HOFSTRA UNIVERSITY®

College of Liberal Arts and Sciences
Department of Mathematics

presents a

Colloquium for Secondary School Teachers of Mathematics

15 sessions
Spring and Fall of 2019
Thursdays, 4:30 p.m. - 6:45 p.m.

Dates and content are on the next pages

Hofstra University Roosevelt Hall, South Campus

For information about the Mathematics Program at Hofstra University, please contact:

David Wayne, PhD
Director of the Computer Assisted Mathematics
Collaborative Learning Environment
& Adjunct Associate Professor

Room 103B Roosevelt Hall
Hofstra University, Hempstead, NY 11549
David.S.Wayne@hofstra.edu • 516-463-7421

Please visit **hofstra.edu/directions** for detailed directions to campus, a printable campus map, and links to the Long Island Rail Road schedule and Hofstra shuttle schedule.

RATIONALE

Over the past decade, the secondary school curriculum has been influenced by the Common Core State Standards Initiative whose proponents "recognized the value of consistent, real-world learning goals and launched this effort to ensure all students, regardless of where they live, are graduating high school prepared for college, career, and life."

From the beginning of its inclusion into the New York State mathematics curriculum, teachers, administrators and districts have been working to grasp the essential ideas and have wrestled with their own mathematical background and understandings in order to develop effective pedagogical strategies that meet New York State and the Common Core standards.

This colloquium will reacquaint teachers with some ideas that they may not have seen since their undergraduate education and, now, have become essential to meet the goal of preparing students for college, career, and life through the math curriculum. Teachers will emerge with a better understanding of how the material they are teaching in grades 7 through 12 impact students when they take college level math courses in all areas and how they might develop pedagogical strategies that make these connections.

DATES AND SESSION TOPICS FOR THE SPRING

All the sessions below are on Thursdays

1. **March 7th** **The Essential Algebra for Calculus**
2. **March 14th** **Calculus Concepts Already in the Secondary School Curriculum**
3. **March 28th** **Geometry as a Vehicle for Logical Thinking**
4. **April 4th** **Counting and Using Combinatorics to Solve Problems**
5. **April 11th** **Tables, Arrays, Spreadsheets and Matrices**
6. **April 25th** **Probability, Statistics and Inferential Decision Making**
7. **May 2nd** **Mathematics for the Enjoyment of the High and Low Achiever**

Dates for Sessions 8 – 15 to be given in the fall semester will be available at a later date. Their content is listed below.

SESSION CONTENT

The colloquium will consist of 15 two-hour sessions with Part One in the spring and Part Two in the fall. Each session will include the following activities with approximate times:

- Discussion of how the previous week's information has been considered or used (10 minutes)
- Introduction of a new topic and a discussion of places where this topic is seen in the 7 – 12 curriculum (20 minutes)
- Content/ Problem Solving with a member of the Hofstra University Math Department (50 minutes)
- Participant reactions to content and discussion on how this plays a role in what they teach (15 minutes)
- Summary of the session's activity (5 minutes)

The College Level Topics below are examples of what may be included. These may change depending upon the needs and interests of participants.

1. The Essential Algebra for Calculus

To what extent is the algebra taught in grades 7 – 12 necessary and sufficient for calculus? What kinds of problems are encountered in calculus that require specific algebraic processes? What would college level instructors want students to have mastered so that calculus is more readily understood?

College Level Topics: Derivative tests on functions; Simplifying terms in a series; Integration where polynomial division can be used.

2. Calculus Concepts Already in the Secondary School Curriculum

Basic calculus concepts such as limits, continuity, rates of change and numerical approximates appear throughout the secondary math curriculum, but not explicitly stated as such. Where are they? How do these concepts play an essential role in understanding precalculus and calculus concepts at the college level? In what ways should the teaching of these topics be enhanced or lessened?
College Level Topics: Determining asymptotes versus removable discontinuities; Definition of the derivative; Riemann sums.

3. Geometry as a Vehicle for Logical Thinking

Aside from the geometry that is essential for a student of mathematics to know, it plays a role as a means to teach deductive reasoning in a postulation system. "Proof" is essential to seeing the relationships between mathematical ideas. In what ways can this be instilled in students? What kinds of logical systems exist and how do they related to the "Statement-Reason" approach seen in a high school course in geometry?
College Level Topics: Truth Tables; Laws of Logic; Multivariable Truth Tables; Fuzzy Logic.

4. Geometry beyond the High School Curriculum

Euclidean Geometry is a foundational area of study in mathematics. How else might geometry be introduced other than with a postulational system? What kinds of geometries exist? How do they relate to EG and diverge from it due to the basic postulates of the systems? Of what benefit is there to introduce these ideas to high school students?
College Level Topics: Non-Euclidean Geometries; Geometric principles through vectors.

5. Trigonometry: Applications and Identities and its role in Calculus

Right Triangle trigonometry and the circular function approach are covered in a standard secondary curriculum. What are some major applications of trigonometry that are often not seen in the curriculum? What roles does trigonometry play in college level math and engineering courses? How have calculators diminished the role of tables and have lessened the retention of essential concepts?
College Level Topics: Trigonometric solutions to differential equations; Fourier Series for periodic functions.

