

**RECEIVED**  
APR 08 1996  
**GRADUATE OFFICE**

CURRICULUM PROPOSAL FORM #3  
University of Wisconsin-Whitewater

**NEW COURSE**

COURSE NUMBER: 760 - 659 / \_\_\_\_\_

EFFECTIVE TERM: Fall 1996

CROSS LISTED NO.: \_\_\_\_\_ - \_\_\_\_\_ / \_\_\_\_\_

COURSE TITLE: Partial Differential Equations

15 CHARACTER ABBREVIATION P A R T I A L D I F F E R E N T I A L E Q N S  
25 CHARACTER ABBREVIATION P A R T I A L D I F F E R E N T I A L E Q N S

SPONSOR(S): Dr. D. Phanord, Dr. Verma

DEPARTMENT(S): Mathematics and Computer Science

COLLEGE(S): Letters and Sciences

CHECK IF THE COURSE IS TO MEET ANY OF THE FOLLOWING REQUIREMENTS:  
 Writing Requirement  
 Diversity Requirement  
 General Studies, Area: \_\_\_\_\_  
 Computer Requirement

CONTACT HOURS/CREDITS  
Total Lecture Hours 48  
Total Lab Hours \_\_\_\_\_  
Total Contact Hours 48  
Number of Credits 3

S THE COURSE REQUIRED IN: \_\_\_\_\_ IS THE COURSE REPEATABLE: YES \_\_\_\_\_, NO  X  
Major, \_\_\_\_\_ No. of Times in Major \_\_\_\_\_ and No. of Credits \_\_\_\_\_  
Minor, \_\_\_\_\_ No. of Times in Degree \_\_\_\_\_ and No. of Credits \_\_\_\_\_  
Emphasis, \_\_\_\_\_

ATTACH THE FOLLOWING:

- I. COURSE JUSTIFICATION
- II. RELATIONSHIP TO PROGRAM OBJECTIVES
- III. BUDGETARY IMPACT
- IV. PROGRAMS AFFECTED IN OTHER ACADEMIC UNITS
- V. COURSE DESCRIPTION
- VI. REQUISITES
- VII. TENTATIVE COURSE SYLLABUS
- VIII. BIBLIOGRAPHY

*replacement*

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COLLEGE(S): Letters and Sciences

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OF THE FOLLOWING REQUIREMENTS:

- Writing Requirement
- Diversity Requirement
- General Studies, Area: \_\_\_\_\_
- Computer Requirement

CONTACT HOURS/CREDIT  
Total Lecture Hours 48  
Total Lab Hours 1  
Total Contact Hours 48  
Number of Credits 3

IS THE COURSE REQUIRED IN:

IS THE COURSE REPEATABLE: YES \_\_\_\_\_,  NO

Major, Math BA/BS Minor \_\_\_\_\_ No. of Times in Major \_\_\_\_\_ and No. of Credit \_\_\_\_\_  
 Minor, \_\_\_\_\_ No. of Times in Degree \_\_\_\_\_ and No. of Credit \_\_\_\_\_  
 Emphasis, \_\_\_\_\_

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**I. Course Justification**

By being a member of the Wisconsin Space Grant Consortium, and a JOVE Institution (Joint Venture between NASA and UW-Whitewater, the University has an obligation to provide its students a space science oriented education.

No one can pursue a career in applied sciences or more precisely in space related sciences without a mastery of wave phenomena. This mastery can be achieved by a complete understanding of Partial Differential Equations.

In addition, many of our students of either Physics or Mathematics must take the GRE in order to secure admission in a reputable graduate program. The knowledge of partial differential equations is crucial to such an endeavor.

**II. Relation to Program Objectives**

The course is a requirement for the mathematics majors anticipating a career in applied mathematics.

Requirement for Mathematics BA/BS.

Also recommended to students anticipating a graduate study in Physics.

**III. Budgetary Impact**

None

**IV. Program Affected in Other Academic Unit**

None

**V. Course Description**

Fourier analysis, partial differential equations and boundary value problems, complex variables, and potential theory.

**VI. Requisites**

prerequisite: 760-361

**VII. Tentative Course Syllabus**

**MATHEMATICS 760659, PARTIAL DIFFERENTIAL EQUATIONS**

Course Outline

Text: Partial Differential Equations, by Walter A. Strauss. New York: John Wiley & Sons, Inc., 1992.

