

## MULTICULTURAL ENGINEERING PROGRAM October 2005

The Multicultural Engineering Program (MEP) is an academic excellence community committed to serving multicultural and first generation students in engineering and applied science. Founded in 1973, the mission of the MEP is to recruit, retain and graduate underrepresented multicultural (URM) and first-generation students with the personal and professional skills to excel in professional engineering careers and/or graduate studies. The program fosters scholastic excellence through a challenging academic "building-community" retention and leadership development component. The MEP also conducts a variety of recruitment and outreach activities designed to increase the enrollment of URM students (African American, Hispanic/Latino and Native American) in the College of Engineering and Applied Science.

### **Retention Elements**

Summer Bridge Program is a five-week intensive academic summer program that prepares 25 incoming freshmen for a more effective transition into the college learning environment. Participants enroll in calculus, chemistry, physics, computing, humanities and writing, and a "biotechnology" engineering mini-projects class. The summer bridge experience helps students to develop excellent academic preparation and strong friendships, creating a peer network that will support them throughout college.

A Freshman Leadership Course GEEN 1510 & 1520, titled "Self-Management and Leadership Principles I & II" focuses on academic skill building, engineering career awareness, self-management, and leadership. By participating in this course, new students foster community, form effective study groups, and reduce feelings of isolation. Students earn 2-credits in the fall semester and 1-credit in the spring semester.

Academic Excellence Workshops (AEWs) enhance students' learning experience by challenging students to earn superior grades in their "gate-keeping" courses, including Calculus 1 and 2, Chemistry, and Physics. Under the tutelage of skilled graduate student facilitators, students meet an additional six hours weekly to work collaboratively in small groups to solve extra course problems and practice exams. While MEP students are required to attend the AEWs during their freshman year, no academic credit is offered for these workshops.

Academic Monitoring and Intervention is routinely conducted for MEP students enrolled in the first-year "gate-keeping" courses. MEP staff review mid-term exam scores and develop academic action plans for students performing below the desired levels.

Academic Advising, Mentoring and Tutoring takes place daily as a result of the close relationships that MEP staff have with students starting in their freshman year. MEP students benefit from general academic, personal, and career advising throughout their undergraduate experience. Tutoring is provided to students in need of one-to-one assistance in difficult engineering courses.

A Resource and Study Center serves as a central meeting place for forming study groups and networking while providing access to MEP staff, computer stations, study tables, a resource library, a photocopy machine, and a kitchenette.

MEP/LEAD Participation Grants are provided to 75% of students who participate in the MEP. The grants average \$1,500/year and are renewable for 2-4 years.

### **Leadership and Professional Development Elements**

Undergraduate Research Opportunities are made available to select students to work on a research project under the supervision of a faculty sponsor in their respective field of study. Funding provides student stipends, research materials and supplies, and travel expenses to attend a related conference. Undergraduate research is the primary method used to prepare MEP students for advanced study at the masters and Ph.D. levels.

Professional and Leadership Development is facilitated through several activities offered by the MEP, such as the CU Multicultural Career Fair, the Lockheed Martin Regional Leadership

Conference, and the MEP Annual Awards Banquet. Additionally, the MEP provides leadership and mentoring to MEP student engineering society officers. These societies (listed below) promote personal and professional development through training workshops, community service, professional networking, and attending national conferences.

- American Indian Science and Engineering Society (AISES)
- Mexican American Engineers and Scientists (MAES)
- National Society of Black Engineers (NSBE)
- Society of Hispanic Professional Engineers (SHPE)

Internship and Job Placement Assistance is provided to MEP students as a result of MEP's strong relations with industry. The MEP staff work closely with the Office of Career Services to deliver special events such as "Suit Yourself" and a wide variety of skills development workshops and coaching to MEP students (resume writing, interview skills, salary negotiations, etc.).

CU-LEAD Alliance activities are also offered to develop MEP students' sense of community across the Boulder campus. These activities include the Fall Welcome for New Students, the Faculty Appreciation Luncheon, the Spring Fling, the Equity and Excellence Banquet for graduating students, and the LEAD Alliance Student Advisory Group (SAG).

### **Recruitment and Outreach Elements**

Success Institute (SI) – is offered in partnership with the CU Integrated Teaching and Learning (ITL) Program hosting 75 multicultural and first-generation high school students (grades 9-12) from the Denver/Boulder region annually in the summer. Participants work in the ITL Laboratory for a series of multi-day "hands-on" engineering design-build projects featuring informal and small-group interaction with CU professors, graduate students, and current MEP college students. SI maintains a strong history of support and participation from Denver's African American communities, and also features special parent workshops to inform parents of important college preparatory information including: mathematics achievement, admissions, financial aid and scholarships, as well as other special opportunity programs within the Denver/Boulder metropolitan area (i.e. CABES/JETS Program, Daniel's Fund, INROADS/Colorado, etc.).

