic Issue 3, which emphasizes research with social commitment. While not embedded directly in the curriculum, these research experiences supplement student learning, contributing to the UPRM goal of strengthening research and creative work and fostering critical thinking and practical skills relevant to agricultural and environmental systems.
4. **Community Impact and Ethical Responsibility**
   Reflecting UPR's Strategic Issue 4, which promotes values and cultural appreciation, the department emphasizes assessing learning outcomes related to ethical responsibility and community impact. This ensures that students are prepared to apply their skills to address the agricultural and environmental needs of Puerto Rican society. This focus aligns with UPRM's goal to positively impact Puerto Rican society, ensuring that students develop as responsible and socially conscious professionals.

# Program Learning Outcomes

## Program Learning Outcomes

The Department of Agricultural and Biosystems Engineering has defined the following Program Learning Outcomes for students in the Bachelor of Science in Agricultural Science with a concentration in Agricultural and Environmental Systems. These outcomes guide the assessment of student learning and ensure graduates are well-prepared to address challenges in agricultural and environmental systems:

- Prepare material and cost estimates for common agricultural structures and electrical installations based on blueprints.
- Recommend machinery that meets the functionality, power, and cost requirements for agricultural applications.
- Analyze the hydrologic cycle and perform calculations to design soil and water management strategies for a catchment area.
- Perform the necessary analysis and mathematical calculations for the selection of appropriate equipment and operating parameters for the processing of agricultural products.
- Design irrigation and drainage systems to optimize crop production.
- Solve practical problems in agricultural and environmental systems by applying acquired knowledge and skills.

## Alignment of Program-Level Outcomes with Course-Level Outcomes

The following table illustrates the alignment between each Program-Level Outcome and specific courses within the curriculum that support these outcomes.

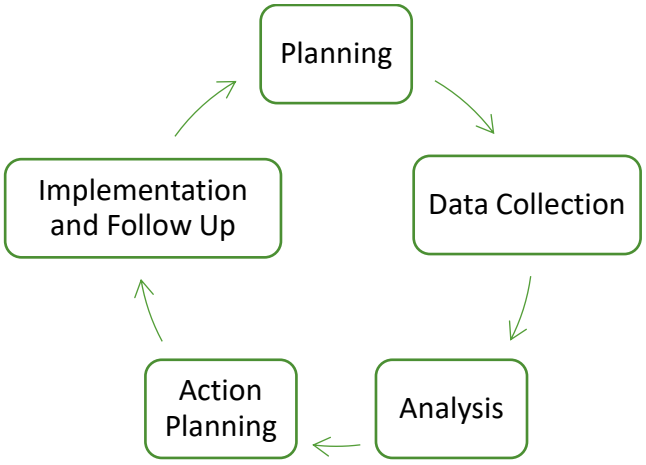
| Program Learning Outcome | Course | Course Description |
|---|---|---|
| Prepare material and cost estimates for common agricultural structures and electrical installations based on blueprints. | **SAGA 4048** Farm Buildings | Discussion of construction planning principles and procedures, functional requirements, and the selection of construction materials in main agricultural structures. |
| | **SAGA 4505** Electrotechnology | Fundamentals of the usage of electric materials for the application of electrical energy in agricultural systems and housing. A project is required on the planning and execution of an electrical installation. |
| Recommend machinery that meets the functionality, power, and cost requirements for agricultural applications. | **SAGA 4041** Agricultural Tractors and Machinery | Analysis of the principal components, operation and maintenance of tractors and agricultural machinery. Safety rules, power requirements, calibration and cost use of the tractors and the main agricultural machines will be evaluated. |
| Analyze the hydrologic cycle and perform calculations to design soil and water management strategies for a catchment area. | **SAGA 4335** Soil and Water Management | Soil-water-plant relationships; soil erosion and its control, principles and practice of irrigation and drainage of farm lands; land improvement by means of mechanical procedures, or structures for soil and water management and conservation. |
| Perform the necessary analysis and mathematical calculations for the selection of appropriate equipment and operating parameters for the processing of agricultural products. | **SAGA 4129** Agricultural Products Processing | Unit operations, equipment, techniques and processes used in handling and preparation of farm products for marketing, utilization and storage. |
| Design irrigation and drainage systems to optimize crop production. | **SAGA 4319** Farm Drainage and Irrigation | Principles of irrigation and drainage of farm lands. Drainage systems, sources of water supply, water quality, irrigation distribution systems through gravity, sprinkler or trickle. |
| Solve practical problems in agricultural and environmental systems by applying acquired knowledge and skills. | **SAGA 4008** Agricultural and Environmental Systems Practicum | Practical professional experience in agricultural and environmental systems. It is carried out under the supervision of the department in collaboration with public or private entities. |
| | **SAGA 4036** Seminar in Agricultural and Environmental Systems | Reviews, study, and discussion of the latest developments and work experiences in the field of agricultural and environmental systems. |

