Department of Electronics, Computer and Communications Engineering   Course Syllabus for ENGMA 102
School of Science and Engineering   First Semester, 2004-2005
Ateneo de Manila University

ENGMA 102: **Engineering Mathematics II** (3 units)

ENGMA 102 A: TTh, 1330 - 1500, F-319

Instructor: Luisito L. Agustin
lagustin@ateneo.edu
http://www.geocities.com/lui_agustin
consultation hours: by appointment, F312/F311

1. Course description
This course aims to equip students with the necessary knowledge in vector calculus and linear algebra as applied to engineering problems.

Prerequisite: ENGMA 101, MA 21

2. Course Objectives

In this course students must be able to
* compute and use the dot product of vectors
* compute and use the cross product of vectors
* plot representations of vector and scalar functions and fields
* compute lengths along curves from their parametric representation
* compute the gradient of a scalar field
* compute the divergence and curl of a vector field
* compute line integrals
* take advantage of independence of path in computing some line integrals
* use Green's Theorem in evaluating some integrals
* evaluate surface integrals
* evaluate triple integrals
* use Gauss' Divergence Theorem in evaluating some integrals
* use Stoke's Theorem in evaluating some integrals
* use Gauss Elimination in solving systems of equations
* determine the rank of a matrix
* recognize vector spaces
* compute determinants
* use Gauss-Jordan Elimination for computing the inverse of a matrix
* determine the inverse of a linear transformation
* determine eigenvalues and eigenvectors of matrices
* recognize special real and complex matrices, and determine their eigenvalues and eigenvectors
* compare and relate the eigenvalues and eigenvectors of similar matrices
* diagonalize matrices

3. Textbook

[Kreyszig]   Erwin Kreyszig: *Advanced Engineering Mathematics*, 8th ed, 1999.

Department of Electronics, Computer and Communications Engineering
School of Science and Engineering
Ateneo de Manila University

Course Syllabus for ENGMA 102
First Semester, 2004-2005

4. Course Outline and Timeframe

Course Outline:

Introduction (secs 8.1, 6.1, 6.2)

Vector Algebra
  Dot Product (sec 8.2)
  Cross Product (sec 8.3)

Vector Differential Calculus
  Vector and Scalar Functions and Fields (sec 8.4)
  Curves, Tangents, and Arc Length (sec 8.5)
  Gradient of a Scalar Field (sec 8.9)
  Divergence of a Vector Field (sec 8.10)
  Curl of a Vector Field (sec 8.11)

[1st exam]

Vector Integral Calculus
  Line Integrals (sec 9.1)
  Line Integrals Independent of Path (sec 9.2)
  Green's Theorem in the Plane (sec 9.4)
  Surface Integrals (sec 9.6)
  Triple Integrals and Gauss' Divergence Theorem (sec 9.7)
  Stoke's Theorem (sec 9.9)

[2nd exam]

Linear Algebra: Matrices, Vectors, Systems of Equations, Transformations
  Linear Systems of Equations: Gauss Elimination (sec 6.3)
  Rank, Linear Independence, and Vector Spaces (sec 6.4)
  Determinants (sec 6.6)
  Inverse of a Matrix: Gauss-Jordan Elimination (sec 6.7)
  Vector Spaces and Linear Transformations (sec 6.8)

[3rd exam]

Linear Algebra: Matrix Eigenvalue Problems
  Eigenvalues and Eigenvectors (sec 7.1)
  Symmetric, Skew-Symmetric, and Orthogonal Matrices (sec 7.3)
  Complex Matrices: Hermitian, Skew-Hermitian, and Unitary Matrices (sec 7.4)
  Similarity of Matrices, Basis of Eigenvectors, and Diagonalization (sec 7.5)

[4th exam]

Department of Electronics, Computer and Communications Engineering
School of Science and Engineering
Ateneo de Manila University

