

Modernizing the Math Curriculum: Preparing Students for Nonacademic Careers in the 21st Century

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PICMath

PIC Math prepares math students for industrial careers by offering a course that engages them in research problems from industry.

Components of PIC Math:

- summer 3-day faculty training workshop
- spring semester course for students
- student recognition conference

PIC Math Course

- students work in small groups solving problems from BIG
- not a lecture
- we provide course material
- taught as a course already on the books
- 10-20 ugrads
- final video and paper on their research results



Research problems

- Youngstown State Univ:
Students evaluated the current police beats based on 2014 crime data and proposed police beats for the city that more equally distributed the officers' workload.
- San Diego State Univ:
Students determined approaches for detecting alterations and forgeries in digital images.

Industries providing problems and consultants:

- Field Museum of Chicago
- Coca Cola Company
- Habitat for Humanity
- Colorado Dept of Transportation
- RAND Corporation
- City of Kansas City
- AIG Insurance
- Texas Children's Hospital
- Massachusetts General Hospital
- Los Alamos National Laboratory
- Sandia Labs



Participation data (2014, 2015, 2016 AY)

- 101 institutions
 - R1s, PUIs, HBCUs, HSIs, Community Colleges
- 107 faculty
- Over 1500 ugrad students
 - 40% female students
 - 21% underrepresented minorities

Male Ugrad at Univ of Pittsburgh (R1): “I got an engineering internship at Delphi-Packard (a Fortune 100 company). During my interview I was able to use my resume talking points on the [PIC Math] class to interest my interviewer . . . I never expected to use so much of what I learned from the course in the real world, in industry.”

Female Ugrad at Virginia State Univ (HBCU): “The PIC Math helped me get my first job. The experience of successfully working in groups, and problem solving were key components in my interview . . . I used the PIC math as a prime example.”

BYU's Applied Computational Math Emphasis

New track in math:

- Modernized curriculum designed for the 21st century providing a rigorous foundation in mathematics, statistics, and computation.
- Interdisciplinary: Horizontal integration across multiple quantitative disciplines.
- Team building and socialization among the students providing softskill experiences.
- Capstone experience through either a research experience or an internship.

BYU's Applied Computational Math Emphasis

Coursework

JUNIOR CORE

- Linear & Nonlinear Analysis
- Computation & Optimization

SENIOR CORE

- Probability and Statistics
- Differential and Integral Equations

Programming labs:

- Page rank algorithm using eigenvalues
- Facial recognition algorithm
- Compressed sensing
- Encryption algorithm
- Dynamic optimization problems
- Modeling orbital reentry

BYU's Applied Computational Math Emphasis

Results

Employment

- Wells Fargo, Microsoft, Google, Fast Enterprises, Vicarious, Innosight, Tanius Tech, Neovest, Raytheon and others.

Year	Student Enrollment
2013	15
2014	25
2015	33
2016	50

Graduate School Acceptance

- University of Texas,
- Rutgers University,
- University of California, Berkeley,
- University of North Carolina and others.