

Academic Assessment Plan

(M.S., Ph.D. / Microelectronics-Photonics)

(M.S. Materials Science, M.S. Materials Engineering, Ph.D. Materials Science & Engineering)

2022 Calendar Year Report

Program Goals

- 1. Provide students with interdisciplinary education and training in engineering and science to meet the needs of emerging technology industries.**
- 2. Place students in interdisciplinary groups performing rigorous and challenging research to prepare them for careers in industrial research teams, national labs, and academic positions.**
- 3. Prepare students to be effective in technology management and entrepreneurship.**

Student Learning Outcomes

- 1. Conduct independent investigations (M.S.) or define and explore new areas of research (Ph.D.) in an interdisciplinary environment. The outcome of their graduate education will be a better understanding of materials and their properties; processes for producing materials and modifying their properties; creation of devices and systems with features enabled by this manipulation of material properties; and the economics that affect successful introduction of these devices and systems into industry and society.**
- 2. Master knowledge, practices, and skills from traditional graduate level programs in Physics, Chemistry, Electrical Engineering, Chemical Engineering, Mechanical Engineering, Biological Engineering, and Biomedical Engineering, regardless of prior traditional educational background.**
- 3. Communicate effectively deep level knowledge of their work to persons well-versed in their field, detailed technical concepts to persons with strong technical backgrounds outside of their field, and general concepts and applications to the general public.**
- 4. Work efficiently in interdisciplinary team environments, fully supporting team goals through active membership or through team leadership as appropriate.**

5. **Implement intellectual property management and research commercialization processes, encouraging migration of ideas from formulation to societal benefit during their professional careers.**
6. **Execute duties found in entry-level professional positions with the operational skills equivalent to at least one year's experience in that position.**
7. **Embrace the role of citizen-scientist in both their professional and societal communities, utilizing their sound ethical and analytical backgrounds, to lead the discussions that will be needed to balance what can be done with what should be done.**

Process for Assessing each Student Learning Outcome

1. **Ph.D. Candidacy Exam Process (Direct): This process addresses the Ph.D. level knowledge portion of outcomes 1 and 2, communications requirements of outcome 3, IP and the commercialization aspects of outcome 5, and professional behaviors found in outcomes 6 and 7. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.**

The MicroEP / Materials Science and Engineering (MSEN) Ph.D. candidacy process consists of a formal written research proposal ~15 pages in length that is similar in nature to an NSF proposal. It is written in strong collaboration with the major professor and must be presented and approved by the student's Ph.D. committee at the end of the formative stage of the research definition but well before the student is deep into the execution stage of the research. It is designed to assure that the field of the research is well understood by the student, that the proposed research topic has sufficient depth and breadth to demonstrate Ph.D. level professional work, and that the research has a reasonable chance of completion within four years after being accepted as a Ph.D. student after completion of a MS degree.

Data Collection and Analysis:

Candidacy Research Proposal and Students Admitted to MicroEP/MSEN PhD Candidacy, 2022 Calendar Year

Number of Students Presenting Candidacy Research Proposal / Number Accepted = 7

Number of Students Admitted to Candidacy = 7

Assessment:

- The candidacy exam process continues to provide a good assessment of the student's capability to meet the requirements of PhD level research.

- The MicroEP/MSEN director and the student's dissertation committee reviews the candidacy research proposals and attends the research candidacy presentations. Constructive feedback is given to the students regarding strengths and areas for improvement as needed. If the students' faculty chair, dissertation committee, and/or the MicroEP/MSEN director feel that sufficient detail is not proposed/presented, the student will be asked to improve upon the proposal and present a second time (typically within 1 month of the first attempt). If the student does not reveal the necessary improvement, they will not be admitted as Ph.D. Candidates.
- In 2022, Associate Director/Director Dr. Matt Leftwich conducted a series of candidacy exam preparation sessions with the students scheduled to participate in the candidacy exam. These sessions provided an in-depth introduction to the requirements of the exam, reviewed best practices in preparing for and taking the candidacy exam, and provided guidance to students to take steps in advance to prepare themselves for the candidacy exam. Examples included preparing a schedule for the exam in advance; notifying those potentially affected of the process; developing proficiency with a reference/citation manager; increasing familiarity with library and research resources available on campus; reviewing previous candidacy exam questions; drafting an outline of a response to an anticipated question; improving oral and written communication skills; and discussion of professional responses to input from evaluators.
- We anticipate making continual improvements to the training documents and templates as students and faculty feedback continue to guide the evolution of the MicroEP/MSEN candidacy exam process.

