



ASEE 2016  
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**Wright State Engineering Math Project at Morgan**



**MORGAN STATE UNIVERSITY**

**CLARENCE M. MITCHELL, JR. SCHOOL OF ENGINEERING**

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# Overview of MSU

- Morgan State University (MSU) is an HBCU located in **Baltimore, Maryland**
  - ~8,000 students (Institution)
  - ~1,100 students (Engr)
  - ~500 students (ECE)



MEB opened  
in 1991



# Engineering at MSU

- Outstanding Engineering Program
- School of Engineering founded in 1984
- Bachelor of Science Degrees (\*ABET accredited)
  - **Civil\***
  - **Electrical\***
  - **Industrial\***
  - Transportation Systems (Fall 2009)





# Freshmen Placement at Morgan

Past 10 years average Math Course Placement rate using ACCUPLACER exams

- Calculus I (Math 241) < 20%
- Pre-Calculus (Math 141) < 10%
- Pre-Calculus (Math 113/114) < 40%
- **Basic Algebra (Math 106) < 40%**
- **Problem: Students who start in Math 106 have less than 10% chance of graduating in six years !!!**



# 6 year Graduation at Morgan

- Our overall 1<sup>st</sup> to 2<sup>nd</sup> year retention is: 75%
- Overall **6 year graduation rate** for School of engineering (and Morgan) is **< 39%**
  - Calculus I (Math 241) < 20%
  - Pre-Calculus (Math 141) < 20%
  - **Pre-Calculus (Math 113/114) < 50%**
  - **Basic Algebra (Math 106) < 10%**



# EngMath 101 Course at Morgan

- Initially designed to be a place holder for the Wright State Approach at Morgan
- Math course with 4 credits + 2 hours of recitation
- Course was “redesigned” by the Math department to focus ONLY on Math



# EngMath 101 Course at Morgan

- Goals of EngMath 101 (4 credits):
  - Accept all students who placed in Math 113/114/141 (Pre-Calculus) students
  - Accelerate the rate at which students enroll in Calculus I (Math 241) < **1 year**
- Issue with the Math Department
  - They did not agree with the format of the course



# EngMath 101 Course at Morgan

- They will NOT accept it as a pre-requisite for any other math course, unless:
  - Math professor teaches the course and
  - Limited the goals of the course to focus on Math only with limited engineering applications
- We were forced to implement the Wright State approach in our **EEGR 105 course** (Intro to Electrical Engineering course)





# EngMath 101 Course at Morgan

- EEGR 105 course (3 credits)
  - Offered to ALL ECE majors (100 per year)
  - 2<sup>nd</sup> semester freshmen students
  - Couldn't convince the ECE department to allow me to implement EngMath in ALL 4 sections
- Created a “Pilot” section of EEGR 105
  - Enrolls about 25 students in each section
  - Offered both in the Fall and Spring semesters



# EngMath 101 Course at Morgan

- EEGR 105 Pilot: Spring 2014
  - **Enrolled 18 students (self-selected → i.e. volunteered)**
  - Math 241 (Calculus I): 11 students → 61%
  - Math 242 (Calculus II): 7 students → 33%
  - 3 hours of lecture and one hour of recitation and engineering applications session



# EngMath 101 Course at Morgan

- **EEGR 105 Pilot: Spring 2014 Results**
  - Number of students: 18
  - Math course **pass rate Spring 14: 17/18 → 94%**
  - Math course pass rate **following semester, i.e. Fall 14: 15/18 → 83%**
  - Math course pass rate **after two semesters , i.e. Spring 15: 14/18 → 78%**
  - **On track to graduate on time in 2.5 years !!!**



# EngMath 101 Course at Morgan

- EEGR 105 Pilot: Spring 2014 Results  
**(detailed results)**
- Math 241 (Calculus I) course **pass rate:**  
**11/11 → 100%**
  - Pass with grade of A: 6/11 → 54.5 %
  - Pass with grade of B: 3/11 → 27.3%
  - Pass with grade of C: 2/11 → 18.2 %



# EngMath 101 Course at Morgan

- EEGR 105 Pilot: Spring 2014 Results  
**(detailed results)**
- Math 242 (Calculus II) course **pass rate: 6/7 → 86%**
  - Pass with grade of A: 5/7 → 71 %
  - Pass with grade of B: 0/7 → 0%
  - Pass with grade of C: 1/7 → 15%



# EngMath 101 Course at Morgan

- EEGR 105 Pilot students **second semester** math results: **Fall 2014 results**
  - Math 241 (Calculus I) students enrolled in Math 242 (Calculus II) : 11 students
  - Math 242 (Calculus II) students enrolled in Math 340 (Differential Equations) : 5 students
  - Math 242 (Calculus II) students enrolled in Math 243 (Calculus III): 2 students



# EngMath 101 Course at Morgan

- **EEGR 105 Pilot: Fall 2014 Results**
- **Math 242 (Calculus II) course pass rate:**  
**8/11 → 82%**
  - Pass with grade of A: 3/11 → 54.5 %
  - Pass with grade of B: 3/11 → 27.3%
  - Pass with grade of C: 2/11 → 18.2 %
  - Failed with grade of D: 2/11 → 18.2 %
  - Failed with grade of F: 1/11 → 1%



# EngMath 101 Course at Morgan

- **EEGR 105 Pilot: Fall 2014 Results**
- **Math 340 (Differential Equations) course**  
**pass rate: 5/5 → 100%**
  - Pass with grade of A: 4/5 → 80 %
  - Pass with grade of B: 1/5 → 20%





# EngMath 101 Course at Morgan

- EEGR 105 Pilot: Fall 2014 Results
- Math 243 (Calculus III) course **pass rate:**  
**2/2 → 100%**
  - Pass with grade of A: 1/2 → 50 %
  - Pass with grade of B: 1/2 → 50%



# EngMath 101 Course at Morgan

- The course was offered in “pilot” form for another 4 semester:
- **EEGR 105 Pilot: Fall 2014 Results**
  - Number of students: **25 (randomly registered)**
  - Transfer students with no math course: 4
  - Math Course Pass Rate: **15/21 ➔ 71%**



# EngMath 101 Course at Morgan

- The course was offered in “pilot” form for another 4 semester
- **EEGR 105 Pilot: Spring 2015 Results**
  - Number of students: **18 (randomly registered)**
  - Transfer students with no math course: 3
  - 14 students were enrolled in **Math 114 (Pre-Calculus II)** → run the course as Wright State **EngMath 100** equivalent instead of EngMath 101
  - Math Course Pass Rate: **9/14 → 64%**



# EngMath 101 Course at Morgan

## ➤ EEGR 105 Pilot: **Fall 2015 Results**

- Number of students: 41 (**randomly registered**)
- Math Course Pass Rate: will be presented in the next report

## ➤ EEGR 105 Pilot: **Spring 2016 Results**

- Number of students: 28 (**randomly registered**)
- Math Course Pass Rate: will be presented in the next report



# Conclusion

- Benefits:
  - It greatly helped the students who participated in the EngMath 101 courses
  - Students were better prepared to handle the math in their engineering → EEGR 202 Electric Circuits
- Barriers
  - Could not implement it fully due to lack of support from Engineering and Math Dept



# Future Work

- Will try to revisit this topic under the new Dean of Engineering
- Will present the data we have to the Chairs of the 4 departments and get their feedback
- THANK YOU to Nathan and NSF for getting us involved in this project !!!!