KINGSBOROUGH COMMUNITY COLLEGE
The City University of New York

CURRICULUM DATA TRANSMITTAL SHEET

DEPARTMENT Mathematics & Computer Science DATE February 2, 2015

Title of Course or Degree Change: MAT 71L: Applications of Linear Algebra & Vector Analysis

Change(s) Initiated: (Please check)

☐ Letter of Intent ☐ Proposal
☐ Closing of Degree Program ☐ Proposal (Letter of Intent sent previously)
☒ New Course* ☐ Change in Degree Requirements
☐ New 82 Course ☐ Change in Degree Requirements (adding concentration)
☐ New Certificate Program ☐ Change in Discipline Code
☐ Change in Pre/Co-Requisite ☐ Change in Description
☐ Deletion of Course ☐ Change in Course Titles, Numbers, Credits &/or Hours
☐ Other (please describe):

PLEASE ATTACH PERTINENT MATERIAL TO ILLUSTRATE AND EXPLAIN ALL CHANGES

I. DEPARTMENTAL ACTION
Action by Department and/or Departmental Committee, if required:

Date approved 02/02/2015 Signature, Committee Chairperson: [Signature]

Signature, Department Chair: [Signature]

II. PROVOST ACTION
Provost to act within 30 days of receipt and forward to College-wide Curriculum Committee exercising one of the following options:

A. Approved ☐ B. Returned to department with comments ☐

Recommendations (if any):

Signature, Provost: [Signature] Date:

III. CURRICULUM SUB-COMMITTEE RECOMMENDATIONS (* FOR NEW COURSES ONLY):

A. Approved ☐ B. Tabled ☐ (no action to be taken by Curriculum Committee)

Recommendations (if any):

Signature, Sub-Committee Chair: [Signature] Date:

IV. COLLEGE-WIDE CURRICULUM COMMITTEE ACTION
Committee to act within 30 days of receipt, exercising one of the following options:

A. Approved ☐ (forwarded to Steering Committee)
B. Tabled ☐ (Department notified)
C. Not Approved ☐ (Department notified)

Signature, Chairperson of Curriculum Committee: [Signature] Date:

Revised/Winter 08
Rationale: This is an elective course for mathematics majors, and will serve to satisfy a major requirement in the category “choose two of the following” in the curricular specifications AS degree in Mathematics.

The addition of MAT 71 to the current list will broaden students' choices and will provide excellent preparation for continued study of the subject matter in a baccalaureate program.
Kingsborough Community College
of
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COURSE SYLLABUS

1. Department, Course number, Course Title: Department of Mathematics and Computer Science, Mat 71, Applications of Linear Algebra & Vector Analysis

2. Does this course meet a general education/CUNY core category? No

3. Transferability of this course? This course will help to prepare students for the introductory Biomedical Engineering Course at Stony Brook University (SUNY). MAT 71 is equivalent to:
   MTH 320 (Vector Analysis) at Medgar Evers
   MAT 39200 (Linear Algebra and Vector Analysis for Engineers) at City College
   MTH 44 (Vector Analysis) at Bronx Community College
   MATH 25500 (Vector Analysis) at Hunter College
   MAT 212 (Linear Algebra & Vector Analysis for Engineers) at LaGuardia Community College

4. Bulletin Description of Course: This course presents the theory of linear systems and vector analysis and their applications through two mutually reinforcing components. The first is modeling, the derivation of governing equations from physical principles. The second is solution techniques and algorithms for solving such equations. The course will illustrate and explain basic techniques – including dynamical systems modeled by linear differential equations, image processing, boundary value problems, and solution techniques such as Fourier Transform and Laplace Transform – that are used in real-world problems of the type encountered in applied mathematics, engineering, and science. The course will also explain how these mathematical techniques are derived from basic mathematical principles.

5. Number of weekly class hours: 4

6. Number of Credits: 4

7. Course pre or co-requisites: MAT 16 (Calculus II) and MAT 56 (Linear Algebra),

8. Brief rationale to justify proposed course: Linear Algebra and Vector Analysis play a central role in applied mathematics, as well as in science, engineering, computer science, probability and statistics, economics, numerical analysis, mathematical biology, and many other disciplines. A background in both calculus and linear algebra as applied to real-world scenarios is an essential tool for all these areas of study.

9. List of courses to be withdrawn when course is adopted: none

10. Field work, Internship, or Independent Study: N/A

11. Proposed text books:
a) Applied Linear Algebra, by Peter J. Olver & Chhrzad Shakiban. Published by Prentice Hall,
12. Required course for majors or area of concentration:
This course will fulfill one elective requirement for math majors

13. If open only to selected students:
Open to all students who satisfy the co-requisite requirements

14. Course Goals:
   I Linear Algebra
   The student will learn the standard techniques in solving systems of linear equations arising in applied mathematics.
   
   II Vector Analysis
   The student will be introduced to the basic concepts of vector analysis and their physical interpretations. The student will also learn how these concepts are applied to such problems that arise in engineering and physical science as fluid mechanics and the theory of electromagnetism, with an emphasis on Maxwell's equations.

15. Method of Teaching: Classroom lecture presentation of the application of the theory of linear algebra and vector analysis in the context applied mathematics, science, and engineering.

16. Assignments to students: Daily homework exercises and regular assigned projects. The homework exercises will call for finding solutions to specific problems related to the lectures. The projects will involve applications of the analyses and techniques discussed in the lectures.

17. Describe method of evaluating learning specified in 15: Classroom tests, quizzes, homework, projects, and a comprehensive final examination. Final Exam will weigh a minimum of 40%, with the remaining 60% distributed between classroom tests, quizzes and projects.

18. Topical Course Outline:

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<th>Topic</th>
<th>Book/Section/pages</th>
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<td>Larson, et. al.</td>
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<td>Differential Equations</td>
<td>Ch. 18</td>
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<td>Eigenvalues and Eigenvectors</td>
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**Vector Analysis**  
Larson, et. al.
Volume Integrals  
Triple Integrals & Applications  
16.6: pp. 966-975  
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Line & Surface Integrals  
Ch. 17

Gradient, Divergence,  
Curl of a Vector Field, &  
Laplacian Operator  
17.1: pp. 1000-10011  
27, 28

Line Integrals & Vector Functions  
17.2: pp. 1012-1023  
29, 30

Work by a Vector Field,  
Line Integrals Independent of Path,  
Conservative Vector Fields  
17.3: pp. 1024-1032  
31, 32

Surface Integrals  
17.6: pp. 1052-1060  
33, 34

Integral Theorems  
Ch. 17

Greens Theorem  
17.4: pp. 1033-1041  
35-37

Divergence Theorem  
17.7: pp. 1061-1067  
38-40

Stokes Theorem  
17.8: pp. 1068-1072  
41-43

Applications  

Continuity Equation of Fluid Flow  
Maxwell's Equations  
44

Exam III  
45

Optional Topics

Fourier Series and Transforms  
Lecture Notes  
&  
http://www.math.umn.edu/~olver/appl.html

Simple Harmonic Motion  
Lecture Notes & Web site  
46

Larson, et. al

Discrete Fourier Series  
5.7: pp. 277-292  
47

Review  
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Final Exam

19. References


