Engineering and Computer Science Advisory Board Meeting
November 2, 2018
4 p.m.
SC 152

Board members present:
Dr. Paul **Brand**, Center for Neutron Research, NIST; Dr. Lorraine **Fleming**, Professor, Civil and Environmental Engineering, Howard University; Dr. William **Fourney**, Emeritus Dean of Engineering, University of Maryland College Park; Ms. Mary **Kraft**, U.S. Director of Services, Hewlett Packard; Mr. Bobby **Patton**, CEO, Patton Electronics; Dr. Joseph **Teter**, Director of Technology Transfer, Naval Surface Warfare Center.

Montgomery College faculty and staff present:
Dr. Nawal **Benmouna**, Department Chair and Professor; Dr. David **Hall**, Department Chair and Professor; Dr. Chienann Alex **Hou**, Program Coordinator and Professor; Dr. Muhammad **Kehnemouyi**, Collegewide Dean; Ms. Margaret **Latimer**, Vice President and Provost; Dr. Max **Nam**, Program Coordinator and Professor; Dr. Alla **Webb**, Program Coordinator and Professor; Ms. Claudia **Greer**, Writer and Assistant to Deans (taking minutes); Ms. Burcu **Crothers**, Administrative Aide to Dr. Kehnemouyi.

- **Welcome from Dr. Kehnemouyi and Introductions**

Dr. Kehnemouyi welcomed participants and thanked the Board for their participation and service. Feedback and recommendations from the Board helps the SET implement current and high-quality curricula. He also reviewed the agenda. Board members and Montgomery College (MC) participants introduced themselves.

- **Opening Remarks from Vice President/Provost Margaret Latimer**

Provost Latimer noted that many STEM fields are changing and MC is working to ensure that curricula fit well with industry needs as well as transfer institution requirements. She also talked about the space renovation at the Germantown Campus and building design at the Takoma Campus.

- **Overview of Engineering and Computer Science Programs/Recommendations from Board**

Referring to the Board Meeting Power Point, Dr. Kehnemouyi talked about engineering enrollment. After we met last time in 2016, engineering enrollment plateaued. It has since decreased, as we are losing some engineering majors to computer science.
He showed the breakdown of our engineering majors: the most enrolled majors are in electrical, mechanical, and computer engineering. We have an articulated program in fire protection engineering with UMCP, which is the only school on the east coast offering that major.
He also showed schools where we transfer students. The largest number go to UMCP, then UMBC and Georgia Tech. Students attend many other schools as well.

Mary Kraft asked about those who complete degrees but don't transfer. MC should take credit for producing a professional person who has an AA degree but didn't go on to get a BA. We don't track this.

Dr. Lorraine Fleming asked about time to degree. It is approximately 3.7 years to transfer. Cybersecurity is a two-year terminal AAS degree, but about half transfer to 4-year schools such as UMUC.

When engineering students transfer they do as well as native four-year students. About 96 percent graduate from those institutions, so we prepare them well.

Dr. Fleming asked about the "general engineering" students. Dr. Nawal Benmouna said these students come in and are not college-ready. The general engineering degree allows for courses such as pre-calculus; it starts earlier than the other tracks. We can't start too early, though, because of rules on credit limits. Financial Aid is very strict about covering only those courses that are in the curriculum. These are credit limits imposed by the state of Maryland and Federal government.

Dr. Kehnemouyi showed "computer science program metrics" and it was clarified that the "graduation" and "transfer" numbers for each year were non-overlapping. Students who come to MC and take 18 credits in the fall semester of their freshman year might transfer to UMCP in the second semester and would not show up in the metrics. Dr. Fourney noted that UMCP prefers that students finish up their degrees here and then go to UMCP.

Dr. Alla Webb noted that more students are interested in completing their computer science and information science degrees.

For many years UMCP did not accept Computer Science I and II from MC—or any two- or four-year school. Those students who did well in these classes at MC still had to take an exemption exam. We formed a gap analysis group and met with UMCP. Dr. Kehnemouyi is happy to report that a few months ago UMCP began accepting these courses, without the need to take the exemption exam. Now our CS degree is completely transferable to the University of Maryland.

Dr. Benmouna discussed Student Academic Plans of Completion. We empower students to create their plan from starting point to completion. We created a sequence of courses for all students to complete degrees in engineering and computer science. Part of the student assignment is to meet with program advisors to review the paths they have created. We added benchmarks for success and interventions for when these benchmarks are not met. Program advisors play a critical role. We need more program advisors.

We have lots of tools for students. They include the student advising report, program advising guides, and student academic plans, available through our college portal. There is also program advisor contact. Tools are self-developed software. Our goal is to keep it simple for students and advisors.

Provost Latimer added that we hope students are getting a soup-to-nuts overview of programs, and understand the impact of withdrawing from or failing a course. We want to be sure results are accurate, timely, and meet the needs of our students.

Dr. Benmouna went on to discuss the update on recommendations made at our November 2016 meeting, referring to the accompanying Power Point. The PPT slides document how MC is implementing active-learning pedagogies (flipped classrooms in introductory classes); extending the time in a classroom period; providing additional course support for students; considering integrated learning blocks (integrating mathematics into curriculum); expanding internship opportunities; offering more training in vocational programs; and attracting new and diverse students.

