Annual Report

CALIFORNIA STATE UNIVERSITY, LONG BEACH

The Annual Meeting of
National Engineering Mathematics Consortium

June 27, 2011
Vancouver, British Columbia

Distribution of Freshmen into various Math Classes

Math Classes	COE		All university	
Math 224 (Calculus III)	9	2.5%	15	1.3%
Math 123 (Calculus II)	58	16.5%	110	9.3%
Math 122 (Calculus I)	59	16.8%	111	9.4%
Both Math 113 and 111	103	29.3%	132	11.2%
Math 113 (Algebra)	47	13.4%	379	32%
Math 111 (Trigonometry)	44	12.5%	104	8.8%
MAPB 11 (Int. Algebra)	31	8.8%	331	28%
Total	**351**	**100%**	**1182**	**100%**



Initial Observations

- Assuming students are Math-ready, it takes at least one year for students to start taking the tier 1 engineering courses in their disciplines.
- The math and physics prerequisites for the tier 1 engineering courses in some disciplines are inappropriate.

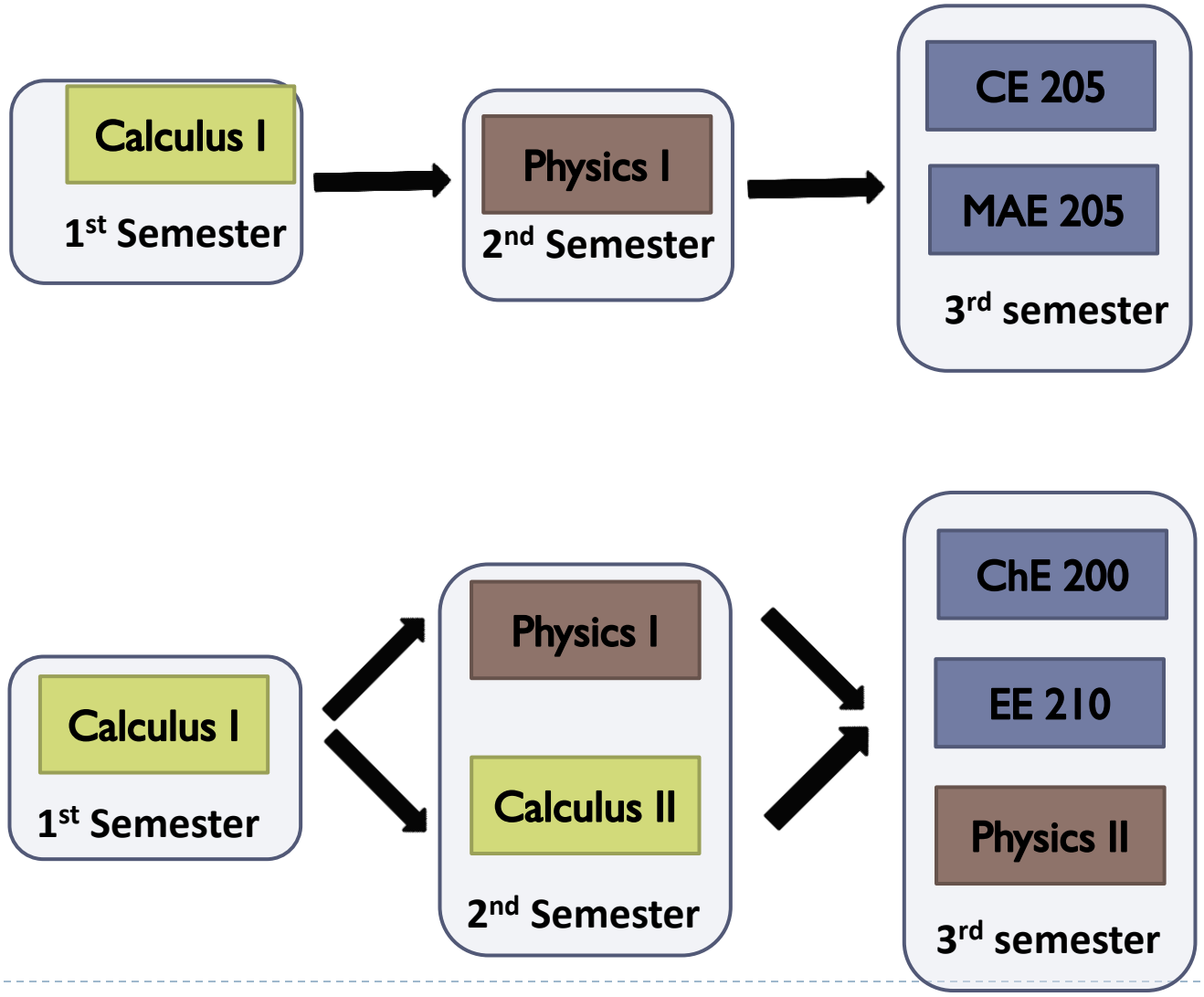
Department	Tier 1 Engineering Course	# Semesters	Prerequisites
ChE	ChE 200 – ChemE Fundamentals	3	Calculus II, Phys I
CECEM	CE 205 – Statics CE 206 – Computer Programming	3 3	Calculus I, Phys I
CECS	CECS 271 – Intro to Numerical Methods	5	Math 222[*2]
EE	EE 210 – Electromagnetic Foundations	3	Calculus II, Phys I
MAE[*1]	MAE 205 – Computer Methods MAE 300 – Engineering Instrumentations	3 5	Calculus I, Phys I Calculus III, Phys I & II