# Assessment Process and Methods

The Department of Agricultural and Biosystems Engineering follows a structured assessment process to evaluate and improve student learning. This process includes specific phases to measure student outcomes and guide program adjustments. An assessment calendar, with timelines and responsibilities, is included in the appendix.

## Assessment Process

The assessment process operates on a continuous (annual) cycle, involving the following stages:




**I. Planning**

At the beginning of each cycle, the Department Chair and the Assessment Committee identify the learning outcomes to be assessed. An assessment plan is developed to align course-level outcomes with program-level objectives, and benchmarks are set to measure student performance. The assessment calendar is then shared with faculty to organize data collection and reporting.

**II. Data Collection**

Faculty collect data using direct and indirect methods, following the assessment calendar. Direct methods include exams, projects, lab work, and practicum evaluations, while indirect methods involve surveys, alumni and employer feedback, and exit interviews. The Department Chair, in collaboration with the Assessment Committee, ensures timely and accurate data collection.

**III. Data Analysis**

The Assessment Committee compiles and reviews data to determine how well students meet targeted outcomes. This analysis identifies strengths and areas for improvement, with findings shared with faculty for input.

**IV. Action Planning**

Based on analysis, the Assessment Committee and Department Chair outline steps to improve areas of student performance, which may include adjustments to curriculum or teaching methods among others. These actions are documented and communicated to faculty.

**V. Implementation and Follow-Up**

Faculty implement recommended changes, with the Department Chair and Assessment Committee monitoring to ensure alignment with intended outcomes. Follow-up assessments in the next cycle evaluate the impact of these changes, supporting continuous improvement.

## Assessment Methods

The department uses both direct and indirect assessment methods to gain a clear understanding of student learning and to support continuous improvement.

### *Direct Assessment Methods*

- **Examinations and Quizzes:** Assess understanding of key concepts and technical skills in core courses.
- **Projects and Reports:** Evaluate students' ability to apply theoretical knowledge to practical problems.
- **Lab and Fieldwork Assessments:** Measure hands-on skills and the application of knowledge in real-world contexts.
- **Practicum Reports and Supervisor Evaluations:** Completed during the final year, this experience demonstrates students' integration of knowledge across program outcomes.
- **Rubrics:** Approved rubrics are used to evaluate student performance on core competencies.

### *Indirect Assessment Methods*

- **Student Surveys:** Collect feedback on students' perceptions of their learning, including strengths and areas needing improvement.
- **Alumni and Employer Feedback:** Gather insights to ensure that the curriculum aligns with current industry standards and employer expectations.
- **Exit Interviews:** Conducted to graduating students to understand their overall experience in the program and to identify potential areas for improvement.

The Departmental Assessment Committee, in collaboration with the Department Chair, designs the instruments required for gathering data as outlined in this plan, which will be included in the appendix of this document.

# Reporting and Utilization of Results

Assessment results are regularly reviewed and applied to strengthen student learning and improve program quality. This section outlines how findings are reported and used to guide adjustments in curriculum, teaching methods, and program effectiveness.