2. Curriculum and career advising each semester at pre-registration (Indirect): This process addresses outcomes 2, 4, and 6. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.

This formal advising process gives an opportunity to discuss with the student such things as their academic performance in the prior semester, how they are working with their professor and their research group members, and what is affecting their ability to make satisfactory progress on their research. All students are advised by Director Dr. Matt Leftwich and co-advised by their major professor.

Data Collection and Analysis:

14 MS and 31 PhD students were advised for Spring 2022.

16 MS and 32 PhD students were advised for Fall 2022.

Assessment:

The advising process is helpful to the program director to get to know the students better and to track the progress of the students, or address issues, toward completing their degree requirements. It is also used as a time to check milestones including their research document (3-5 page description of their intended research initially signed by their committee and updated each semester by the student and approved by their major professor), committee form, title form, annual reviews, and reminders of dates for their candidacy research proposal (if Ph.D. students).

3. Small Group Student Meetings (peer assessment and mentoring) (Indirect): This process addresses outcomes 3, 4, 6, and 7. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.

These peer mentoring groups are led by senior MicroEP/MSEN students, and participation is required for all MicroEP/MSEN students during their first two years in the program. The groups are required to meet four times per semester in conjunction with the students' professional practice seminar courses. However, they typically end up meeting an additional two to four times each fall and spring semester and focus on how to effectively communicate to other students that are not already familiar with the work. In this way, they practice communicating with young professionals unfamiliar with their field and have an opportunity to discuss operational problems with their peers and receive feedback on their way of handling the problems. They are also taught the use of MS Project and 3-min / 12-min presentation formats that are modeled after federal program project update procedures.

Data Collection and Analysis:

Spring 2022:

17 first and second year students in four Small Group Teams met four times.

Attendance (excluding illness, conference travel, and candidacy) = 100%.

Fall 2022:

23 first and second year students in four Small Group Teams met four times.

Attendance (excluding illness, conference travel, and candidacy) = 100%.

Assessment:

The Small Group Leaders teach the students to use MS Project to map out their key project as a graduate student – meeting the requirements to get their graduate degree. Each student's MS Project file must be updated and submitted to MicroEP/MSEN management once in the fall

semester and once in the spring semester. The students' completed MS Project summary of their graduate program path is included as an appendix in their thesis/dissertation.

The students also prepare, and practice presenting their research to their small group team and are coached by their small group leader. Each small group rotates presenting their research at monthly Research Communication Seminars (four per semester) to all MicroEP/MSEN students. This practice improves the student's public speaking skills and prepares them for conference presentations, oral defense of candidacy exams, defense of their thesis/dissertation, and becoming effective communicators throughout their careers.

- 4. Use of Microsoft Project software (Indirect): This software usage addresses outcomes 4 and 6. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.**

One large predictor of professional success is the ability to plan your work such that you have no downtime during the day. All students in their first two years must use Microsoft Project software for their research planning to help them learn the time management and project management practices they will need in their early careers.

Data Collection and Analysis:

All MicroEP/MSEN graduate students learn the use of Microsoft Project in their Small Group teams (see Student Learning Outcomes Process #3). 17 students learned use of MS Project in Small Group teams and how to develop their 'Degree Project Plan' in spring 2022 and 23 students in fall 2022. Except for their first full month in the program, students in their first two years in the program are required to submit their updated MS Project plan monthly to MicroEP/MSEN program management. This submission is part of their grade for the Operations Management seminar grades.

