Mathematics
Texas A&M University
Core Curriculum Cover Sheet
Initial Request for a course to be considered for the Fall 2014 Core Curriculum

1. This request is submitted by (department name): Mathematics

2. Course prefix and number: Math 152

3. Texas Common Course Number: 2414

4. Complete course title: Engineering Mathematics II

5. Semester credit hours: 4

6. This request is for consideration in the following Foundational Component Area:
   - [ ] Communication
   - [ ] Creative Arts
   - [X] Mathematics
   - [ ] American History
   - [ ] Life and Physical Sciences
   - [ ] Government/Political Science
   - [ ] Language, Philosophy and Culture
   - [ ] Social and Behavioral Sciences

7. This course should also be considered for International and Cultural Diversity (ICD) designation:
   - [ ] Yes
   - [X] No

8. How frequently will the class be offered? Fall, Spring & Summer

9. Number of class sections per semester:
   - Fall average = 31
   - Spring average = 45
   - Summer average = 4

10. Number of students per semester:
    - Fall average = 695
    - Spring average = 1329
    - Summer average = 89

11. Historic annual enrollment for the last three years:
    - 2011-2012: 2190
    - 2010-2011: 2092
    - 2009-2010: 2056

This completed form must be attached to a course syllabus that sufficiently and specifically details the appropriate core objectives through multiple lectures, outside activities, assignments, etc. Representative from department submitting request should be in attendance when considered by the Core Curriculum Council.

12. Submitted by: Jennifer L. Lewis
    
13. Date: 3/27/2013
    
14. Approvals:
    
15. Date: 3/29/13

16. Department Head
    
17. Date: 4/1/13

18. College Dean/Designee

For additional information regarding core curriculum, visit the Texas Higher Education Coordinating Board website at www.thecb.state.tx.us/corecurriculum2014

See form instructions for submission/approval process.
In the box below, describe how this course meets the Foundational Component Area description for Mathematics. Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts, and the application of appropriate quantitative tools to everyday experience.

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?

This course is focused on quantitative literacy in mathematics as applied to Engineering and Physics. Upon successful completion of this course, students will be able to:

1. Use the concepts of definite integrals to solve problems involving area, volume, work, and other physical applications.

2. Use substitution, integration by parts, trigonometric substitution, and partial fractions to evaluate definite and indefinite integrals.

3. Apply the concepts of limits, convergence, and divergence to evaluate different types of improper integrals.

4. Determine convergence or divergence of sequences and series.

5. Use Taylor and Maclaurin series to represent functions.

6. Use Taylor or Maclaurin series to integrate functions not integrable by conventional methods.

7. Understand and apply vector operations such as dot and cross product in three dimensions.

8. Use Computer Algebra Systems such as Matlab to solve non-routine problems.

**Core Objectives**

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.

The proposed course is required to contain each element of the Core Objective.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):
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The following critical thinking skills will be assessed on quizzes, homework, and exams:

- Students will synthesize data from graphs and visual skills to formulate and evaluate definite integrals to calculate areas, volumes, work, and surface areas of revolution.

- Students will analyze definite and indefinite integrals to determine and apply appropriate methods of evaluation of these integrals.

- Students will inquiry to determine the convergence or divergence of improper integrals and evaluate convergent improper integrals where appropriate.

- Students will apply creative thinking and logical reasoning to determine the convergence or divergence of sequences and series and evaluate convergent sequences and series where appropriate.

- Students will use Taylor and Maclaurin series to represent functions which cannot be integrated conventionally.

- Students will apply appropriate error estimates to determine the accuracy of integration using Taylor and Maclaurin series.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

The following communication skills will be assessed in class, on quizzes, homework, and exams:

- Students will visually examine graphs of areas and volumes and be able to write definite integrals which represent said areas and volumes.

- Students will clearly develop problem-solving strategies and analysis used to answer questions concerning topics discussed in class.