6. **Counting and Using Combinatorics to Solve Problems**
   Grouping, sorting, classifying and counting distinct and non-distinct arrangements is a skill necessary for life. In what ways to we see this in the secondary curriculum? What are the essential ideas and formulas for students to know? How does this relate to college level course not necessarily in the hard sciences?
   College Level Topics: Basic ideas of combinatorics and applications; Binomial Theorem and Pascal's Triangle.

7. **Tables, Arrays, Spreadsheets and Matrices**
   Creating Tables of Values is often a first step when exploring a new type of function in the secondary math curriculum. What can be learned by the use of a spreadsheet when exploring a bale of values? What do we gain by organizing data into arrays? How are matrices important in solving of application based problems?
   College Level Topics: Matrix Algebra; Solving Systems of Equations with Matrices; Linear Programming Models and the Simplex Method.

8. **Probability, Statistics, Regression and Inferential Decision Making I**
9. **Probability, Statistics, Regression and Inferential Decision Making II**
   Where do Probability and Statistics appear in the secondary curriculum and to what degree? What are the underlying concepts, relationships and goals of these areas of study? What are the advantages of understanding regression in its many forms? How do we interpret and use measures of central tendency? What do we mean by statistical validity and how is it determined?
   College Level Topics: Probability beyond ratios and as an integral; Tests of significance; Best Fit and Least Error.

10. **Arithmetic, Algebra and Number Theory**
    How can arithmetic and algebra be viewed in an advanced way? How are simple arithmetic concepts more involved and more interesting than what appears on the surface?
    College Level Topics: Primes and their foundational place in arithmetic; Group and Field Properties; Elementary theorems of primes and divisibility; Base b arithmetic.

11. **Patterns, Sequences, and Series**
    Recognition of patterns is an essential tool in leading students to observations of mathematical truths. How can patterns be observed and formalized? What are some interesting sequences and series that give rise to or make use of important mathematical ideas and skills?
    College Level Topics: Sequences of Polygonal Numbers; Finite Differences to Develop a Formula for a Sequence; Taylor's Theorem and the notion of convergence.

12. **Exponential and Logarithm Functions Beyond the High School Curriculum**
    Exponential Functions are now taught early in the secondary curriculum. What are the benefits of this early introduction? How are exponential and logarithms related (as inverses) and how is this important for more advanced study? What are some applications of these functions not necessarily seen in the secondary math curriculum? How have calculators diminished the role of tables and have lessened the retention of essential concepts of logarithms?
    College Level Topics: Properties of inverse functions; Continuous Growth or Decay; Logistic Growth; The many facets of the number e; Logarithmic axes.

13. **Problem Solving Strategies Beyond the Formal Approach**
    Often, learning how to solve problems is based on the skill or concept being currently taught. Teaching strategies to solve problems is seldom taught. What are some typical approaches used to understand and explore a problem and eventually arrive at a solution? (i.e. – Work backwards; Consider a simpler problem; Try and modify; etc.)
    College Level Topics: Problems from a variety of sources that don't necessarily require a particular advanced result or skill, but does require a good amount of exploration and consideration.

14. **Mathematics for the Enjoyment of the Low Achiever**
    How can educators instill an affection for mathematics in students who struggle in class and find math confusing? What kinds of problems can pique their interest and are within their grasp to solve?
    College Level Topics: A variety of problems that have easy to explain mathematical solutions involving arithmetic, counting, pattern recognition, and other areas where such problems can be found.

15. **Mathematics for the Enjoyment of the High Achiever**
    The high achieving math student is always eager for a math problem to solve? How do we move the student forward in his/her pursuit of learning new and interesting mathematical ideas?
    College Level Topics: A variety of problems that have mathematical solutions that while simple on the surface lead to more stimulating similar problems and into advanced areas of mathematics.

REGISTRATION FEE

The colloquium will meet in two parts – 7 sessions in the spring of 2019 and 7 sessions in the fall of 2019. You can, if you wish, register for only one at this time.

COST: $300 for each set of 7 sessions $500 for both sets of sessions

For the spring, sessions will meet on Mondays from 4:30 pm to 6:45 pm with dinner included.
Hofstra University will certify 15 hours of CTL time for attending all 7 sessions in one semester.

REGISTRATION FORM

Please respond by Monday, February 25, 2019 • ***Make checks payable to Hofstra University.***

Mail registration form and fee to: **Office of Professional Development Services, School of Education**
Room 233 Hagedorn Hall, 119 Hofstra University, Hempstead, NY 11549-1190
Phone: 516-463-5750
Email: officeofprofessionaldevelopmentservices@hofstra.edu

Visa/MasterCard are accepted. To pay by credit card, please visit **hofstra.edu/edworkshopreg**.

CONFERENCE FEES: (includes conference and dinner) $300 for each set of 7 sessions
$500 for both sets of sessions

Name_____

Address_____

Phone (day)_____(evening)_____(cell)_____

Affiliation_____

Email_____

Some workshops have limited space; early registration is highly recommended

- ☐ **Spring 2019 .....7 sessions**
- ☐ **Fall 2019 .....8 sessions**
- ☐ **Spring/Fall 2019 .....15 sessions**

Check the box that applies

HOFSTRA UNIVERSITY

77154:3/18