[*1] CE 205 is also the tier 1 engineering courses in MAE department.

[*2] Intermediate Calculus

The prerequisite for Phys I is Calculus I, and for Phys II is Calculus II.

Possible Paths



Options at CSULB

- Two Tracks
  - Old track

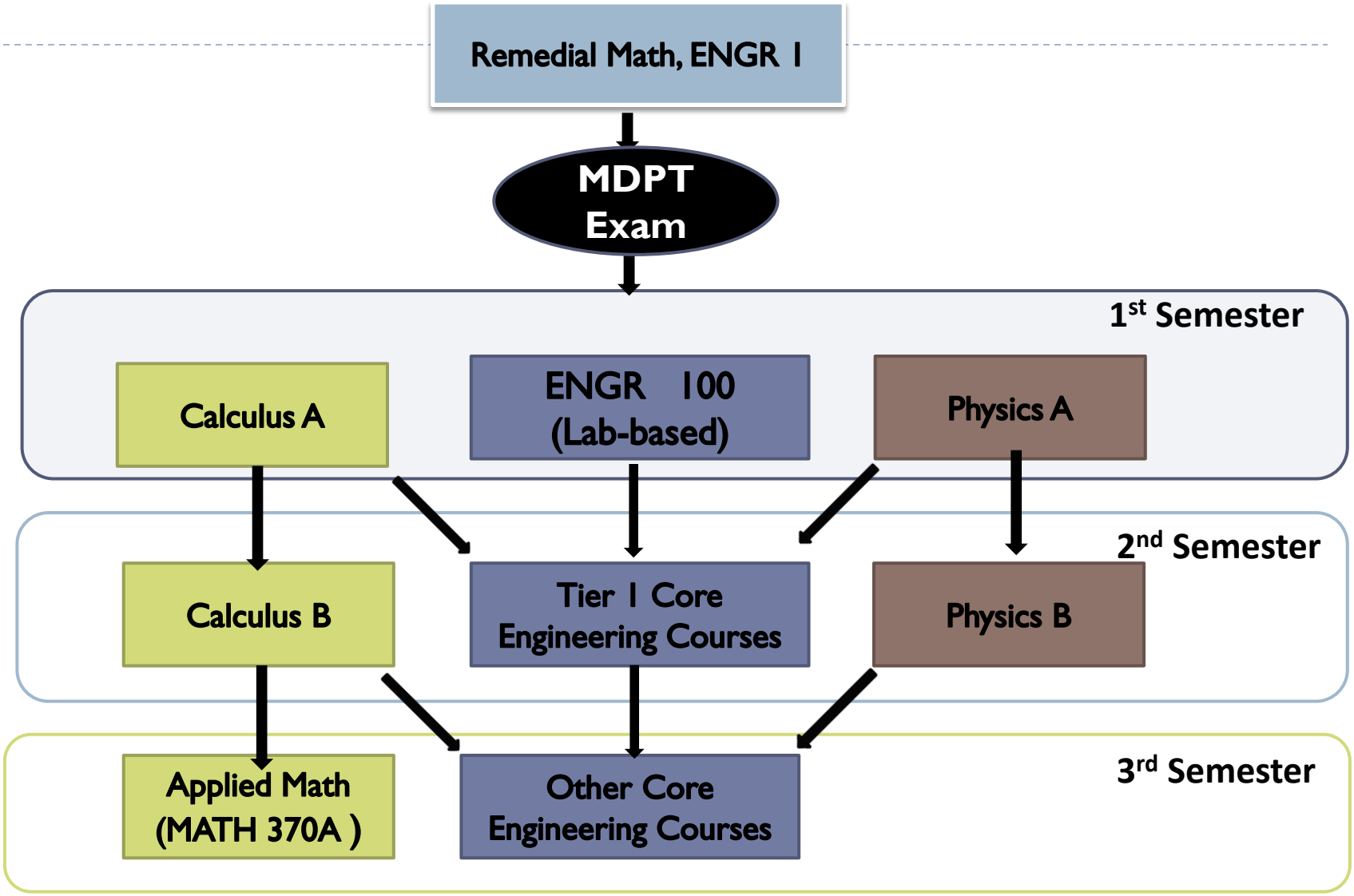
$$\text{Math111} \rightarrow \text{Math113} \xrightarrow{MDPT} \text{Math122} \rightarrow \text{Phys151} \rightarrow \text{Tier 1 Engineerin g}$$