- Students will use appropriate theorems to present clear written arguments in support of the convergence or divergence of improper integrals, sequences, and series.

- Students will be required to communicate orally with other group members when working on Computer Algebra system projects or other group activities.

- Students will communicate orally in group discussion in required weekly recitation sessions.

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The following empirical and quantitative skills will be assessed on quizzes, homework, and exams:

- Students will interpret a given integral as the area of an appropriate 2-dimensional region or volume of an appropriate solid.
Texas A&M University

Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

- Students will use appropriate calculations to analyze the convergence or divergence of series.
- Students will use graphical and numerical data to assess appropriate error formulas used in measuring the accuracy of the partial sum of a series.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.
Syllabus for Math 152

Spring 2013

Instructor Jennifer Lewis.
Office Blocker 630A
office hours: MWF 11-1, Tues 10-1 Thurs 12-3
e-mail jlewis@math.tamu.edu
My website: www.math.tamu.edu/~jlewis
At my website you will find my course materials at my Math 152 page.

The departmental Math 152 Course Home Page URL address is
http://calclab.math.tamu.edu/docs/math152/
Here you will find the times and location for the common exams.

Course Description: Credit 4. Integration techniques and their applications (area, volumes, work), improper integrals, analytic geometry, vectors, infinite series, power series, Taylor series, computer algebra (Matlab). Prerequisite: Math 151 or equivalent. credit will not be given for more than one of Math 148, 152, 172. Text books: Calculus: Early Vectors, preliminary edition (hard back), by Stewart et al, published by Brooks/Cole. The computer laboratory will use Matlab: An Introduction with Applications by Wiley.

My 152 classes: All lectures are MWF If you miss one, you may attend another.
Sections 513-515 1:50-2:40 Held 111
537-539 8:00-8:50 Held 111
801-804 9:10-10:00 Held 109

Online Homework: Online homework is required in all math 152 classes. These online homework assignments can be accessed anytime day or night, from any computer with a connection to the internet and a Web browser. All information:
regarding online homework can be found at
http://www.math.tamu.edu/courses/eHomework . Practice assignments are not
for a grade and are not really due. You should also do the suggested problems in
the text book listed on my website. The webassign homework is not enough
practice.

Quizzes: You will have a quiz in recitation each week. The quiz problems will be
similar to suggested problems in the text book problems and / or problems done
in class. There will also be occasional quizzes in lecture.

Grading: Your grade will be determined by three exams, a cumulative final exam,
a laboratory grade , a homework grade and a quiz grade. The points of each of
these out of 600 total are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Exam I</th>
<th>Exam II</th>
<th>Exam III</th>
<th>Final</th>
<th>Matlab</th>
<th>Webassign</th>
<th>Quizzes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points</td>
<td>100</td>
<td>100</td>
<td>150</td>
<td>60</td>
<td>30</td>
<td>60</td>
<td></td>
</tr>
</tbody>
</table>

90-100% = 540-600 points = A,  80-89%=480-539 points = B,
70-79%=420-479 points=C,  60-69%=360-419 points = D
0-59% = Below 360 = F

Exams I, II and III are common exams (the same exam is given for all sections of
Math 152) and are administered in the evenings from 7:30-9:30pm. Copies of old
exams are available on the web. The final is comprehensive and is given in your
lecture room according to the final exam schedule. The final is not a common
exam and is written by me. The format will be discussed later in the course. (See
weekly schedule below)

Make-ups for exams and quizzes will only be given with documented University-
approved excuses (see University Regulations).

Where to get Help: My office hours are for you . You do not need an
appointment to come to office hours. If you cannot come during those hours,
please let me know, other times can be arranged.

Week in Review: The week in review is a 2-hour review of the week just
completed. You are highly encouraged to attend. WIR is taught by Amy Austin;
time and place will be announced in class. Before you go to WIR, print the problems from the WIR website which will be posted on my webpage soon.