We now have embedded coaches in Physics 161. Our DFW rate for that course is 29 percent; two years ago it was 35 percent. To have common exams we need course content to be in lock step with each

other. We now have a homework coordinator, to create the homework sets and ensure the students can't just go online and "look things up."

Homework counts for about 10 percent of the grade. Dr. Fourney said that homework used to be more challenging when students couldn't access Google to get the answers. Provost Latimer added that we hear from people in industry that when someone is given a task, the first thing they do is search for the answer instead of using critical thinking skills and problem solving.

Dr. Webb noted that they tie exam material to the homework—so students see the direct correlation between completing the homework and passing the exam.

Dr. Benmouna said that classes use videos as part of the flipped classroom but we need the first 20 minutes of class to reinforce the concepts. A class with no lecturing at all usually doesn't work well.

As part of expanded vocational program training, students can complete a cloud computing certificate. Our Capital One grant is for non-credit to credit badging, in cooperation with Workforce Development.

As part of our effort to attract new and diverse students, we have the SSTEM and Clark scholarships, and we now have more outreach with our high schools. There's a new early college program that enables junior level high school students to come to MC and earn associate degrees in math and in teaching math. We have new programs for these high school students as well. All schools in MCPS are notified of opportunities. MC tuition is paid for as are their books. By the time they graduate from high school they have an associate's degree. Dr. Fourney noted that the drawback is, if they don't do well they might not get into their preferred college.

Percentage of women in engineering: about 20 percent. In bioengineering and environmental engineering, there are more. There are not as many women in electrical, mechanical, or civil engineering. The Society of Women Engineers and WEST (Women in Engineering, Science, and Technology) are active here at MC. We have a larger percent of women faculty (about 50 percent), who serve as role models. Still, we need to reach girls at an earlier age to encourage them.

Dr. Fleming encouraged us to focus on changing this. Ms. Kraft shared her own experience with being advised to go into engineering. Women need to be pointed towards these fields so they can support themselves. Provost Latimer described her experiences at a STEM conference for women of color. What resonated for her was that even though these young women had faced prejudice and other struggles, they kept on the path. She went on to say that young men of color, as well as Latino students, also don't always know what the opportunities are. Dr. Fleming added that we should not give up on students who may not have been encourage to pursue STEM when they were in the first and second grade.

Dr. Kehnemouyi attended a two-day meeting at National Science Foundation (NSF) recently. This combined the Business Higher Ed group with ASEE, and included Fortune 500 CEOs, some university presidents, and deans and directors. The focus: how do we re-skill American's work force and align industry with higher ed? There was a lot of new information on fields such as cybersecurity, data science, data analytics, AI, clouds, and smart manufacturing. There clearly are skills gaps. They talked about "2+2+2 pathways," stackable credentials, badging, and related topics. Recommendations were made to shape the curriculum of the future, including risk management. There was a big emphasis on capstone projects. Train engineers that are problem finders, not just problem solvers. The idea was that narrow credentials might be barriers to innovation.

Mr. Patton noted that it's important to have more integration between industry and the credentials you are seeking. He sees this developing more in Europe. Students will work for a while, stop and take classes, then apply what they learn in a work setting. This requires a change of thought, both on the employer's side and the academic side. In the U.S., undergraduate co-op programs are valuable in making the connection between school and work. A school that demonstrates this well is York College in Pennsylvania. Provost Latimer replied that we have discussions about badging and what that means. While MC can develop badges, there needs to be an industry standard for them.

National Academy of Engineering (NAE) Grand Challenges: This initiative led by Dan Mote and others identifies 14 challenges and five competencies to satisfy. MC's proposal to join the Grand Challenges was accepted, and we are going be the first community college to offer the Grand Challenges program. Dr. Kehnemouyi was at an NAE panel discussion led by Dean Pines of UMCP, where he talked about the demands and rewards of running such a program at a two-year school. We are starting recruiting in the second semester of the freshman year. We are already active in Engineers Without Borders. We will reach out to deans from other areas, and get buy-ins from other deans at our upcoming meeting.

Dr. Kehnemouyi is working on MOUs with four-year schools, not just on curricular alignment but on extra-curricular alignment.

- **Additional Recommendations from the Advisory Board**

Dr. Teter said that his laboratory has formed strategic partnerships with colleges and universities, and they are looking to develop internships throughout the year. His lab also recently filled its STEM coordinator position.

Dr. Alla Webb asked, how can we better integrate with industry needs? We have students who come back after going into the workforce because they need to know this or that programming language. It was suggested that MC have a programming languages course where students do every project in a different language. Ms. Latimer said that the option of short winter credit courses in programming languages could give students the opportunity to be exposed to different languages.

Mr. Patton noted that after you've picked up a few languages, it's easier to learn another one. Learning syntax and logic, even linguistics, can help with grasping the theory of languages. Dr. Fleming added that we need to teach students how to teach themselves.

Dr. Fourney said that a knowledge of computers is going to be essential for all engineers. We can communicate that by giving students meaningful problems that require them to use computers.

Courses that teach students to think holistically are important. Co-ops are also a way to teach integrated skills. They enable students to "hit the ground running" when they get out of college.

The meeting concluded with thanks from Dr. Kehnemouyi.