NACME Programs – The MEP initiated a partnership with the National Action Council for Minorities in Engineering, Inc. (NACME) in 2000-2001 that yielded scholarship funding for the NACME Vanguard program in the amount of \$10,000/year for 7 years (3 cohorts of students for 5/years each). In 2002 NACME replaced the Vanguard program with the Block Grant program which is providing additional funding of \$45,000/year for 4 years. These funds are assisting the effort to recruit students to the College of Engineering and Applied Science.

MEP Participation in Upward Bound (UB) for the past 2 years the MEP has participated in the College of Engineering's partnership with the CU American Indian Upward Bound (UB) program to offer a multi-faceted "engineering component" to the UB curriculum. The MEP has led a class for UB high school freshmen, sophomores and juniors providing them exposure to the broader opportunities of the engineering profession. The class has featured faculty and student guest presenters, hands-on problem-solving activities and tours of engineering center labs. In coordination with the Dean's Office the MEP has also co-hosted a summer pizza party for all UB students to interact with College faculty and MEP students.

Colorado MESA Advisors Retreat and Kick-off "MARK" is conducted in partnership with Colorado MESA (Mathematics, Engineering, and Science Achievement) and the Women in Engineering Program. This 1-day event brings 75-100 MESA advisors (who are math and science teachers in middle schools and high schools) from throughout the state to gain insight into the numerous engineering outreach activities available for their students at CU and throughout the state. In addition to learning about the College's resources (i.e. MEP, WIEP, NASA Space Grant Program and ITLL) the Advisors gain new skills to provide activities for their MESA after school clubs. This

event spurs a handful of individual high school and middle school visitations (in the local community and on-campus) each year.

Colorado MESA Fall Fling is offered in partnership with Colorado MESA and a corporate sponsor such as Seagate Technology or SpectraLink (\$5,000 donation). This 2-day event brings 200 high school students (from 20 high schools) to the CU campus to compete in two separate engineering team competitions: a boat-building challenge and race held in the main recreation center swimming pool and a multi-purpose vehicle “mouse-trap car” competition held in the recreation center gymnasium. The event features college and laboratory tours and interaction with CU faculty and staff, current MEP college students, MEP alumni, and industry professionals. Students receive CU admissions and financial aid information also.

Admissions Support – by working closely with the Office of Admissions and the Dean’s Office throughout the application cycle, the MEP staff help “personalize” the process for students applying to CU-Boulder. Current MEP students contact accepted students to provide information and answer questions about the College and MEP as well as share from their personal experiences as CU engineering students. The MEP also hosts prospective “admitted” students on the CU campus for a special one-day campus visitation program and awards banquet held in April each year.

**Criteria for Participation**

The MEP enrolls student participants through the following means:

- underrepresented multicultural students (freshmen and transfers) accepted into the College of Engineering and Applied Science are invited to participate in MEP;
- Office of Admission staff identify first-generation college-bound students, students from rural or low-income schools, and students who have specific needs that would be served by the MEP;
- students receiving Daniel’s fund or Admissions LEAD scholarships are required to choose a LEAD program and may choose MEP; and,
- any student may self-elect to participate in the MEP on a single activity-basis or as a full participant; and, many faculty, staff and current students make such referrals to MEP.

**Profile of Students**

At present the MEP provides services to approximately 200 students, 80% of whom have underrepresented multicultural backgrounds. The remaining 20% include students who are Asian and White, of whom many are first-generation college-bound students.

|                  |     |
|------------------|-----|
| Asian            | 14% |
| African-American | 18% |
| Hispanic/Latino  | 55% |
| Native American  | 8%  |
| White            | 5%  |

Among the total enrollment of URM engineering students (205 in fall semester 2005), approximately 70% participate to varying degrees in the MEP.

**Retention Rates**

The following 2<sup>nd</sup> fall retention rates are derived from the Office of Planning, Budget and Analysis web-site, as well as internal MEP data, and reflect average 2<sup>nd</sup> fall retention rates for the past 5 years.

|                         |   |
|-------------------------|---|
| To 2 <sup>nd</sup> fall | 84% for MEP URM students ( <u>into Engineering specifically</u> ) |
|                         | 86% for all engineering students (into any college)               |
|                         | 87% for all engineering students of color (into any college)      |

MEP retention data further indicates that URM students who choose not to participate in MEP (about 15 students/year) have a 2<sup>nd</sup> fall return rate of 50% on average into Engineering. Additionally, MEP students have lower academic suspension rates after the freshman year, 6% for URM MEP participants vs. 17% for URM non-participants, as well as lower transfer/withdrawal rates (i.e. to other CU colleges/schools or other institutions) with 9% for MEP participants vs. 35% for non-participants.