**Streaming Videos:** Streaming videos by Amy Austin are available at http://www.math.tamu.edu/~amy.austin/wirmath152.html

**Help Sessions:** Help sessions are question and answer sessions on a drop in basis. This schedule will be announced in class and can be found at http://www.math.tamu.edu/teaching/helpsession/

**Academic Integrity Statement:** "An Aggie does not lie, cheat or steal or tolerate those who do." Please see the Honor Council Rules and Procedures on the web at http://www.tamu.edu/aggiehonor.

**Students with Disabilities:** The American with disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact the Department of Student Life, Services for Students with Disabilities, in Room 126 of the Koldus Building or call 845-1637.

**Copyright Information** Please note that all written and web materials for this course have an implied copyright. In particular, you can Xerox (or download) for your own use, but you may not reproduce them for others.

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**Tentative Weekly Schedule**

- **Week 1 Jan 14-Jan 18**
  - Sections 6.4–6.5, 7.1
  - Review of the Fundamental Theorem of Calculus, integration by substitution, area

- **Week 2 Jan 21-Jan 25**
  - Sections 7.1–7.2
  - Area, volumes by slicing, disks, washers

- **Week 3 Jan 28-Feb 1**
Sections 7.3–7.4
Volume by cylindrical shells, work

Week 4 Feb 4-Feb 8

Sections 7.5, 8.1–8.2
Average value, integration by parts, trigonometric integrals

Week 5 Feb 11-Feb 15

8.3, 8.4
Trigonometric substitution, partial fractions

Review and Exam 1 (Covers through Section 8.2 or 8.3 to be announced)

Week 6 Feb 18 - Feb 22

Sections 8.9, 9.3, 9.4
Improper integrals, arc length, surface area of revolution
(Section 8.8 on Numerical integration will be done in lab)

Week 7 Feb 25 - Mar 1

Sections 10.1–10.2
Sequences, Series

Week 8 Mar 4 - Mar 8

Sections 10.2, 10.3
Series, convergence tests

Spring Break March 11-March 15

Week 9 Mar 18-Mar 22

Review and Exam 2 (Covers through Section 10.2 or 10.3 to be announced)

Week 10 Mar 25-Mar 28 Friday Mar 29 is Good Friday and is a reading day, no classes

Sections 10.4, 10.5, 10.6
Series, convergence tests. Power series, representing functions as power series

Week 11 Apr 1-Apr 5 Sections 10.7, 10.9
Taylor and Maclaurin series, applications of Taylor series

Week 12 Apr 8 - Apr 12
Sections 10.7, 10.9
Taylor and Maclaurin series, applications of Taylor series

Week 13 Apr 15-Apr 19
Section 11.1–11.3
3D coordinates, vectors, dot product, cross product.

Week 14 Apr 22-Apr 26
Review and Exam 3 (covers through 11.2 or 11.3 to be announced)

Week 15 Apr 29 and Tues Apr 30
Tuesday, Apr 30 is redefined as a Friday, attend all Friday classes.
Section 13.4
Polar coordinates

Final Exam Schedule
Sections 513-515 Tues, May 7 3:30-5:30 pm
537-539 Fri, May 3 10:00 am- noon
801-804 Mon, May 6 8:00 - 10:00 am
Texas A&M University

Core Curriculum Cover Sheet

Initial Request for a course to be considered for the Fall 2014 Core Curriculum

1. This request is submitted by (department name): Mathematics

2. Course prefix and number: Math 172

3. Texas Common Course Number: Click here to enter text.

4. Complete course title: Calculus

5. Semester credit hours: 4

6. This request is for consideration in the following Foundational Component Area:
   - Communication
   - Mathematics
   - Life and Physical Sciences
   - Language, Philosophy and Culture
   - Creative Arts
   - American History
   - Government/Political Science
   - Social and Behavioral Sciences

7. This course should also be considered for International and Cultural Diversity (ICD) designation:
   - Yes
   - No

8. How frequently will the class be offered? Fall, Spring

9. Number of class sections per semester:
   - Fall = 2
   - Spring = 5

10. Number of students per semester:
    - Fall average = 80
    - Spring = 153
    - 2011-2012
    - 2010-2011
    - 2009-2010

11. Historic annual enrollment for the last three years: 224

   This completed form must be attached to a course syllabus that sufficiently and specifically details the appropriate core objectives through multiple lectures, outside activities, assignments, etc. Representative from department submitting request should be in attendance when considered by the Core Curriculum Council.