Assessment:

This methodology is fully integrated into the MicroEP/MSEN graduate program and helps the students understand what is needed to complete their graduate degree (and helps drive conversations with their major advisor or MicroEP/MSEN program director when it is not). The students include their completed MS Project plan summary as an appendix in their thesis or dissertation. Program alumni and employers alike frequently provide feedback regarding how this skill clearly and positively distinguishes MicroEP/MSEN graduates from most new hires from other STEM graduate degree programs.

5. Research Communications Seminars (Indirect): This process addresses outcomes 3, 4, 6, and 7. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.

Monthly seminars are held to update the students on the MicroEP/MSEN announcements, news, events, and recognition. Students in the first two years of the MicroEP/MSEN program also present their research to their peers at these seminars. These one hour and 30 min seminars are held the first Monday evening of each month during the spring and fall semester. Attendance is required for all MS students in their first four semesters and all PhD students in their first five semesters (unless they completed the sequence during their MS).

Data Collection and Analysis:

Spring 2022:

Three research communication seminars were held.

Attendance of MS students in their first three semesters = 100%*.

Attendance of PhD students in their first five semesters = 100%*.

Fall 2022:

Four research communication seminars were held.

Attendance of MS students in their first three semesters = 100%*.

Attendance of PhD students in their first five semesters = 100%*.

* Students who miss a seminar are required to attend a thesis or dissertation defense or other technical seminar authorized by the MSEN 5611/6611 course instructor (Dr. Morgan Ware).

Assessment:

Students in the four Small Groups give two types of presentations – a 3-minute (elevator pitch) presentation and a 12-minute conference-style presentation. This gives them valuable experience in learning how to present their research at the level appropriate for their audience. The group leaders implemented an evaluation procedure for 12 minute and 3-minute presentations. For 3-minute presentations, all the students in the group which present 3-minute presentation for next month will evaluate with written comments and provide them to the current month presenters. For the 12-minute presentations, the 3-minute presenters of the current month (who will be giving their 12-minute presentations the following month) will evaluate and send their feedback to the presenters. Feedback is submitted via Blackboard for ease of review and record keeping.

- 6. Small Group Leader meetings (Indirect): This process addresses outcomes 4, 6, and 7. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.**

Senior MicroEP/MSEN students that lead these small groups experience their first taste of administrative responsibility, performance assessment and feedback, and management team discussions as they find common issues of concern from the different Small Groups. They have the responsibility to not only assess and prioritize common issues and the responsibility to propose and help implement program changes needed to address the issues. These '22 meetings were facilitated by Associate Director Dr. Ware.

Data Collection and Analysis:

MicroEP/MSEN program management met with Small Group Leaders on January and August to share best practices, discuss and implement new initiatives among the students, and gain support among these student leaders to affect these changes. In addition, to teaching soft skills in these small group meetings, community service is also advocated. Service initiatives for 2022 included a clean-up of our adopted section of the Razorback Regional Greenway Trail in May '22 and October '22. Approximately 14 MicroEP/MSEN students and faculty volunteered to participate in the event, and it was followed by lunch at Grub's.

Assessment:

The Small Group Team concept is working as intended giving senior MicroEP/MSEN students an opportunity to develop their leadership skills and more direct access to the program management to explore and implement new initiatives to help other students in the program with their professional and academic development.