Course Syllabus for ENGMA 102
First Semester, 2004-2005

ENGMA 102 Timetable, 1st Semester, 2004-2005

Week		Tuesday		Thursday
1	June	15 Introduction (8.1, 6.1, 6.2)	17	Dot Product (8.2) Homework: # 24, 25, 28, 29, 34, p 413
2		22 Cross Product (8.3) Homework: # 30, 31, 32, 35, 36 , p 422	24	Vector and Scalar Functions and Fields (8.4) Homework: # 10 (a), 18, 19, 22, 23 (e), p 427
3		29 Curves, Tangents, and Arc Length (8.5) Homework: # 22, 23, 27, 28, 29 , p 434		
3	July		1	Gradient of a Scalar Field (8.9) Homework: # 2, 5, 19, 30, 35, p 452 - 453
4		6 Divergence of a Vector Field (8.10) Homework: # 6, 9 (e), 16, 17, 20, p 456 - 457	8	Curl of a Vector Field (8.11) Homework: # 6, 7, 8, 12, 13, p 459
5		13 First Exam	15	Line Integrals (9.1) Homework: # 6, 8, 9, 15, 20, p 470 - 471
6		20 Line Integrals Independent of Path (9.2) Homework: # 3, 4, 8, 17, 18, p 477 - 478	22	Green's Theorem in the Plane (9.4) Homework: # 2, 3, 4, 9, 10, p 490
7		27 Surface Integrals (9.6) Homework: # 2, 7, 10, 13, 16, p 503 - 504	29	ENGMA 102 Holiday
8	Aug	3 Triple Integrals (9.7) Homework: # 2, 3, 4, 6, 7, p 509 - 510	5	Gauss' Divergence Theorem (9.7) Homework: # 14, 16, 17, 18, 19, p 510
9		10 Stoke's Theorem (9.9) Homework: # 2, 3, 6, 10, 13, p 520 - 521	12	Second Exam
10		17 Gauss Elimination (6.3) Homework: # 8, 9, 13, 14, 16, p 329 - 330	19	ENGMA 102 Holiday
11		24 Rank, Linear Independence, and Vector Spaces (6.4) Homework: # 14, 17, 18, 19, 24, p 337	26	Determinants (6.6) Homework: # 11, 12, 13, 18, 19, p 349 - 350
12		31 Inverse of a Matrix: Gauss-Jordan Elim. (6.7) Homework: # 2, 4, 7, 8, 9, p 357		
12	Sept		2	Vector Spaces (6.8) Homework: # 2, 4, 6, 7, 8, p 364
13		7 Linear Transformations (sec 6.8) Homework: # 26, 27, 28, 29, 30, p 365	9	Third Exam
14		14 Eigenvalues and Eigenvectors (7.1) Homework: # 8, 10, 11, 12, 14, p 375	16	Eigenvalues and Eigenvectors (sec 7.1) Homework: # 15, 16, 18, 19, 20, p 376
15		21 Symmetric, Skew-Symmetric, and Orthogonal Matrices (7.3) Homework: # 4, 5, 6, 10, 12, p 384	23	Complex Matrices: Hermitian, Skew-Hermitian, and Unitary Matrices (7.4) Homework: # 6, 7, 8, 9, 10, p 390 - 391
16		28 Similarity of Matrices, Basis of Eigenvectors, and Diagonalization (sec 7.5) Homework: # 2, 3, 4, 5, 6, p 397	30	Similarity of Matrices, Basis of Eigenvectors, and Diagonalization (sec 7.5) Homework: # 10, 12, 13, 14, 15, p 397
17	Oct	5 Fourth Exam	7	ENGMA 102 Holiday
18		Finals Week: Oct 11-16 (ENGMA 102 Holiday)		

Adjustments to the timetable will be made as needed.

Homework indicated for a given class day are homework that should have been done by class time on that day.

Department of Electronics, Computer and Communications Engineering   Course Syllabus for ENGMA 102
School of Science and Engineering   First Semester, 2004-2005
Ateneo de Manila University

5. Course Requirements

There will be four exams and regular homework. The ability to present homework in class is a requirement for one to receive credit for homework done. Detailed policies are in sec. 7.

5.1. Exams

Four exams will be given, as indicated in the course outline and timetable. The coverage of an exam will mainly be material that has been covered before the exam, but which has not been covered by a previous exam. However, it is understood that skills needed in an earlier exam may again be required in a succeeding exam.

All exams shall be "open notes, open books" exams.

Each exam shall consist of five items, with each item graded over 10 points regardless of its difficulty. The exam grade shall be twice the number of points earned.

There is no comprehensive final exam. Exemptions are available for each exam.

