



Universidad de Concepción

Facultad de Ciencias Físicas y Matemáticas

Departamento de Matemática

CURSILLO

“Lectures on Isoperimetric Problems”

Profesor: Mark Ashbaugh, University of Missouri, EE.UU.

Semana 1° : Classical Isoperimetric Problems

The Classical Isoperimetric Problem asks, “Given a closed loop of string of a given length, in what shape should you place it on a flat surface so as to enclose the largest area?” This problem arose in antiquity as the problem of Queen Dido, and it is supposed that the Greeks knew the answer (arrange the string in the shape of a circle) even if they didn't know how to prove it. This problem has a varied history and progress on it and related problems even mirrors the development of mathematics generally. Early proofs (or attempted proofs) of the classical isoperimetric problem will be discussed, as well as those of related problems. In addition, the subtle problems concerning existence of minimizers, the Dirichlet problem, and the “crisis in analysis” of the late 19th century will be touched on.

HORARIO:

Lunes 5 de Noviembre, desde las 10:15 a 12:00 horas

Martes 6 de Noviembre, desde las 15:15 a 17:00 horas

Miércoles 7 de Noviembre, desde las 15:15 a 17:00 horas

Sala REDOC, Dirección de Postgrado

Edmundo Larenas N°234, Barrio Universitario, Concepción

Sesiones de Ejercicio:

Jueves 8 de Noviembre, desde las 15:15 a 17:00 horas

Viernes 9 de Noviembre, desde las 10:15 a 12:00 horas

Sala Postgrado, Facultad de Ciencias y Matemática, 1° Piso.

Coordinador del Cursillo: Profesor Rajesh Mahadevan, Oficina 534, FCFM

Correo electrónico: rmahadevan@udec.cl

Cursillo realizado en el marco del proyecto MEC (Modalidad Estadías Cortas) 80170093 del Programa de Cooperación Internacional - CONICYT.

Inscripciones en Secretaría Departamento de Matemática



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Semana 2° : Isoperimetric Problems for Eigenvalues and in Analysis Generally

Problems having a similar character to the classical isoperimetric problem have come to be called “isoperimetric problems”. For example, suppose you wish to construct a drum, of any shape but of a given area (and fixed material, tension, etc.), what shape should you make it to give it the lowest fundamental frequency (bass note or tone)? This problem was formulated by Lord Rayleigh in the 1870s, and solved by Faber and Krahn (independently) in the 1920s. Or, “Given a fixed amount of material, in what way should you distribute it to make the strongest possible column of a prescribed length?” This problem was formulated by Lagrange in 1773 (but not fully solved until much later), and is likely the first “non-classical” isoperimetric problem to be considered. Or you could ask how to distribute the material to give the highest free-standing column. In this case the best guess might be to taper the column (flagpole) in some way, but it still remains to find the precise way to taper it to give it the greatest height. Finally we come back to vibration problems with another problem of Lord Rayleigh: Among all clamped plates of given area (all other physical parameters held fixed), what shape gives the lowest fundamental frequency of vibration? These and related problems will be discussed in the second week, along with some of the methods used to attack them.

HORARIO:

Lunes 12 de Noviembre, desde las 10:15 a 12:00 horas

Martes 13 de Noviembre, desde las 15:15 a 17:00 horas

Miércoles 14 de Noviembre, desde las 15:15 a 17:00 horas

Sala REDOC, Dirección de Postgrado

Edmundo Larenas N°234, Barrio Universitario, Concepción

Sesiones de Ejercicio:

Jueves 15 de Noviembre, desde las 15:15 a 17:00 horas

Viernes 16 de Noviembre, desde las 10:15 a 12:00 horas

Sala Postgrado, Facultad de Ciencias y Matemática, 1° Piso.

Coordinador del Cursillo: Profesor Rajesh Mahadevan, Oficina 534, FCFM

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