- 7. Annual student academic reviews (Indirect): This process addresses outcomes 1, 2, 3, 4, and 6. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.**

An annual review process was established by the Graduate School several years ago that is designed to tell the student if they are making satisfactory research and academic progress toward their degree, or if they are not. The MicroEP/MSEN grad program expanded the feedback forms significantly to allow the major professor to separately address the quantity and quality of a student's work in many different performance attributes including academic progress, interaction with professor, interaction with other students, laboratory work, research documentation, thesis/dissertation progress, and research planning. The student fills out a self-assessment and then brings that document with him/her to the meeting with the major professor, which gives the

student practice in how to align their self-assessment of their work to their direct supervisor's assessment. All review forms are then reviewed by Associate Director Dr. Panneer Selvam to both create a program wide composite view and to identify any students that need further program level performance review before the forms are forwarded to the Graduate School.

Data Collection and Analysis:

Annual student academic reviews were received from 38 students in 2022. Performance reviews were expected from 38 students with 7 students not expected to submit because they were either distance education students and/or students in the program for less than one year.

Assessment:

The annual student academic review serves its intended purpose of identifying academic performance issues as well as differences in academic performance perception between the student and their major professor. These differences can facilitate a useful discussion during the review meeting.

The level of participation in this process remains relatively high (100% in '22, 93% in '21, 95% in '20, and 90% in 2019).

- 8. Formal Exit Interviews with all graduates (Indirect): This process addresses all outcomes. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.**

While the MicroEP/MSEN program receives student feedback through many channels, as a result of feedback from external reviewers during the first program review a formal exit interview policy was implemented and a script was created to help guide the interview. Associate Director/Director Dr. Matt Leftwich performs these exit interviews; then the forms are scanned and stored in both electronic forms.

Data Collection and Analysis:

Exit interviews were conducted by Dr. Leftwich with 11 of 11 students who graduated from the program during the 2022 calendar year. Participating in the exit interview has now been formalized as a requirement after final sign-off of the student's record of progress. Four of the graduates were MS students that remained in the program for their PhD work.

Assessment:

The students generally reflect positively on the unique and interdisciplinary nature of the MicroEP/MSEN program. Students appreciated belonging to a cohort and participating in the community culture of the program, e.g., the summer camp, seminars, presentations to peers and

service activities. Students also provided positive comments regarding the entrepreneurial and business development aspects of the MicroEP/MSEN program. In particular, students appreciate becoming familiar with organizational tools, e.g., Microsoft Project, that increase their productivity, Microsoft PowerPoint, to improve their presentation quality, and the courses that utilize those tools to aid in the development of communication skills that are critical to their success. Many students report getting positions in the microelectronics industry. Some students comment on the difficulty of obtaining jobs specific to the “Microelectronics-Photonics” disciplinary areas, the majority of which consist of international students, which has partly prompted and been remedied by its evolution into the MSEN Graduate Program. Specific to MicroEP/MSEN, students suggested providing a framework that supports incoming and matriculating students in meeting all requirements of the program, graduate school, and university on the way to graduation. Most of the criticisms are associated with individual students’ personnel experiences on campus, with some departments, some faculty, and/or one or more of the educational tools utilized for particular courses that did not sit well with them. These criticisms are few and far between and typically are unique cases that do not point to systemic or MicroEP/MSEN-wide problem areas. For example, one student commented on the lack of value in the required Design for Experiments course due to it being less relevant to those conducting theoretical (modeling/simulation) studies. A frequent comment that is received and understandable in many cases is regarding how demanding faculty are of their RA/GAs. There were mixed comments on the value of the University Career Center regarding aiding in determining career direction and/or opportunity, resume assistance, etc.; or they did not use the Career Center in that capacity. Many comment on how much they like the Northwest Arkansas academic and entrepreneurial environment, especially those that have had experience as interns and/or employees of one of the local high-tech startups and/or small businesses in the area.

- 9. M.S. and early-stage Ph.D. Research Document (Direct): This process addresses outcomes 1 and 3. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.**

All early stage MicroEP/MSEN students are required to create a research description document to both help them fully understand their proposed research and to assist in communicating the goals and limits of their proposed research with their committee members. It is updated each semester with progress made and current issues hampering progress. When a Ph.D. student completes the Ph.D. Candidacy Research Proposal, this document is no longer required.