### **Graduation Rates**

The following 6<sup>th</sup> summer (year) graduation rates are derived from the Office of Planning, Budget and Analysis web-site, as well as from internal MEP data, and reflect average 6<sup>th</sup> summer graduation rates for the past 5 years.

Graduated by 6<sup>th</sup> summer (Entry College / Any College):

60% / 75% for all MEP URM students (estimated)  
52% / 70% for all engineering students  
49% / 63% for all engineering students of color

The University of Colorado at Boulder has performed well in national retention studies compiled by the National Action Council for Minorities in Engineering, Inc. (NACME). Based on enrollment and degree headcount data (not actual SIDs) compiled by the Engineering Workforce Commission, a 2003 NACME study ranked the University of Colorado at Boulder to be 1<sup>st</sup> among public universities and 6<sup>th</sup> overall in the nation for its URM engineering retention-to-graduation rate of 66.3 percent, as compared to a national average of 38.8 percent.

In a similar retention study published in 1999, NACME ranked the University of Colorado at Boulder 7<sup>th</sup> overall in the nation (out of 117 Engineering institutions) for its URM engineering retention-to-graduation rate of 66.9%, as compared to a national average of 36.5%. The 1999 NACME retention study ranked the University of Colorado at Boulder far above our in-state peer institutions. Colorado School of Mines was ranked 47<sup>th</sup> in the nation with a 42% URM engineering retention-to-graduation rate, while Colorado State University was ranked at 52<sup>nd</sup> in the nation with a 39% URM engineering retention-to-graduation rate.

### **Student Engagement and Achievement**

Over the last decade MEP students have demonstrated increased engagement and achievement in all areas, such as participation in the University of Colorado Engineering Council, University of Colorado Student Union, NASA Space Grant Program, ITL Outreach Fellows, Engineers without Borders, CU SMART Program (summer research) and NSF Research Experiences for Undergraduates (REU). Furthermore, a growing number of students are pursuing advanced degrees in Business, Medicine, and Law (names can be provided) in addition to pursuing master's and doctoral degrees in engineering. Currently, four students (who began as MEP freshmen) are enrolled as Ph.D. candidates in engineering:

- Tsali Cross, Mechanical Engineering (BS '99, MS '02)
- Damon McCoy, Computer Science (BS '99, MS '04)
- Alicia Ortega, Mechanical Engineering (BS '03)
- Gary Weickum, Aerospace Engineering (BS MCEN '04, MS MCEN '05)

### **Staffing**

The MEP is staffed with four full-time professionals including a co-director of student development and retention, a co-director of recruitment and outreach, an assistant director and an office manager. The MEP staff is further augmented by two part-time positions which include a Financial Aid counselor (20% FTE) and a Career Counselor (30% FTE). A large team of Graduate and Undergraduate student assistants are also employed in various recruitment and retention functions. Finally, the MEP enjoys the volunteer contributions of several retired

engineering and business professionals who serve as tutors, community liaisons, and student society advisors.

### **LEAD Financial Aid**

During the 2005-06 academic year, LEAD financial aid in the amount of \$44,000 has been awarded to MEP scholars with the average award being \$1,500.

### **Other Financial Aid**

In addition to the LEAD financial aid, the MEP awards approximately \$100,000 from College of Engineering donor funds and an additional \$84,000 in Third Party funds (i.e. NACME, institutional funds, and individual and corporate donations). Other than a small number of large individual awards (per specific donor agreements), the average MEP award is \$1,500.

### **Sources of Funding**

Over the years the MEP has secured funding from a variety of sources. In addition to College funding the MEP receives funding from the campus (primarily the Office of Diversity and Equity), federal grants, event proceeds, corporate donations, as well as from individual endowments and donations. This diversity of funding sources helps protect the MEP from budget constraints and the expiration of specific grants or donations.

### **Partnerships and Collaborations**

The MEP has developed extensive partnerships with campus and external organizations both regionally and nationally. In collaborating with other programs, departments, and organizations the MEP is able to leverage resources and achieve results that would not otherwise be possible with its limited staff and resources.

#### College and Campus

Women In Engineering Program (WIEP)

Integrated Teach and Learning Program (ITL)

Herbst Humanities Program in Engineering

Engineering Academic Departments – The MEP has successfully partnered with various engineering faculty to obtain grants (DOE Master's Fellowships) and supplemental funding (on NASA and NSF research grants) for educational outreach, undergraduate research and REU recruitment.