5.2. Homework and Recitation

Homework for each class day is specified in the timetable. Each exercise assigned as homework is worth 2 points regardless of the difficulty.

Recitation is incorporated into homework as a requirement. One may claim credit for homework only if he is fully capable of presenting and discussing the said homework in class. Credit for homework is claimed thru homework accomplishment reports as will be described later.

Bonus points may be earned in relation to homework that has been done correctly. Demerits will be given for inaccurate claims regarding homework.

6. Grading System

The basic class standing (BCS) is computed as
$$BCS = 0.10\ H + 0.90\ E$$
where
> H is the homework and recitation grade computed as
> $$H = 100 * \text{(points earned)} / \text{(points possible)}, \text{ and}$$
> E is the average exam grade.

The class standing (CS) is computed as
$$CS = BCS + B - D,$$
where
> B is the number of bonus points earned (details later), and
> D is the number of accumulated demerits (details later).

Department of Electronics, Computer and Communications Engineering   Course Syllabus for ENGMA 102
School of Science and Engineering   First Semester, 2004-2005
Ateneo de Manila University

The final grade (FG) will be determined from the class standing (CS) as follows:

$$FG = \begin{array}{ll} F & \text{if } CS < 50, \\ D & \text{if } 50 \leq CS < 60, \\ C & \text{if } 60 \leq CS < 69, \\ C+ & \text{if } 69 \leq CS < 77, \\ B & \text{if } 77 \leq CS < 86, \\ B+ & \text{if } 86 \leq CS < 92, \\ A & \text{if } 92 \leq CS. \end{array}$$

Your instructor has the prerogative of giving a higher grade than that determined from the class standing.

Bonus points are points added directly to your class standing. These points are given in relation to exercises assigned as homework. Detailed policies are in sec. 7.

Demerits are points deducted from your class standing for offenses against the conduct of the course. These offenses include, but are not limited to:
* claiming undue credit for homework
* failure to discuss homework for which credit has been claimed
* disrupting class discussion
* doing work unrelated to ENGMA 102 during class time
* use of cellphones during class time, cellphones ringing during class time
* arriving late for an exam and/or disturbing others during an exam
* refusal to participate in class activities
* insisting on staying in the classroom despite being late

One demerit is given for the first time an offense is committed. Successive offenses of the same nature shall be awarded two demerits, three demerits, and so on.

7. Class Policies

7.1. Exams

All exams must be accomplished using blue or black ink. Only the front of each sheet of paper should be used. No credit shall be given for anything written at the back nor for anything not written in ink.
Only the following paper may be used in exams:
* white intermediate pad paper
* white short bond paper
* white long bond paper
* yellow pad paper.

Students taking exams are required to bring 20 sheets of paper, and two pens. Students who do not have these should not proceed with the exam.

All exams, except for make-up exams, shall be "open books, open notes" exams. Students may and should bring calculators to exams. Students who do not bring calculators to exams forfeit the right to use them. Students may not pass notes, books and/or calculators among themselves during exams. Students who do so shall be asked to submit their papers immediately.

Make up exams shall be taken with closed books and notes, regardless of the nature of the regular exam. Exemptions to this rule are possible only in extreme circumstances, and subject to the discretion of your instructor.

Department of Electronics, Computer and Communications Engineering
School of Science and Engineering
Ateneo de Manila University

Course Syllabus for ENGMA 102
First Semester, 2004-2005

Answers to exam questions must be arranged in sequence and exam papers stapled together on the upper left hand side when they are submitted. 20 points shall be deducted from the exam grade if answers are not arranged in sequence. 20 points shall be deducted from the exam grade if the exam papers submitted are not stapled together on the upper left hand side. The exam grade shall be 0 if these deductions result in a negative score.

Each exam will have the same weight in the final grade. No exam will be canceled in computing the final grade.

Corrections to exam scores will only be entertained up to one week after exam papers have been returned in class, regardless of whether one was in class or not. Exam papers will typically be returned on the class day following the exam.