12. Submitted by: [Signature]
    Date: 29 March 2013

   Course Instructor

   Approvals: [Signature]
   Date: 04/01/13

   Department Head
   Date: 4/11/13

   College Dean/Designee

For additional information regarding core curriculum, visit the Texas Higher Education Coordinating Board website at www.thecb.state.tx.us/corecurriculum2014

See form instructions for submission/approval process.
Foundational Component Area: Mathematics

In the box below, describe how this course meets the Foundational Component Area description for Mathematics. Courses in this category focus on quantitative literacy in logic, patterns, and relationships. Courses involve the understanding of key mathematical concepts, and the application of appropriate quantitative tools to everyday experience.

The proposed course must contain all elements of the Foundational Component Area. How does the proposed course specifically address the Foundational Component Area definition above?

This course is focused on quantitative literacy in mathematics as applied to math and science. Upon successful completion of this course, students will be able to:

1. Understand and explain the relationship between Riemann Sums and definite integrals.
2. Use the concepts of definite integrals to solve problems involving area, volume, work, and other physical applications.
3. Use substitution, integration by parts, trigonometric substitution, and partial fractions to evaluate definite and indefinite integrals.
4. Apply the concepts of limits, convergence, and divergence to evaluate different types of improper integrals.
5. Use first-order differential equations to model real-world situations, and be able to solve these equations using appropriate techniques.
6. Determine convergence or divergence of sequences and series.
7. Use Taylor and Maclaurin series to represent functions.
8. Use Taylor or Maclaurin series to integrate functions not integrable by conventional methods.

Core Objectives

Describe how the proposed course develops the required core objectives below by indicating how each learning objective will be addressed, what specific strategies will be used for each objective and how student learning of each objective will be evaluated.

The proposed course is required to contain each element of the Core Objective.

Critical Thinking (to include creative thinking, innovation, inquiry, and analysis, evaluation and synthesis of information):
Texas A&M University
Core Curriculum

Initial Request for a Course Addition to the Fall 2014 Core Curriculum

The following critical thinking skills will be assessed on quizzes, homework, and exams:

- Students will synthesize data from graphs and visual skills to formulate and evaluate definite integrals to calculate areas, volumes, work, and arclength.
- Students will analyze definite and indefinite integrals to determine and apply appropriate methods of evaluation of these integrals.
- Students will inquiry to determine the convergence or divergence of improper integrals and evaluate convergent improper integrals where appropriate.
- Students will apply creative thinking and logical reasoning to determine the convergence or divergence of sequences and series and evaluate convergent sequences and series where appropriate.
- Students will use Taylor and Maclaurin series to represent functions which cannot be integrated conventionally.
- Students will apply appropriate error estimates to determine the accuracy of integration using Taylor and Maclaurin series.

Communication (to include effective development, interpretation and expression of ideas through written, oral and visual communication):

The following communication skills will be assessed in class, on quizzes, homework, and exams:

- Students will clearly explain the relationship between Riemann sums and definite integrals.
- Students will visually examine graphs of areas and volumes and be able to write definite integrals which represent said areas and volumes.
- Students will clearly develop problem-solving strategies and analysis used to answer questions concerning topics discussed in class.
- Students will use appropriate theorems to present clear written arguments in support of the convergence or divergence of improper integrals, sequences, and series.
- Students will be able to explain (prove) various formulas and theorems used in the course.
- Students will communicate orally in group discussion in required weekly recitation sessions.