## Reporting Results

Assessment results are documented and shared to inform faculty and guide improvements. Reporting methods include:

- **Annual Assessment Report:** At the end of each cycle (e.g., during the first semester of the academic year), the Assessment Committee prepares an Annual Assessment Report with summaries of data, trends, key findings, strengths, and areas for improvement. This report is reviewed by the Department Chair and shared with faculty for feedback and discussion about possible adjustments to improve student learning outcomes.
- **Five-Year Evaluation Report:** Every five years, a full evaluation of the academic program and curricular sequence is conducted to assess long-term effectiveness. The Five-Year Evaluation Report provides a detailed summary of assessment activities, results, and actions taken over multiple cycles, along with feedback from students, alumni, and employers to keep the program aligned with its goals and industry needs. Findings from this report are shared with faculty, the Department Chair, Academic Deans, and university committees to support planning and program updates.
- **Updates to Stakeholders:** When needed, summaries from assessment reports are shared with employers and alumni to ensure the academic offerings alignment with industry needs.

## Utilization of Results

Findings from the assessment process guide actionable improvements in the following areas:

- **Curriculum/Course Adjustments:** Results may identify areas where curriculum/course content needs expansion or revision to better support program-level learning outcomes and stakeholders.
- **Teaching Methods and Resources:** Based on assessment findings, faculty may adjust teaching methods or include new resources to support areas where students could benefit from additional instruction.
- **Facilities and Equipment:** When assessment results indicate a need for additional support for practical learning, the department prioritizes improvements to facilities and equipment. This may involve upgrading lab equipment, improving workspace, or updating technology to ensure students have the tools needed for hands-on learning.
- **New Courses, Curricular Sequences, and Minors:** Findings from the assessment process may reveal opportunities to introduce new courses, curricular sequences, or minors that

align with current trends and student interests, helping keep the program updated and responsive to student needs.

- **High-Impact Experiences:** Assessment results can be used to develop high-impact experiences, such as internships, research projects, and community-based learning opportunities, that support student learning and professional development.
- **Continuous Improvement Cycle:** Adjustments based on assessment results are tracked and reviewed in subsequent cycles to measure their impact on student learning. This ongoing feedback loop enables the program to assess the effectiveness of improvements and make further refinements as needed.

# Faculty and Student Engagement

Effective engagement of faculty and students is central to the success of the Department's assessment plan. Faculty and students participate in various roles and stages throughout the assessment cycle, contributing valuable insights and feedback that drive continuous improvement.

## Faculty Engagement

Faculty members are actively involved in the assessment process in the following ways:

- **Defining and Aligning Outcomes:** Faculty work collaboratively to define program learning outcomes and ensure they align with course-level objectives. Their input is essential in maintaining academic rigor and relevance in the curriculum.
- **Data Collection and Reporting:** Faculty are responsible for implementing assessment methods within their courses, collecting relevant data through exams, projects, practicum evaluations, and other tools. They also report assessment data following the guidelines set out in the department's assessment calendar.
- **Analysis and Interpretation:** Faculty members contribute to the interpretation of assessment results, identifying patterns and trends in student performance. Their expertise in their subject areas allows for a nuanced analysis that is crucial to identifying specific strengths and areas for improvement.
- **Developing and Implementing Action Plans:** Based on assessment findings, faculty participate in developing action plans to enhance student learning. This may involve curricular adjustments, updating teaching strategies, or recommending facility and equipment upgrades.
- **Continuous Improvement:** Faculty plays an ongoing role in monitoring and refining the assessment process. Their engagement in periodic faculty meetings ensures that the assessment plan remains responsive to student needs and aligns with institutional goals.

### Student Engagement

Student involvement in the assessment process provides insight into their educational experience and helps to tailor the program to better meet their needs. Key areas of student engagement include:

- **Providing Feedback through Surveys and Exit Interviews:** Students participate in surveys, exit interviews, and other feedback mechanisms that allow them to share their perspectives on the program, including areas of strength and areas for growth.
- **Engagement in High-Impact Experiences:** Students are encouraged to participate in internships, research projects, and practicum opportunities that contribute to their development of program-level competencies. These experiences are often assessed through reports and evaluations, providing additional data on student learning outcomes.
- **Role in the Assessment Cycle:** Through feedback mechanisms and participation in experiential learning activities, students contribute data that are critical to understanding the effectiveness of the curriculum. This engagement allows the department to continuously refine academic offerings to better serve future students.