Data Collection and Analysis:

In 2022, Director Dr. Leftwich met with incoming graduate students to introduce the research document, describe its purpose as a tool to establish goals and expectations, guide research activities, and provide continuous feedback regarding research results. Each section of the research

document was discussed in detail. Dr. Leftwich met individually with each graduate student as they prepared their research document to provide feedback and guidance in completing the review as well as establishing and communicating their research direction.

Research documents were received from 15 of 19 MS and PhD students in Spring 22, and 20 of 22 MS and PhD students in Fall 22.

Assessment:

The initial research document drafts were reviewed by Dr. Leftwich and the student's major advisor. Once all suggested edits are implemented, the document is approved and signed by the student's major professor, committee, and a member of the MicroEP/MSEN management team. Subsequent updates, submitted each Fall and Spring semester, are reviewed and signed by the major professor and the MicroEP/MSEN management team. This helps document the student's progress on their intended research – through completion for MS students and, for PhD students, until the candidacy research proposal is approved by their committee.

10. Research Commercialization course MEPH 5383 (Indirect): This course addresses outcomes 3, 4, 5, and 7. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.

This course, taught by Director Dr. Matt Leftwich (but not offered Spring '22 or Spring '23 due to lack of students ready for the course and lack of enrollment), will be offered again in Spring '24 with sufficient numbers to break-up into three - four teams (at least four students per team). This is a core requirement of both the MicroEP/MSEN M.S. and Ph.D. curricula, and leads the student teams through the full process of commercialization of research (via a mock Phase 2 SBIR/STTR structured proposal and commercialization pitch presentation). It is a team-based course that requires development of a commercialization plan for an on-campus related research and extensive presentations on that work to the class. Three to four teams are created from at least four students and each team will focus on a Phase 2 product development and commercialization proposal (emulating the Phase 2 SBIR/STTR requirements).

Data Collection and Analysis:

Research Commercialization (MEPH 5383) was not offered during Spring '22 (or Spring '23) due to insufficient enrollment. It will be offered again in Spring '24.

Assessment:

The course gives students an exposure to the entrepreneurial process of commercializing research. This helps prepare the students for the MicroEP/MSEN PhD written candidacy exam as well as

providing insight into the research commercialization process for those who may consider an entrepreneurial career path. Several local entrepreneurial ventures have been started by graduates of the MicroEP/MSEN program.

11. Operations Management seminar courses MEPH/MSEN 5811/5911/6811/6911 and Materials Engineering Design (and Proposal Writing) MEPH 6323 (Indirect): This five semester course sequence addresses outcomes 6 and 7. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.

This is a required core course sequence for every MicroEP/MSEN student and is designed to introduce aspects of management of a technical group in a high-tech workplace.

Data Collection and Analysis:

MSEN 5811 (Operations Mgmt: Infrastructure Management) Fall 2022: 16 students enrolled.

MSEN 5911 (Operations Mgmt: Personnel Management) Spring 2022: 7 students enrolled.

MSEN 6811 (Operations Mgmt: Management&Leadership I) Fall 2022: 3 students enrolled.

MSEN 6911 (Operations Mgmt: Management&Leadership II) Spring 2022: 6 students enrolled.

MSEN 6323 (Materials Engineering Design (and Proposal Writing)) Fall 2022: 5 students enrolled.

Assessment:

The operations management seminars, taught by Director Leftwich (Spring and Fall '22), provide students in the interdisciplinary MicroEP/MSEN graduate program with an insight into organizational, personnel, and management topics and issues typically encountered in the corporate world which most STEM graduates receive no, or little, exposure to until they make the sudden and rather dramatic change to an engineer or scientist hired into industry. These seminars help prepare the graduates for this transition and improve the likelihood of making a favorable impression as they start their new careers. A portion of the seminars is also allocated to improving the students' resumes using resources brought in from the UA Career Development Center. The students also present the MS Project plan, 3-min/12-min presentations, and Research Quad Charts for completing their degree requirements as a means of 'best practices' sharing.