7.2. Exemptions from Exams

A student shall be exempted from the first exam and given a grade of 100 for the exam if the student meets ALL of the following conditions on the day of the exam:
* must have no cuts
* must have no demerits for any offense whatsoever
* must have a homework standing of at least 80
* must have earned at least 5 bonus points

A student shall be exempted from the second exam and given a grade of 100 for the exam if the student meets ALL of the following conditions on the day of the exam:
* must have no cuts
* must have no demerits for any offense whatsoever
* must have a homework standing of at least 80
* must have earned at least 8 bonus points, with at least 5 bonus points earned after the first exam
* must have a grade of at least 60 for the first exam

A student shall be exempted from the third exam and given a grade of 100 for the exam if the student meets ALL of the following conditions on the day of the exam:
* must have no cuts
* must have no demerits for any offense whatsoever
* must have a homework standing of at least 80
* must have earned at least 11 bonus points, with at least 5 bonus points earned after the second exam
* must have an average grade of at least 60 for the past exams

A student shall be exempted from the fourth exam and given a grade of 100 for the exam if the student meets ALL of the following conditions on the day of the exam:
* must have at most 1 cut
* must have no demerits for any offense whatsoever
* must have a homework standing of at least 80
* must have earned at least 14 bonus points, with at least 5 bonus points earned after the third exam
* must have an average grade of at least 60 for the past exams

Department of Electronics, Computer and Communications Engineering   Course Syllabus for ENGMA 102
School of Science and Engineering   First Semester, 2004-2005
Ateneo de Manila University

7.3. Homework

The fundamental rule in claiming credit for homework should be:
CLAIM CREDIT ONLY FOR WORK YOU HAVE REALLY DONE.

The homework accomplishment report form in sec. 9 of this syllabus shall be used for claiming credit for homework assigned. Printed, photocopied, and handwritten versions of the form are all acceptable. The paper used shall be one whole sheet of any of the following:
* white intermediate pad paper
* white short bond paper
* white long bond paper
* yellow pad paper.
Only blue or black ink may be used.

Homework accomplishment reports are due when they are called for in class. The usual practice shall be for reports to be collected soon after class has started. Students are expected to have their homework accomplishment reports ready and filled out before class starts. Only those physically present in class may submit homework accomplishment reports. Late reports will not be accepted. Those who choose to submit handwritten homework accomplishment reports must have finished writing them by the time class starts.

Students claiming credit for any assigned exercise must be able to produce on demand their answers to the exercise, including any and all scratch paper used in working on that exercise.

A student may claim full credit for an assigned exercise if he has completed the exercise and would be able to present all details of his work in class if called upon to do so. It is the student's responsibility to ensure that all instructions for a given exercise have been complied with.

A student may claim half credit for an assigned exercise if he has not completed the exercise, but has done a significant amount of work on the exercise, and would be able to present all details of his work in class if called upon to do so, as well as justify his claim that a significant amount of work has been done. Typically, a claim for half credit for an exercise is valid if a student can present much of the work called for, and could actually discuss what work remains to be done for the exercise to be completed or if a student can discuss in detail various nontrivial attempts to do the exercise, and can defend his claim that these attempts were nontrivial.

Merely starting an exercise or merely deciding that an exercise is too difficult does NOT entitle anyone to claim half credit for the exercise.

Full or half credit claimed for homework is NOT valid under circumstances similar to the following, among others:
* a student can only present photocopies of accomplished homework for which credit is claimed (except for those who have submitted printed answers for possible bonus points)
* a student can only present copies --whether photocopied or hand copied-- of someone else's homework but claims credit for it
* a student is unable to discuss in class what he claims to be his homework
* a student has been copying homework from someone else a few minutes before class, and then claims credit for it

Department of Electronics, Computer and Communications Engineering   Course Syllabus for ENGMA 102
School of Science and Engineering   First Semester, 2004-2005
Ateneo de Manila University

Students called to discuss their work, must be able to justify all details of homework they claim credit for. Inability to do so shall be penalized with a zero for homework, along with demerits.

A homework accomplishment report that has the wrong date, claims credit for the wrong exercises, lacks a signature, or has any error of a similar nature to these, shall be considered defective. Students who submit defective reports on a given day get a zero for homework for that day.

The penalty for claiming undue credit in a homework accomplishment report on a given day shall be a 0 for all exercises assigned for that day, demerits, forfeiture of any and all bonus points already earned, and disqualification from earning any more bonus points.

The accuracy of homework accomplishment reports may be verified more thoroughly for some students, possibly taking into account such factors as their number of cuts, previous demerits, suspicious behavior, complaints from other students, large differences between homework grades and exam grades, and others.