## Resources and Support

Implementing the Departmental Plan for Assessment of Student Learning in Agricultural and Biosystems Engineering requires essential resources and support from the institution. These resources ensure that faculty and students are equipped to participate fully in the assessment process, fostering a culture of continuous improvement.

### Faculty Development and Training

- **Workshops and Seminars:** Faculty are encouraged to participate in workshops and seminars focused on assessment methods, data interpretation, and curriculum design. These professional development activities help build a shared understanding of assessment goals and strategies across the department. These are provided by the Center for Professional Enrichment (CEP) and the General Library among others.

### Facilities and Equipment

- **Laboratory and Field Resources:** To support hands-on learning and the assessment of practical competencies, the department maintains well-equipped laboratories and field sites. Regular updates to lab equipment and technology are prioritized based on assessment findings, ensuring that students have access to industry-relevant tools.
- **Computing Resources:** Activities involving data analysis, simulations, or specialized software are supported through the university's computing resources, including high-capacity computers and relevant software in the department's Computer Center.

### Technological Tools for Assessment

- **Data Analysis Software:** Access to data analysis software enables faculty to efficiently review assessment results, identify trends in student performance, and make informed decisions about curriculum adjustments.

### Administrative and Institutional Support

- **Departmental Assessment Committee:** The Assessment Committee, comprising faculty members, provides ongoing support and oversight for the assessment process. This committee organizes assessment activities, reviews results, and collaborates with the Department Chair to implement improvements as needed.
- **Office of Institutional Planning, Research and Improvement (OPIMI):** OPIMI provides essential data resources, including dashboards with student information on graduation rates, retention, and placement. These insights are valuable for monitoring program effectiveness and guiding improvements aligned with institutional goals.

## Continuous Improvement and Review of the Plan

To keep the Departmental Plan for Assessment of Student Learning effective and aligned with departmental and institutional goals, it undergoes a regular review process. Each year, the Assessment Committee and the Department Chair evaluate the plan's effectiveness, make any necessary adjustments, and submit the revised plan for departmental review and approval.

The plan will be updated as needed to align with the Missions and Strategic Plans of UPRM and the College of Agricultural Sciences, ensuring that assessment practices reflect both departmental objectives and broader institutional priorities. This process includes gathering faculty feedback and using assessment results to guide improvements. The department also maintains records of all assessment activities to track progress over time and support ongoing refinement.

# Appendixes

## Appendix A: Assessment Calendar

| Stage | Activity | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Planning** | Faculty define course assessment interventions | X | | | | | X | | | | | X | |
| | Assessment Committee identify the learning outcomes to be assessed in the current cycle | X | | | | | | | | | | | |
| **Data Collection** | Faculty collect course assessment data | | X | X | X | | | X | X | X | | X | X |
| | Faculty submits course results to assessment committee | | | | | X | | | | | X | | X |
| | Assessment Committee defines the indirect methods to be used in the current cycle | | X | X | X | X | | | | | | | |
| | Assessment Committee executes indirect measurements for the current cycle | | | | | | X | X | X | | | | |
| | Assessment Committee prepares report of indirect measurements of the current cycle | | | | | | | | | X | X | | |
| **Analysis** | Assessment Committee compiles and reviews reported data from previous cycle | X | X | | | | | | | | | | |
| | Assessment Committee identifies and reports strengths and areas for improvement from previous cycle | | X | X | X | | | | | | | | |

| Stage | Activity | Aug | Sep | Oct | Nov | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Action Planning** | Assessment Committee submits report to Department Chair outlining the recommended steps to improve areas of student performance based on previous cycle data | | | | X | | | | | | | | |
| | Department Chair shares improvement plan with faculty | | | | | X | | | | | | | |
| **Implementation and Follow Up** | Faculty implement recommended improvements and reports changes to the Assessment Committee | | | | | | X | X | | | | | |
| | Assessment Committee summarizes implemented improvements and documents the closure of the assessment cycle (previous year) | | | | | | | X | X | X | | | |
| | Assessment cycle (previous year) report presented to faculty and submitted to Department Chair | | | | | | | | | X | X | | |