  - New Track

$$\text{ENGR 1} \xrightarrow{MDPT} \text{ENGR 100} \rightarrow \text{Tier 1 Engineerin g}$$



Proposed Flowchart



- Tier 1 engineering courses include CE 205, CE 206, MAE 205, MAE 300, CECS 271, CHE 200, and EE 210.

Math through Science & Engineering (ENGR 1)

- Pass/Fail (no credit)
- Course Content
  - Trigonometry
    - Trigonometric relationships
    - Graphics
  - Algebra
    - Exponents and radicals
    - Logarithms
    - Polynomials and functions
    - Algebraic equations

- Currently → ENGR 100 (4 units, 3 units inst, 1 unit lab)
- Future → ENGR 1 (0 unit)
  ENGR 100 (3 units)



Fundamentals of Engineering Analysis (ENGR 100)

- Instruction/lab (3-units)
- Course Content
  - Vectors and derivatives
  - Integrals
  - ODE with constant coefficients
  - MATLAB
  - Engineering Applications



Engineering Applications

- Scientific notations
- Unit conversion
- Kinematics of falling bodies
- Static equilibrium
- Forces and free body diagram
- Energy storage
- Mass-spring system
- Electrical circuits (Ohm's law)
- Analysis of experimental data



Observations from the first cohort

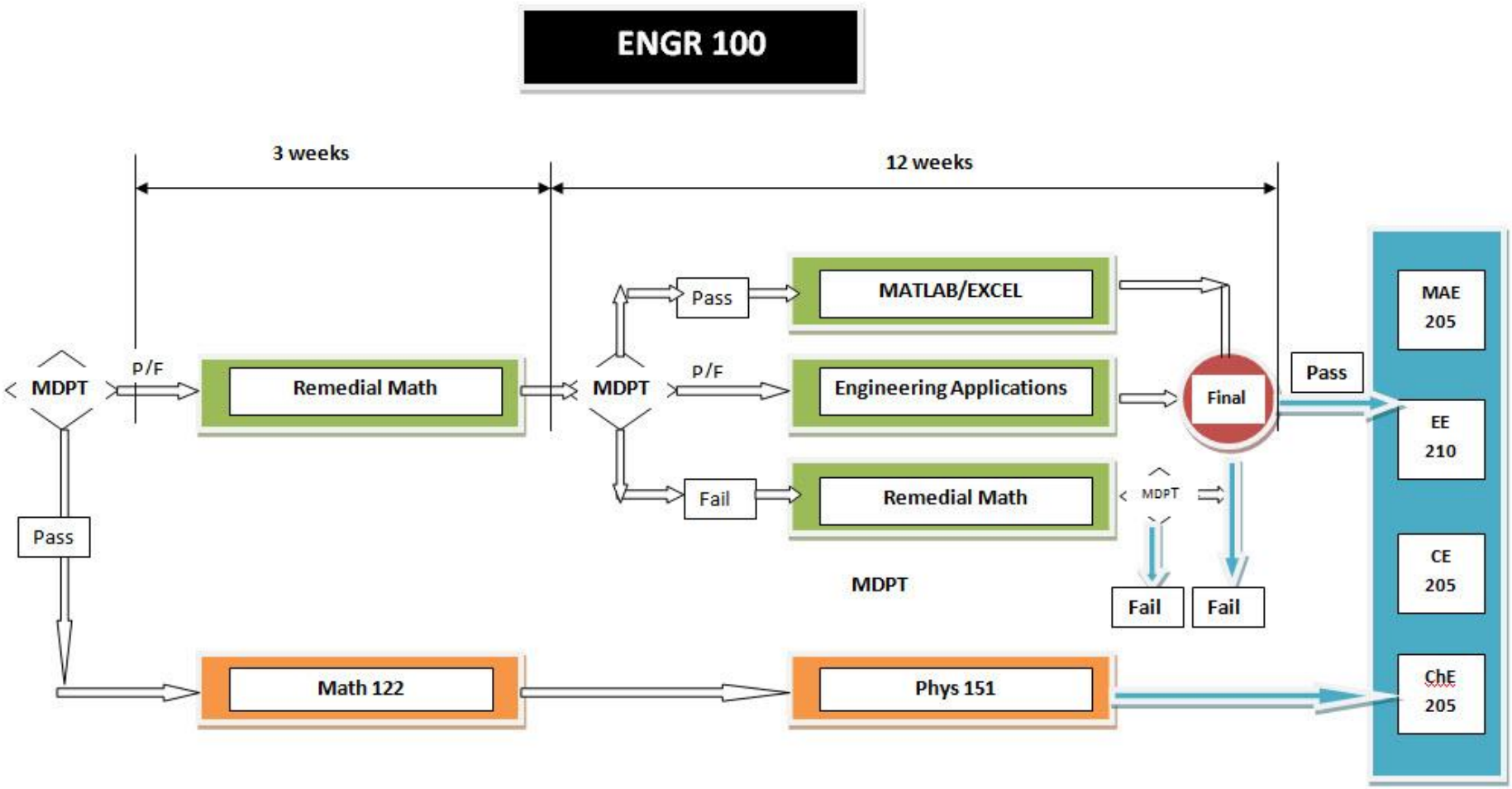
- Math anxiety – a big factor
- Pre-baccalaureate students benefited the most
- Pre-calculus students saved one to two courses

Please take time to visit:

