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KOWAN COLLEGE
CURRICULUM COMMITTEE

PROPOSAL TITLE: Mathematics for Engineering Analysis I 701-235

UNDERGRADUATE GRADUATE 4 CREDIT HOURS

SPONSOR(S): Dr. Abera Abay, Dr. Thomas Osler and Dr. Marcus Wright

DEPARTMENT & TELEPHONE# Mathematics - 4844

CHECK ONE: COURSE MINOR PROGRAM CONCENTRATION SPECIALIZATION
 ACHIEVEMENT CERTIFICATE CERTIFICATION PROGRAM MAJOR PROGRAM

<p>STEP #1 (DEPARTMENT)</p> <p><input checked="" type="checkbox"/> APPROVED/DATE: <u>1/7/96</u></p> <p><input type="checkbox"/> NOT APPROVED/DATE:</p> <p><u>Abera Abay</u> DEPT. CURRICULUM CHR.</p> <p><input type="checkbox"/> REVIEWED/DATE: <u>11/7/96</u></p> <p><u>Sally Stewart</u> DEPT. CHR.</p>	<p>STEP #2 (RECEIPT)</p> <p>SCC# <u>96-97-78</u></p> <p>DATE RECEIVED: <u>11-7-96</u></p> <p><u>Ronald J. Gochen</u> SENATE CURRICULUM CHR.</p>	<p>STEP #3 (SCHOOL)</p> <p>REVIEWED DATE: <u>11/26/96</u></p> <p><input checked="" type="checkbox"/> RECOMMEND TO APPROVE</p> <p><input type="checkbox"/> RECOMMEND NOT TO APPROVE</p> <p>FORWARD FOR OPEN HEARING</p> <p><input checked="" type="checkbox"/> WITHOUT RESERVATIONS</p> <p><input type="checkbox"/> WITH RESERVATIONS</p> <p>COMMENTS: <u>SCC wants to discuss process of taking Calc III</u></p> <p><u>Ken P. McGuire</u> SCHOOL COMMITTEE CHR.</p>
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STEP #4 (ACADEMIC DEAN) COMMENTS:

RECOMMEND

NOT RECOMMEND

CONDITIONALLY RECOMMEND (SEE COMMENTS)

DATE & SIGNATURE, DEAN OF SCHOOL: 12/4/96 Robert J. ...

RECEIVED

DEC 6 3 1996

STEP #5 (SENATE CURRICULUM COMMITTEE)

DATE OF OPEN HEARING: 1/29/97

APPROVED BY SENATE CURRICULUM COMMITTEE (DATE) 1/29/97

RETURNED TO SPONSOR(S) FOR THE FOLLOWING REASONS:

SENATE

DEC 4

RECEIVED

STEP #6 (SENATE)

DATE PRESENTED TO SENATE: _____

APPROVED NOT APPROVED

NOTIFICATION TO EXECUTIVE VICE PRESIDENT/PROVOST (DATE): _____

SENATE CURRICULUM COMMITTEE CHAIR SIGNATURE/DATE: Ronald J. Gochen 2/21/97

STEP #7 (EXECUTIVE VICE PRESIDENT/PROVOST)

DATE RECEIVED 3/7/97

APPROVED: YES NO

IF NO, REASONS ARE AS FOLLOWS:

STUDENT CREDIT HOURS 4

FACULTY LOAD HOURS 4

EQUALIZED CREDIT HOURS _____

OFFICIAL COPY & APPROVAL SHEET FILED (DATE) _____

SIGNATURE, EXECUTIVE VICE PRESIDENT/PROVOST C. Strassman

REGISTRAR

DATE APPROVED COURSE DESCRIPTION RECEIVED 19 Mar 97

HEGIS TAXONOMY AND COURSE NUMBER ASSIGNED 1701.235

DATE/SIGNATURE OF REGISTRAR B. Kelly

NOTIFICATION FORWARD:

___ SENATE CURRICULUM COMMITTEE CHAIRPERSON

___ DEPARTMENT CHAIRPERSON(S)

___ ACADEMIC DEAN(S)

___ REGISTRAR

___ SPONSOR(S)

**Rowan College of New Jersey
Department of Mathematics**

Course Proposal

Mathematics for Engineering Analysis I

I. Details:

- a) **Course Title:** Mathematics for Engineering Analysis I
- b) **Sponsors:** Dr. Abera Abay, Dr. Tom Osler, Dr. Marcus Wright,
Department of Mathematics
- c) **Course Level:** Sophomore
- d) **Credit Hours:** 4 credit hours
- e) **Curricular Effect:** Required course for all students in the undergraduate engineering program.
- f) **Prerequisite:** Calculus II.
- g) **Suggested Time /
Implementation** This course will be offered every semester.
- h) **Resources:** Faculty, equipment and library resources are adequate to run this course.

II. Rationale:

This course is the first of a sequence of two advanced mathematics courses required for all engineering students that will be taken after Calculus II.

This course provides a comprehensive introduction to functions of several variables, vectors, vector valued functions, and ordinary differential equations. Differential equations are of fundamental importance in engineering mathematics since they provide excellent mathematical models of many physical laws and relations.

III. Essence of the Course:

a) Objectives:

At the end of this course, students will be able to:

- (i) calculate dot and cross product of vectors,
- (ii) compute the divergence and curl of a vector field,
- (iii) compute the partial derivatives and gradient of a function of several variables,
- (iv) use Lagrange's multipliers to solve applied extremum problems of a function of several variables with a given constraint,
- (v) evaluate double integrals and find area and volume using them,
- (vi) solve separable and exact ordinary differential equations and use integrating factors in solving differential equations, and
- (vii) use the methods of undetermined coefficients, variation of parameters, in solving second order ordinary differential equations.
- (viii) perform matrix operations, evaluate determinant, eigenvalues and eigenvectors of a matrix operator.

b) Topical Outline:

Topics that will be covered include:

- (i) Functions of Several Variables: Limits and continuity, partial derivatives, chain rule, directional derivatives, gradient, Lagrange's multipliers, double integrals.
- (ii) Vector Valued Functions: Vector algebra in 2 or 3 space, dot and cross product, arc length, velocity and acceleration, divergence and curl of a vector field.
- (iii) Linear Algebra: Matrices and matrix operations, linear systems of algebraic equations, vector spaces--basis, dimension and transformation, determinants, eigenvalues and eigenvectors, diagonalization.
- (iv) First Order Differential Equations: Basic concepts, separable and exact differential equations, integrating factors, linear differential equations.
- (v) Second Order Differential Equations: Homogeneous linear equations, homogeneous equations with constant coefficients, Euler-Cauchy equation, nonhomogeneous equations, solutions by undetermined coefficients and variation of parameters.

c) Student Evaluation:

Students will be evaluated based on class participation, assignments and tests.

d) Course Evaluation:

This course will be evaluated through student evaluations as well as departmental review.

IV. Results of Consultations:

The content and nature of this course was discussed with the Chairpersons of the four Departments of Engineering. This proposal has been reviewed and approved by the Curriculum Committee of the Department of Mathematics.

V. Course texts:

The following book may be used as a text for the course.

Kreyszig, Erwin, (1993), Advanced Engineering Mathematics, John Wiley & Sons.

VI. Catalogue Description:

1703-241 Mathematics for Engineering Analysis I

(Prerequisite: Calculus II)

This course gives a comprehensive introduction to functions of several variables, linear algebra, vector calculus and ordinary differential equations. It includes partial derivatives, double integrals, matrices, matrix operations, eigenvalues, dot and cross products, divergence, curl, first and second order ordinary differential equations.