The Materials Engineering Design (and Proposal Writing) course is taught by Director Leftwich. The course introduces factors that affect proposal success in both the academic and industrial arenas; demonstrates different approaches to writing successful proposals; and introduces students to the legal responsibilities and ramifications of proposal management. As part of the MicroEP-to-MSEN

transition, the course has been modified to include a system-level design aspect, and an additional credit hour (3 hr vs. 2 hr) has been designated for the revised course.

12. Ethics course MEPH 5821 (Indirect): This course addresses outcome 7. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.

This is a required core course, taught by Professor Ken Vickers, for every MicroEP/MSEN student, and is designed to prepare MicroEP/MSEN graduates with discussions of alternative actions that may be taken in many typical ethically uncomfortable positions that may arise in the technology workplace.

Data Collection and Analysis:

Ten MicroEP/MSEN graduate students and nine Physics REU students were enrolled in MEPH 5821 – Ethics for Scientist and Engineers – in summer 2022.

Assessment:

In this class, the students learn about famous examples of unethical practices and decisions which led to engineering catastrophes such as the Challenger disaster, about understanding what plagiarism is and how to avoid it, and about appropriate and ethical authorship of research papers.

13. M.S. Thesis preparation and defense (Direct): This process addresses outcomes 1, 2, 3, and 5. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.

The M.S. thesis work and documentation demonstrates both a student's skills and knowledge and is often the first major professional work done by the student where he/she has the responsibility to both guide the work and overcome whatever obstacles arise. We see this as the demonstration vehicle of the student demonstrating through achievement that they are now professionals. The MicroEP/MSEN program requires all Ph.D. path students that enter the MicroEP/MSEN program after the B.S. degree to complete a thesis-based M.S. MicroEP/MSEN degree before being admitted as a Ph.D. student. The thesis is first used to assess a student's capability for independent work and analysis and then used as a career guidance tool. In this sense the M.S. thesis is part of the Ph.D. candidacy process as well.

Data Collection and Analysis:

Spring 2022 – 1 MS thesis graduate.

Summer 2022 – 3 MS thesis graduates.

Fall 2022 – 1 MS thesis graduate.

Assessment:

N/A.

14. Ph.D. Dissertation preparation and defense (Direct): This process addresses outcomes 1, 2, 3, 4, 5, and 7. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.

A student completing a Ph.D. dissertation has a responsibility to have created a new field of investigation, performed a meaningful investigation, performed analysis to tie current work to prior theory, examined the societal and commercial potential of their work, and found a way to communicate deep level knowledge in an understandable fashion to their committee and public.

Data Collection and Analysis:

Spring 2022 – 2 PhD graduates.

Summer 2022 – 2 PhD graduates.

Fall 2022 – 2 PhD graduates.

Assessment:

N/A.

15. Industrial Advisory Board (IAB) (Indirect): This board meets annually and addresses outcomes 2, 3, and 7. Assessment of the report year will begin on January 15th of the following year and results will be reported by May 1st.

The IAB is comprised of proven professionals in companies that have a strong interest in the MicroEP/MSEN fields of research, including several early graduates from the MicroEP program. During its annual meeting it reviews program attributes and gives feedback on proposed changes, as well as having the authority to propose changes to the program from their own intuitions or observations. During the annual meeting, selected students present their research in progress to

the IAB and discuss the societal implications of their work with this group of outside professionals. The meeting was conducted over the entire day on Friday, October 28.

Data Collection and Analysis:

The Industrial Advisory Board meeting was held October 28, 2022 with eight board members from industry attending plus previous MicroEP program directors, Prof. Ken Vickers and Dr. Rick Wise. Five students participated in the online 3-min thesis contest held from 11:30 am to noon.