Empirical and Quantitative Skills (to include the manipulation and analysis of numerical data or observable facts resulting in informed conclusions):

The following empirical and quantitative skills will be assessed on quizzes, homework, and exams:
Texas A&M University
Core Curriculum

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- Students will interpret a given integral as the area of an appropriate 2-dimensional region or volume of an appropriate solid.

- Students will convert a practical situation into an appropriate first-order differential equation.

- Students will use appropriate calculations to analyze the convergence or divergence of series.

Please be aware that instructors should be prepared to submit samples/examples of student work as part of the future course recertification process.
MATH 172: Calculus

Learning Outcomes
This course is focused on quantitative literacy in mathematics as applied to math and science. Upon successful completion of this course, students will be able to:

1. Understand and explain the relationship between Riemann Sums and definite integrals.

2. Use the concepts of definite integrals to solve problems involving area, volume, work, and other physical applications.

3. Use substitution, integration by parts, trigonometric substitution, and partial fractions to evaluate definite and indefinite integrals.

4. Apply the concepts of limits, convergence, and divergence to evaluate different types of improper integrals.

5. Use first-order differential equations to model real-world situations, and be able to solve these equations using appropriate techniques.

6. Determine convergence or divergence of sequences and series.

7. Use Taylor and MacLaurin series to represent functions.

8. Use Taylor or Maclaurin series to integrate functions not integrable by conventional methods.

Course Objectives

Critical Thinking: The following critical thinking skills will be assessed on in-class quizzes and exams:

- Students will use graphs and visual skills to formulate and evaluate definite integrals to calculate areas, volumes, work, and arclength.
- Students will analyze definite and indefinite integrals to determine and apply appropriate methods of evaluation of these integrals.
- Students will apply logical reasoning to determine the convergence or divergence of improper integrals and evaluate convergent improper integrals where appropriate.
- Students will apply logical reasoning to determine the convergence or divergence of sequences and series and evaluate convergent sequences and series where appropriate.
- Students will use Taylor and Maclaurin series to represent functions which cannot be integrated conventionally.
- Students will apply appropriate error estimates to determine the accuracy of integration using Taylor and Maclaurin series.
**Problem Solving:** The following problem solving skills will be assessed on in-class quizzes and exams:

- Students will formulate and evaluate definite integrals to solve practical problems involving work, average value of a function, and hydrostatic force.
- Students will formulate and solve first-order differential equations for practical problems.
- Students will use geometric series to model and solve numerical and practical problems.
- Students will apply operations of vectors in three dimensions to applications such as work and torque.

**Communication:** The following written communication skills will be assessed on in-class quizzes and exams:

- Students will clearly explain the relationship between Riemann sums and definite integrals.
- Students will clearly explain problem-solving strategies and analysis used to answer questions concerning topics discussed in class.
- Students will use appropriate theorems to present clear written arguments in support of the convergence or divergence of improper integrals, sequences, and series.
- Students will be able to explain (prove) various formulas and theorems used in the course.
Math 172 Course Syllabus

Instructor: David J. Manuel
Office Hours: MW 9-10am, TR 10am-12pm or by appointment
Contact Points: Office: Blocker 637 (862-4481), e-mail: dmanuel@math.tamu.edu
Web Page: http://www.math.tamu.edu/~dmanuel

Course Name: Calculus
Learning Outcomes: Math 172 is the second of a three semester beginning calculus sequence, which is taken, for the most part, by math, chemistry, and physics majors. The department expects that students passing Math 172 will be able to set up an appropriate definite integral to solve the applied problems (areas, volumes, arclength, work, and force) discussed in the course. Students must understand the relationship between definite integrals and Riemann sums, and be able to clearly state (write) this relationship. Regarding infinite series: students are expected to know what an infinite series is, how to use the convergence tests, be able to clearly state them, and explain (prove) why they work. Students are expected to know the alternating series test, including the error estimate for this test and the error estimate from the integral test for positive term series.

