

Academic Assessment Plan

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

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

2020 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 is in two parts which may be taken in either order. One part is 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.

The second part is a written exam with oral discussion taken by the student prior to the start of the spring semester. This exam is a combination of a real Federal R&D program solicitation (that may or may not be actively accepting proposals) and a Request for Quotation received by a technology-based company. Students are allowed access to any written information they wish to use, but they may not discuss the exam scenario or their work with any person. The student is limited to 15 pages, and the written document and the oral discussion are both evaluated by the same faculty panel. A student who fails the exam may take it one additional time during the same time the following year. This document is almost always the first complex problem assessment and development proposal written by the student and provides very good information on how the

student will perform in the types of assignments typically given in a professional position where a Ph.D. is the minimum education requirement for being hired.

Data Collection and Analysis:

Candidacy Research Proposal, 2020 Calendar Year

Number of Students Presenting Candidacy Research Proposal / Number Accepted = 4/4.

Written Candidacy Exam, Spring 2020

Number of Students Taking Exam: 7.

Number of Students Passed Exam (First Attempt): 2.

Number of Students Passed Exam (Second Attempt): 2.

Number of Students Failed Exam (First Attempt): 3.

Number of Students Failed Exam (Second Attempt)*: 0.

* - Removed from MicroEP PhD program.

Students Admitted to MicroEP/MSEN PhD Candidacy, 2020 Calendar Year

Number of Students Admitted to Candidacy** = 4.

** - Passed both parts of MicroEP/MSEN PhD candidacy process.

Five Year Statistics for Written Candidacy Exam

Pass rate (first attempt) = 20/32 = 63%.

Pass rate (second attempt) = 10/11 = 91%.

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 written candidacy exam

provides a good indication of how the student will perform in the types of assignments typically given in a professional position where a Ph.D. is the minimum education requirement for being hired.

- Some students who do not pass the written candidacy exam on the first attempt have voluntarily moved to other PhD programs at the university.
- The written candidacy exam results are presented to, and accepted by, the MicroEP/MSEN faculty.
- The MicroEP/MSEN director and associate director review the results of the written exam and the faculty panel assessment with each student examinee and their major professor. Constructive feedback is given to the students regarding strengths and areas for improvement – either in preparation for their PhD research and dissertation or to re-take the exam the following year.
- The MicroEP/MSEN staff solicits feedback from the faculty and students each year following the exam on the exam process and ways in which it may be improved. For example, addition of a summary highlighting the novel fundamental aspects of the written proposal is being considered for addition to the candidacy exam.
- In 2020, Associate 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. The sessions also elicited input from the participants on ways to improve the candidacy exam process. Feedback from candidacy exam participants in post-exam debriefings about the preparation sessions was uniformly positive.
- The written candidacy exam format was modified and approved by a selected committee of MicroEP/MSEN faculty and directors during the 2020 summer semester. This included written exam format changes per the NSF PAPPG in addition to slight modifications to the written and oral evaluation sheets to help guide faculty during panel review and deliberation. Also in 2020, the MicroEP/MSEN faculty discussed and approved a ‘candidacy exam readiness procedure’ in which a one-time request to extend the students’ candidacy exam date by one additional year beyond the first date recommended for the student to

take the exam may be granted. The student's PhD Committee Chairperson is to assess and confirm the student's readiness for the candidacy exam. If the student and faculty advisor feel that the student is not ready to take the candidacy exam during their first opportunity to do so, a 1-year extension may be requested. This 1-year extension may only be requested/granted one time before the first exam attempt or the second exam attempt but not for both. The procedure was implemented during the 2020 Fall Semester along with minor changes to the written examination format and the oral examination evaluation criteria.

- 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. However, these changes will impact students taking the MicroEP/MSEN candidacy exam during the 2021 winter break and beyond.

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. Rick Wise and co-advised by their major professor.

Data Collection and Analysis:

22 MS and 33 PhD students were advised for Spring 2020.

21 MS and 34 PhD students were advised for Fall 2020.

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 written candidacy exam and candidacy research proposal.

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 students, and participation is required for all MicroEP students during their first two years in the program. The groups meet six 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.

Data Collection and Analysis:

Spring 2020:

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

Attendance (excluding illness and conference travel) = 93%.

Fall 2020:

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

Attendance (excluding illness and conference travel) = 99%.

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 three times in the fall semester and four times in the spring semester. The student's 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 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). 19 students learned use of MS Project in Small Group teams and how to develop their 'Degree Project Plan' in spring 2020 and 16 students in fall 2020. 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 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 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 15 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.

Data Collection and Analysis:

Spring 2020:

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 2020:

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 program director.

Assessment:

Students in the four Small Groups give two types of presentations – a three-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 three-minute presentations. For three-minute presentations, all the students in the group which present three-minute presentation for next month will evaluate with written comments and provide them to the current month presenters. For the 12-minute presentations, the three 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.

- 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 meetings are facilitated by Associate Director Dr. Panneer Selvam.

Data Collection and Analysis:

MicroEP/MSEN program management met with Small Group Leaders on January 22, August 19, and December 16 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 2020 were significantly curtailed due to the Covid 19 pandemic. However, a clean-up of our adopted section of the Razorback Regional Greenway Trail was held on October 24 (with masks and social distancing). Twelve MicroEP/MSEN students and faculty volunteered to participate in the event.

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 43 students in 2020. Performance reviews were expected from 45 students.