http://vervepublishers.com/engr100/



Ideal Roadmap

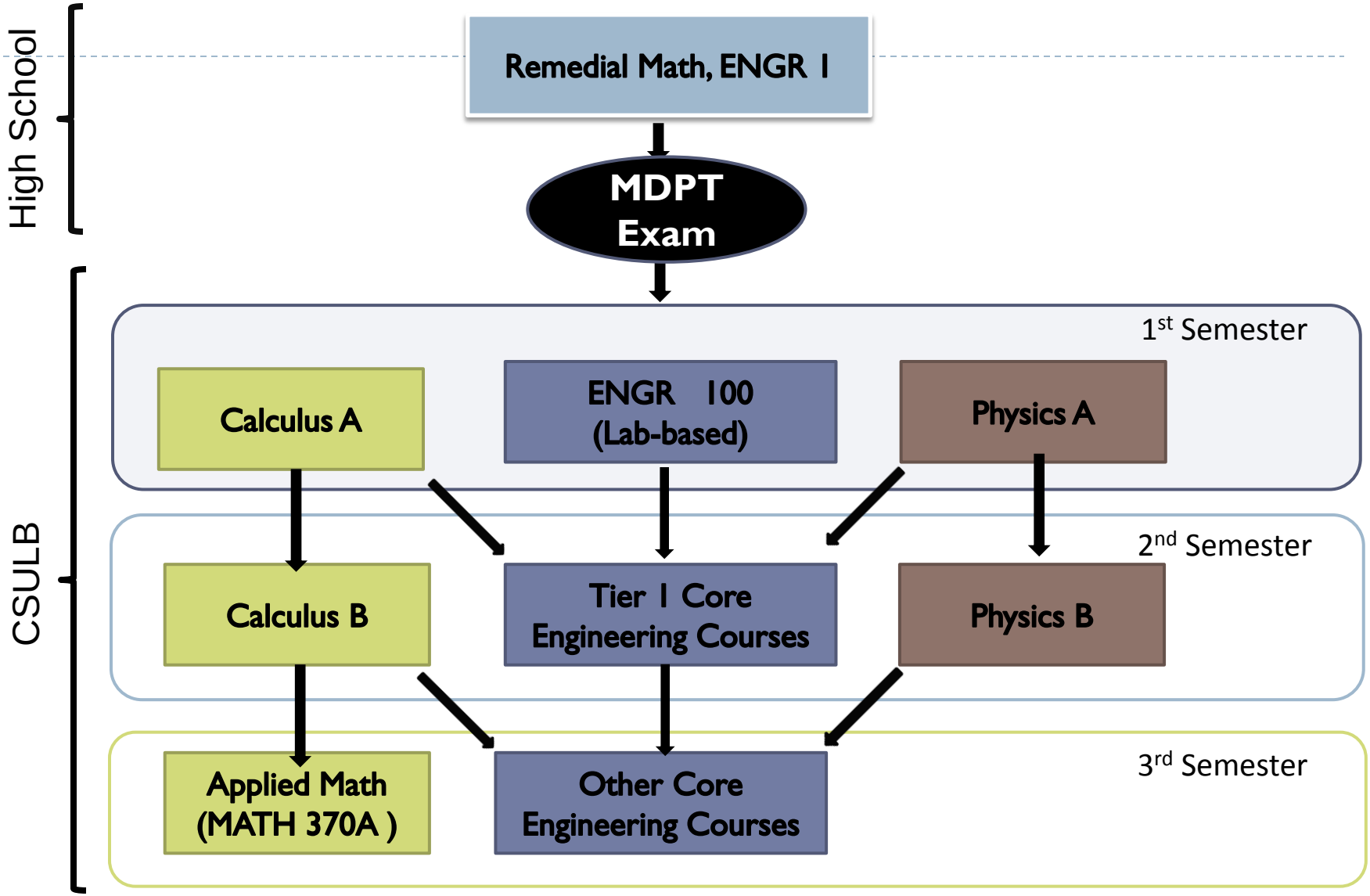


Integrating into the Curricula

- Too many complicating factors
  - High unit count: 128 and more
  - Pressure to reduce the unit count to 120
  - The "sacred" GE
  - Another minor issue … California budget!
- Solution: Offer it at feeder schools
  - Cornerstone of the "Access + Success" program
  - Augments the existing Young Scholars Program



Proposed Flowchart



Tier 1 engineering courses include CE 205, CE 206, MAE 205, MAE 300, CECS 271, CHE 200, and EE 210.

Pre-Calc Preparation – K-12

- Students register for college credit, while satisfying high school requirements.
- Classes are offered at the high school
  - All lectures at the school
  - Some lab sections at the school – for simpler experiments
  - Some labs, grouped together, offered at the Engineering lab of the university
- First classes taught by Prof. Toossi
- All lecture material and lab instructional material available on-line
- Possible funding sources: Private foundations, NSF, NAVY



Our Course of Action

- Offer the course at Jordan High School Ace Academy
  - The Dual Enrollment model
  - The program has existed for several years
    - Classes are offered both at CSULB and at the Academy
- Discussions at the District level for replication at other sites
  - The "Long Beach Promise" provides an excellent infrastructure and leadership.