Text: Stewart, Calculus-Early Vectors, Preliminary Edition

Calculator Policy: Calculators are not allowed on assignments unless otherwise specified.

Grading Policy:

<table>
<thead>
<tr>
<th>Component</th>
<th>Points</th>
<th>Grade Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 exams</td>
<td>500</td>
<td>A = 900-1000</td>
</tr>
<tr>
<td>Homework</td>
<td>100</td>
<td>B = 800-899</td>
</tr>
<tr>
<td>Quizzes</td>
<td>150</td>
<td>C = 700-799</td>
</tr>
<tr>
<td>Final Exam</td>
<td>250</td>
<td>D = 600-699</td>
</tr>
<tr>
<td>Total</td>
<td>1000</td>
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</tbody>
</table>

Make-up Policy: If you miss a quiz or an exam you must contact me by the end of the next working day after the exam and provide appropriate documentation of the university-approved excuse within one week after the exam. Exams must be made up within 30 days of the date of the exam. Homework Assignments may be turned in up to 30 calendar days late (no penalty) with a documented University excused absence or up to 2 days late for any reason for a 30% penalty.

An Aggie does not lie, cheat, or steal or tolerate those who do. Please refer the student to the Honor Council Rules and Procedures on the web at http://www.tamu.edu/aggiehonor for more specific information regarding Scholastic Dishonesty.

Copyright Statement: Please note that all written and web materials for this course are protected by copyright laws. You can Xerox (or download) one copy for your own use, but multiple copies are forbidden unless written permission is obtained by your instructor.

ADA Statement: The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, in Cain Hall, Room B118, or call 845-1637. For more information, visit http://disability.tamu.edu.
Expectations: I expect you to have read the material and stepped through the examples before class, and I expect you to treat me with respect. You can expect me to be prompt and fair in grading and treat you with respect.

Course Outline (tentative):
Week 1: 6.2-6.3, 6.4-6.5,
Week 2: 7.1, 7.2, 7.3;
Week 3: 7.3, 7.4, 7.5
Week 4: 8.1, 8.2, 8.3, 8.4
Week 5: 8.4, Review, Exam I (6.2-8.4), 8.9
Week 6: 8.9, 8.8, 9.1
Week 7: 9.2, 9.3, 9.6
Week 8: 10.1, Review, Exam II (8.8-9.3, 9.6)
Week 9: 10.1, 10.2
Week 10: 10.2, 10.3
Week 11: 10.3, 10.4
Week 12: 10.5, 10.6
Week 13: 10.7, 10.9
Week 14: 10.9, Review, Exam III (10.1-10.7, 10.9)
Week 15: Review for Final

Homework/Practice Problems: Suggested Practice Problems are listed at www.math.tamu.edu/courses/math172/currenthw.html. Do as many of these as you deem necessary to be able to master the concepts of the section on a quiz or an exam. Some of these problems will be turned in as part of homework grades (the rest of the homework problems will come from various sources, including www.math.tamu.edu/courses/eHomework/). I will distribute homework assignments at least a week in advance throughout the semester. Typically, homework will cover the week’s (MWF) lecture and will be due the following Wednesday. Homework will account for 100 points, and I will drop the lowest homework grade.

Recitation Quizzes: Every Thursday (except exam weeks), students will attend recitation. During this time, students will have an opportunity to ask questions over the homework. At the end of recitation, a quiz will be administered. Quizzes will account for 150 points, and I will drop the lowest quiz grade.

Course Emphasis:
The priorities of this course are:
1. Ability to correctly solve problems and write the solutions in a coherent fashion.
2. Conceptual understanding of material
3. Ability to state and apply definitions and theorems and provide simple proofs

Because of this, each exam will consist of computational problems, applications, concept questions, statement of definitions and theorems, and simple proofs using definitions and theorems. On all assignments, emphasis will be placed on how a problem is solved and how a solution is written up. Bottom line: “getting the right answer” is not nearly as important as providing a clear detailed explanation of the reasoning behind your answer.