Mike Seacrist, Senior Fellow from SundEdison Semiconductor, serves as the board chair. And Dr. Douglas Hutchings was elected to serve as the new President for 2023. Dr. Greg Salamo (PHYS) informed the IAB of the recent \$194.7M grant to the UA to establish I3R and that Materials Science and Engineering will be one of the focus areas of the Institute. The grant also includes funding for entrepreneurship education. Dr. Hugh Churchill (PHYS) presented an update on the NSF Quantum Leap Challenge Institute for Disruptive Quantum Technology Platforms proposal. Dr. Fisher Yu (ELEG) gave an update on the DOD MURI on SiGeSn alloys for infrared devices. Dr. Matt Leftwich gave the MSEN graduate program update and three new faculty introduced themselves and shared their faculty information quad chart.

Assessment:

The Industrial Advisory Board continues to provide a valued service to the MicroEP/MSEN graduate program in assessing the academic coursework, research, and processes used to prepare the students to compete and contribute in high-tech industry. The board members provide the program with good contacts to industry and serve as role models for the students.

Key feedback from the IAB for consideration by the MSEN Management team:

1. Presentation of 5-year plan for MSEN and the program benchmarking were well received. IAB looks forward to those being reviewed in future meetings.
2. Pleased that enrollment is increasing. Student recruiting discussion included targeting on-campus undergrads, REU, continued focus on domestic students, and providing recruiting packets/brochures to program alumni and IAB.
3. Impressive funding in areas including SiGeSn, SiC, Quantum Foundry, and I3R. Possibility to further capitalize on new initiatives in US semiconductor research through CHIPS Act.
4. IAB appreciates the excellent research area updates including SiC fab, SiGeSn and Quantum Foundry. IAB suggests that SiC foundry have a plan on how to involve MSEN students in a hands-on / meaningful fashion alongside the technician workforce.
5. The 3 minute student presentations were excellent. The IAB ranking was 1) Thomas, 2) Katie, and 3) Chandler. IAB had mixed reaction to the use of quad charts. Although they provide a good framework for explanation, they may diminish the presenter's engagement with audience.

6. The IAB is very semiconductor heavy in its composition. Suggested that MSEN staff consider whether IAB should be expanded or modified in industry composition with respect to the full breadth of MSEN research.

7. IAB agreed to rotate chair position to Doug Hutchings.

From breakout meeting with students (not held at 2022 meeting)

8. The student roundtable (~ 15 students) yielded excellent questions and discussion. Feedback on MicroEP to MSEN transition was positive. Discussed about making meaningful industry connections to help identify job opportunities. Common concern is that often person is not sure about exactly what kind of job suits them, but that many companies offer flexibility and room to move. Discussed about how company goal based performance evaluations are conducted. Emphasized that increased focus on US activity in semiconductor manufacturing and research should yield many job opportunities.

From breakout meeting with faculty (not held at 2022 meeting)

9. In the faculty roundtable (~ 10 faculty) there was discussion about semiconductor research and workforce development opportunities through the CHIPS Act, and about how IAB could help advise MSEN in this area. Good points were made about STEM outreach and starting efforts at younger ages. Comments were made about grad students working towards understanding big picture of research, building confidence, and developing persistence in problem solving. MSEN speaker series consisting of big picture talks was discussed and possibility was raised about alumni contributions.

16. Timeline for Data Collection and Analysis

Collection, Analysis, and Reporting of Assessment Data (Program Director)	Aug 24
Document Key Findings	Aug 24

Use of Results

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| - Actions for MSEN Management Team Approval | Sept 15 |
| - Actions for MSEN Graduate Studies Committee Approval | Oct 1 |
| - Actions for MSEN Graduate Faculty Approval | Oct 15 |
| - Program review with Industrial Advisory Board | Oct 28 |

In addition to the actions taken by these groups in response to the Academic Assessment report, other issues will be addressed as appropriate in a timely manner.