Office of Diversity and Equity

CU LEAD Alliance

Colorado Diversity Initiatives (NSF AGEP grant, NIH Minority Biological Sciences grant)

Office Admissions

Office of Financial Aid

Office of Career Services

Department of Housing

#### Regional and National

Colorado Alliance for Minority Participation NSF Grant

Colorado Black Professional Engineers and Scientists (CABPES) – JETS Program

Colorado Mathematics, Engineering and Science Achievement

INROADS/Colorado, Inc.

National Association of Multicultural Engineering Program Advocates, Inc. (NAMEPA)

National Action Council for Minorities in Engineering, Inc. (NACME)

The National GEM Consortium (graduate fellowships for URM students in SMET fields)

#### MEP Advisory Council

The MEP maintains a close working relationship with approximately 20 corporations and agencies who actively participate on the MEP Advisory Council providing intellectual expertise to assist the MEP in its strategic development. Additionally, the companies provide funding to the MEP for participation grants and program activities, as well as support MEP special events. It is

worth noting that six MEP alumni currently participate as representatives for their companies on the MEP Advisory Council.

Mike Avritt, Advisory Engineer, IBM Printing Systems  
Jennifer Brooks, Campus Relations Manager, Lockheed Martin  
Craig Burger, Director WW Toner Operations, Lexmark International, Inc.  
Lawrence Coleman, Operations Manager, INROADS/Colorado, Inc.  
\*Marc Cordova, Special Programs (EEEN BS '92, MS '94), Lockheed Martin  
\*Tsali Cross (MCEN BS '90, MS '92), PhD Student, Mechanical Engineering  
\*David Davenport, Senior I/T Specialist (CSEN '97), IBM Global Services  
Suzanne Delchamps, Professional Recruiter, Ball Aerospace & Technologies Corp.  
William Farnum, VP Enterprise Business Group, StorageTek (Retired)  
Connie Fulmer, AA/EEO Specialist, Sr., StorageTek  
David Gallegos, Manager – Next Gen. Monitoring Systems, Sandia National Laboratories  
Kim Guitierrez,,EEO/AAP Administrator, Ball Aerospace & Technologies Corp.  
\*Felix Mendoza, Engineering Manager (ASEN, MCEN '93), Raytheon Polar Services Co.  
Gloria Nelson, Executive Director, Colorado MESA  
Tani Owens, Senior Human Resources Specialist, Qualcomm, Inc.  
Cliff Pacaro, Campus Account Manager, Sun Microsystems, Inc.  
Lalit Pandit, R&D Program Manager, Agilent Technologies, Inc.  
Lynda Pasma, Sales Engineering Manager, Texas Instruments, Inc.  
Calvin Pohawpatchoko Jr., Vice President, Colorado AISES Professional Chapter  
\*Adrienne Rivera-Clark (ASEN '92), TMOS System Engineer/Test Lead, Raytheon Co. IIS  
\*Anik Sánchez-Rubalcava (CSEN '03), European Applications Engineer, Seagate Technology  
Ann Shattuck, Senior HR Consultant, Shell Lubricants  
Greg Smith, Lead Engineer, Eastman Kodak Company (Chair)  
Henry Wright, Director of Vertical Marketing, SpectraLink

\*signifies MEP alumni

### **Critique and Recommendations**

The MEP could improve its retention programming by adding additional academic enrichment activities for upper-class students (i.e. junior/senior seminars for corporate leadership and preparation for research and graduate study).

Although MEP has maintained a fairly steady retention effort over the past 15 years, the College has seen little increase in enrollment of URM engineering students since the early-mid 1990s. In planning for the future, the MEP (with support from the College) would like to successfully grow the enrollment of URM students beyond the current level (7-8%) towards a level closer to the national average (12%). With additional staff and funding, the MEP would be in a better position to achieve the following:

- Expand the Success Institute to a year-round program (i.e. 3-4 Saturday Academies for student and parent workshops similar to PCDP year-round model)
- Develop improved marketing materials and DVD
- Develop a sophisticated relational database to track MEP student retention and graduation data more accurately over time
- Construct a designated “Active-Learning” Classroom for MEP and WIEP community building activities, GEEN 1510 course, and AEWs
- Develop relations with MEP alumni (i.e. increased donations for participation grants and activities, and increased volunteer participation in outreach)

Lastly, financial assistance in the form of participation grants provides direct tangible support to MEP students in their academic pursuits. Additional funding for these grants will help to increase the number of awards, as well as maintain the value of the awards in proportion to future increases in tuition and other educational expenses.