## Course Outline Cont.

- I. Boundary-Value Problems and Characteristic-Function Representations
  - A. The rotating string
  - B. The rotating shaft
  - C. Buckling of long columns under axial loads
  - D. The method of Stodola and Vianello
  - E. Orthogonality of characteristic functions
  - F. Expansion of arbitrary functions in series of orthogonal functions
  - G. Boundary-value problems involving nonhomogeneous equations
  - H. Fourier sine and cosine series
  - I. Complete Fourier series
  - J. Fourier-Bessel series
  - K. Legendre series
  - L. The Fourier integral
  
- II. Partial Differential Equations of Mathematical Physics
  - A. Heat flow
  - B. Steady state temperature distribution in a rectangular plate
  - C. Steady-state temperature distribution in a circular annulus
  - D. Poisson's integral
  - E. Axisymmetrical temperature distribution in a solid sphere
  - F. Temperature distribution in a rectangular parallelepiped
  - G. Ideal fluid flow about a sphere
  - H. Vibration of a circular membrane
  - I. Heat flow in a rod
  - J. The superposition integral
  - K. Traveling waves
  - L. The pulsating cylinder
  - M. The application of Fourier integrals
  - N. The Laplace transform and the telegraph equations for a long line
  - O. Formation of problems
  - P. Supersonic flow of ideal compressible fluid past an obstacle
  
- III. Functions of a Complex Variable
  - A. The complex variable
  - B. Elementary Functions
  - C. Analytic functions
  - D. Line integrals
  - E. Cauchy's integral formula
  - F. Taylor series
  - G. Laurent series
  - H. Singularities
  - I. Residues
  - J. Evaluation of real integrals

## Course Outline Cont.

- K. Theorems on limiting contours
- L. Indented contours
- M. Conformal mapping
- N. Two dimensional fluid flow
- O. Basic flows
- P. Other applications of conformal mapping
- Q. The Schwarz-Christoffel transformation

Credits: 3

Offered: Second semester of each year

Pre-requisite: 760361

Accepted credit toward what majors and minors: Mathematics major and minor

Catalog Description: A course in functions of several variables, theory of partial differential equations, partial differential equations of mathematical physics, functions of a complex variable with applications.

Graduate students: Will be responsible for a research paper and a research project.

## VIII. Bibliography

Partial Differential Equations, Strauss, Walter A., New York: John Wiley & Sons, Inc., 1992.

Applied Differential Equations., Spregel R. Murray, Prentice-Hall, Englewood Cliffs, NJ, 1981.

Differential Equations, Ahmad S, Keener M, and Lazer A.C., Academic Press, New York, 1980.

Solutions of Partial Differential Equations, TPR, Blue Ridge Summit, PA, 1986.

Differential Equations, 3rd Edition, Ross L'Shepley. John Wiley and Sons, New York, 1984.

Elementary Applied Partial Differential Equations, 2nd Edition, Haberman, Richard, Prentice-Hall, Englewood Cliffs, NJ, 1987.

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CROSSLISTED NUMBER:       /      /      

COURSE TITLE: Partial Differential Equations

*Shendur* / *Krishnamoorti* 3/29/96  
Proposal Sponsor Date of Submission

*Gay Keatt* Math & CS 4/8/96  
Chair of Sponsoring Department Department Approval Date

*Z. Roberts*        4/4/96  
Chair, College Curriculum Committee Approval Date

*Thompson* LES 4/8/96  
Dean of College College Approval Date

FOR UNDERGRADUATE ACTIONS:

IF COURSE IS TO BE CONSIDERED AS A DIVERSITY/ G.S. OPTION:

       Recommended  
       Not Recommended         
Chair, Div. Comm./ Gen. Ed. Review Comm. Date

       Approved  
       Not Approved         
Chair, University Curriculum Committee Date

       Approved  
       Not Approved         
Chair, Faculty Senate Date

FOR GRADUATE ACTIONS:

*Chae* Approved 4/11/96  
       Not Approved         
Chair, Graduate Council Date

*Kay Schallert* 5/1/96  
Provost & Vice Chancellor Date Received

ACADEMIC UNIT	SIGNATURE	DATE	*ACTION

\* Indicate Approve, No Contest, or Disapprove, for graduate programs only)

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Proposal Sponsor      Date of Submission

*Gary Keatt*      Math & CS      4/8/96  
Chair of Sponsoring Department      Department      Approval Date

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Chair, College Curriculum Committee      Approval Date

*Thompson*      LES      4/8/96  
Dean of College      College      Approval Date

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            Not Approved              
Chair, University Curriculum Committee      Date  
-----  
            Approved  
            Not Approved              
Chair, Faculty Senate      Date

FOR GRADUATE ACTIONS:  
*[Signature]*      Approved      4/11/96  
            Not Approved              
Chair, Graduate Council      Date

                    
Provost & Vice Chancellor      Date Received

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_____	_____	_____	_____

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