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 continued to increase (95% vs. 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 Dr. Matt Leftwich performs these exit interviews; then the forms are scanned and stored in both hardcopy and electronic forms.

Data Collection and Analysis:

Exit interviews were conducted by Dr. Leftwich with 10 of 10 students who graduated from the program during the 2020 calendar year. Participating in the exit interview has now been formalized as a requirement before final sign-off of the student's record of progress.

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 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. There was a notable improvement in 2019 vs. 2018 that remained consistent in 2020. Therefore, it seems that the Career Center value to MicroEP/MSEN students has improved and is now more consistent per the 2020 exit interviews. 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 2020, Associate 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 and updates were received from 22 MS and early-stage PhD students during the 2020 spring semester and 2020 fall semester, a total of 44 for the calendar year.

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. Rick Wise, is a core requirement of both the MicroEP M.S. and Ph.D. curricula, and leads the student through the full process of commercialization of research. It is a team-based course that requires development of a commercialization plan for an on-campus professor's research and extensive presentations on that work to the class.

Data Collection and Analysis:

Research Commercialization (MEPH 5383) was taken by 12 MicroEP students during the 2020 calendar year (offered in spring semester). A patent filing by MicroEP/MSEN affiliated faculty Dr. Ryan Tian (CHBC) entitled “A Cell-Sensory Bioscaffold: The fabrication and Application” was used as the commercialization project for the class. Teams were formed to cover: 1) Intellectual Property and Technology Space, 2) Market Space: Competitor Analysis / Methods & Strategy, 3) Production & Manufacturing, 4) Financials, and 5) Business Plan.

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 program.

11. Operations Management seminar courses MEPH/MSEN 5811/5911/6811/6911 and Proposal Writing course MEPH 5832 (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 2020: 7 students enrolled.

MEPH 5911 (Operations Mgmt: Personnel Management) Spring 2020: 10 students enrolled.

MSEN 6811 (Operations Mgmt: Management&Leadership I) Fall 2020: 10 students enrolled.

MEPH 6911 (Operations Mgmt: Management&Leadership II) Spring 2020: 10 students enrolled.

MEPH 5832 (Proposal Writing and Management) Summer 2019: 13 MicroEP students enrolled.

Assessment:

The operations management seminars, taught by Director Dr. Rick Wise, provide students in the interdisciplinary MicroEP 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 for completing their degree requirements as a means of 'best practices' sharing.

The proposal writing and management course is taught by Associate Director Dr. Matt 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.

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 Director Dr. Rick Wise, for every MicroEP student, and is designed to prepare MicroEP 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:

Eight MicroEP graduate students were enrolled in MEPH 5821 – Ethics for Scientist and Engineers – in summer 2020.

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 2020 – 1 MS thesis graduate.

Summer 2020 – 1 MS thesis graduates.

Fall 2020 – 2 MS thesis graduates.

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 2020 – 1 PhD graduate.

Summer 2020 – 2 PhD graduates.

Fall 2020 – 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. Due to the COVID-19 pandemic, the meeting was conducted remotely from 10:30 am to 1:30pm on October 23, 2020.

Data Collection and Analysis:

The Industrial Advisory Board meeting was held October 23, 2020 with eight board members from industry attending plus previous MicroEP program director, Prof. Ken Vickers. 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. 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. Rick Wise gave the MSEN graduate program update.

Assessment:

The Industrial Advisory Board continues to provide a valued service to the MicroEP graduate program in assessing the academic coursework, research, and processes used to prepare the students to compete and contribute in the 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. Efforts to have more local recruits.
2. 3-minute slides need to be descriptive
3. Breakout with students and faculty requested if meeting is again held remote.
4. Schedule for additional hour with more breaks requested if meeting is again held remote.
5. Material science expert in the Board for future may help.

From breakout meeting with students (not held at 2020 meeting)

From breakout meeting with faculty (not held at 2020 meeting)

Several topics were discussed including student recruiting and efforts from UARK to develop a pipeline of potential graduate students from undergraduate schools in Arkansas. Faculty observes that most students (85%) are moving to industry versus around 5% to academic career and 10% to national labs. Discussion about the topic of simple coding skills, consensus is that this should be addressed at undergrad level and can be supplemented more informally at the grad level through seminars or clubs or student-initiated self-study. IAB members provided feedback on industrial needs/trends according to the topics for discussion handout provided MicroEP prior to the meeting. Overall, this session was less attended than in the past with fewer questions from the faculty. IAB suggests strengthening preparation for this session by again having IAB members prepare company/industry trends and needs and encourage more discussion with faculty.

(Summary Review with MSEN management)

Thanks to all the MSEN staff for coordinating the virtual meeting. We all prefer in person meeting but under circumstances the meeting was effective.

IAB missed the interaction with students and faculty groups, but understands the circumstances made such a large group forum difficult.

IAB congratulates MicroEP on executing the transition from MicroEP to MSE, and formation of the new Academy to further strengthen the program's connection to alumni. The new I3R initiative offers significant future opportunity for MSEN.

Timeline for Data Collection and Analysis

Collection, Analysis, and Reporting of Assessment Data (Program Director) May 1

Document Key Findings

May 1

Use of Results

- **Actions for MSEN Management Team Approval** **June 30**
- **Actions for MSEN Graduate Studies Committee Approval** **July 31**
- **Actions for MSEN Graduate Faculty Approval** **September 15**
- **Program review with Industrial Advisory Board** **November 15**

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.