7.4. Bonus Points

Bonus points are points added directly to the class standing.

Each item in the problem sets assigned as homework is also considered a bonus problem. Individual students who submit correct answers to these exercises may earn bonus points, provided certain conditions are met.

Students who submit answers to bonus problems should expect them to be checked very strictly.

Students must submit answers individually. Each students may submit at most one answer for each item. A student who submits more than one answer to a given bonus problem is disqualified from earning a bonus point for that problem.

Answers to bonus problems must have been submitted by 11 a.m. of the school day prior to the day for which the exercise was assigned; Saturdays, Sundays, and holidays shall not count as school days. Answers must have been typeset electronically or digitally and printed --NOT HANDWRITTEN-- on short white bond paper, and must not have any part handwritten, nor have any erasures. Handwritten answers are not acceptable. Where appropriate, answers must include graphs, figures and diagrams produced by software. Each exercise in the problem sets is a separate bonus problem. (There is no need to have answers to all exercises in a given problem set.) Each exercise must be started on a new sheet of paper. If several sheets of paper are required, these must all be stapled together. The student's name must appear clearly on the upper left hand side of the first sheet. The exercise being answered must be clearly identified. Submitted answers that do not meet all these conditions will not be evaluated.

Only students with at most one cut may earn bonus points. Students with more than two cuts forfeit any and all bonus points already earned. Students with exactly 2 cuts get to keep any bonus points already earned, but may not earn additional bonus points.

No information will be given as to whether answers have already been submitted for a given exercise. Submitted answers are evaluated only after the corresponding classes for which they have been assigned. No feedback regarding their correctness should be expected before the day for which they were assigned.

Department of Electronics, Computer and Communications Engineering   Course Syllabus for ENGMA 102
School of Science and Engineering   First Semester, 2004-2005
Ateneo de Manila University

Answers that have been submitted for a given exercise shall be evaluated in the order they were submitted. Bonus points will be awarded for the first answer, if any, that meets ALL of the following conditions:

* the answer must be correct, and must have no noticeable errors of whatever nature (whether logical, grammatical, typographical, etc.); solutions and computations must be sufficiently detailed
* the answer must be nicely typeset, nicely presented, and appropriately explained
* the one who submitted the answer must have no cut on the day the exercise was assigned for
* the one who submitted the answer must have had at most one cut on the day the exercise was assigned for
* the one who submitted the answer must have claimed full credit for it in the corresponding homework accomplishment report

One bonus point will be given for each answer that qualifies.

7.5. Attendance

The usual practice shall be for attendance to be checked soon after homework accomplishment reports have been collected. Students who arrive in class while attendance is being checked shall be considered present, but shall not be allowed to submit homework accomplishment reports.

Attendance may be checked at any time during class, any number of times. Absence from class at any time attendance is checked shall be considered a cut. No definite grace period is required before attendance is checked.

Students who arrive after attendance has been checked shall be barred from class. Those who insist on staying shall be given demerits.

Students who have exceeded the allowed number of cuts shall be given a grade of W, and shall be barred from class for the rest of the semester.

8. ENGMA 102 Discussion Group

A discussion group for ENGMA 102 will be organized if there is sufficient interest among students. The discussion group shall serve as a forum for discussing various matters related to the course. Students might conduct review sessions, organize study groups, present advanced material of interest to the group, present details regarding their projects, or present interesting software and other material that may be useful in the course. Other ideas are welcome.

Participation in the discussion group shall not be a requirement of the course. However, those who contribute significantly to the discussion group may be given higher grades than those determined from the class standing.

9. Homework Accomplishment Report Form

See next page.

Department of Electronics, Computer and Communications Engineering   Course Syllabus for ENGMA 102
School of Science and Engineering   First Semester, 2004-2005
Ateneo de Manila University

Homework Accomplishment Report

date: _____

I,_____, hereby claim full credit for the following exercises
          (printed name)

assigned as homework for today:

Furthermore, I claim half credit for the following exercises assigned as homework for today:

I hereby affirm that I make all these claims in accordance with the policies set forth in the course syllabus for ENGMA 102 for this first semester of school year 2004-2005.

_____
(signature over printed name)