Comprehensive Course Syllabus

BC II/III

Course Description:

BC II/III is a continuation of BC I/II. Topics of study include techniques of integration, Maclaurin and Taylor series, polar coordinates and vectors, and slope fields and differential equations. The emphasis is placed on a conceptual understanding of important concepts well beyond the learning of essential skills. In addition, students are required to creatively apply their knowledge, whether it be in the form of solving complex problems, writing expository text, or posing and solving research problems.

INSTRUCTOR(S):
• Name: Steven Condie

• Office Number: Math Office; see posted schedule for available times.

• Telephone number: x5967

• Email address: scondie@imsa.edu

Meeting Days, Time and Room(s)

• Room A150. Period 7

Text(s) / Materials:

Calculus, 2nd edition. Hughes-Hallet, Gleason, et al. Wiley. 2002.
Additional handouts will be provided by the instructor.

Essential Content:

Techniques of integration

- Integration by parts
- Partial fractions
- Powers of trigonometric functions
- Trigonometric substitution

Applications of the integral

- Area, volume
- Applications given a context, often using data
- Solids of revolution

Differential Equations

- Modeling quantities that change with time
- Solving separable differential equations
- General and particular solutions

Improper Integrals
Sequences
Infinite Series
- Geometric Series
- Convergence
- Tests for convergence
- Alternating series and absolute convergence

Maclaurin and Taylor Series
- Intervals of convergence
- Error analysis
- Lagrange error bound

SSLs and Outcomes:
FA = Formally assessed, IA = Informally assessed
IA. Students expected to demonstrate automaticity in skills, concepts, and processes that enable complex thought by
- completing daily homework assignments **FA, IA**
- completing regular Take Home assignments **FA**
- engaging in daily collaboration to complete or check work **IA**
- completing quizzes and tests **FA**

IB. Students expected to construct questions, forge connections and deepen meaning by
- completing daily homework assignments **FA, IA**
- completing regular Take Home assignments **FA**
- engaging in daily collaboration to complete or check work **IA**
- completing quizzes and tests **FA**

IC. Students expected to precisely observe phenomena and accurately record findings by
- regularly justifying conclusions and claims in all written work **FA**
- carefully supporting answers verbally with appropriate mathematical justification during in-class discussions **IA**
- engaging in daily collaboration to complete or check work **IA**

ID. Students expected to evaluate the soundness and relevance of information and reasoning findings by
- regularly justifying conclusions and claims in all written work **FA**
- carefully supporting answers verbally with appropriate mathematical justification during in-class discussions **IA**
- engaging in daily collaboration to complete or check work **IA**

IIA. Students identify unexamined cultural, historical and personal assumptions and misconceptions that impede and skew inquiry by
- identifying weaknesses or misconceptions in related prior mathematical concepts **IA**
- discussing problems from multiple perspectives and opposing views to determine validity to various approaches **IA**

□□engaging in daily collaboration to complete or check work **IA**

IIIA. Students use appropriate technologies as extensions of the mind by
□□exploring mathematical ideas and problem solving using tools such as graphing calculators, Winplot, Mathematica, Excel, etc. **IA**
□□making mathematical conjectures based on graphics and animations **IA**
□□using web-based resources to clarify, verify, or explore ideas **IA**

IIIB. Students recognize, pursue, and explain substantive connections within and among areas of knowledge by
□□applying calculus methods to familiar contexts, such as position, velocity and acceleration, and justifying conclusions **FA**
□□solving problems that require similar means which involve new or less familiar application contexts and justifying conclusions **FA**

IVA. Students construct and support judgments based on evidence through
□□constructing graphs of a function based on the graph of its rate of change, and vice versa, giving full written and/or verbal justification **FA**
□□solving optimization problems, with full justification **FA**
□□exploring and justifying solutions to differential equations **FA**

IVB. Students will be challenged to write and speak with economy, power, and elegance by
□□supporting answers with written justification using precise mathematical notation and language **FA**
□□making sound mathematical verbal arguments using precise language **IA**

IVC. Students will identify and characterize the composing elements of dynamic and organic wholes, structures and systems. **NA**
IVD. Students will be challenged to develop an aesthetic awareness and capability. **NA**
VA. Students will identify, understand and accept the rights and responsibilities of belonging to a diverse community by
□□actively participating in class discussions **IA**
□□respecting each others' questions and responses, both in and out of class **IA**
□□collaborating outside of class on Take Home and other assignments without infringing on each others' intellectual capital **IA**

VB. In order for students to make reasoned decisions which reflect ethical standards, and act in accordance with those decisions, students
□□collaborate outside of class on Take Home and other assignments without infringing on each others' intellectual capital **IA**
□□produce their own work on formal assessments **FA**

Instructional Design and Approach:
BC II/III is intended to provide students an experience of studying calculus well beyond simply learning the mechanics of solving routine problems. As much as possible, routine practice will be relegated to outside the classroom, while in-class work will focus on more theoretical discussions

and discussing more involved and intractable problems in-depth. The intent is that students think mathematically about elementary calculus.

Student Expectations:
Students are expected to have all work handed in on time. Students knowing they will have difficulty doing so should consult the instructor.
Students should have some means of organizing their work. Having a three-ring binder is suggested, with sections marked Daily Work, Notes, Vocabulary, Exams, and Other. It is expected that students meeting with the instructor bring their binders with them.

Assessment Practices, Procedures, and Processes:
Exams will occur periodically, approximately every three weeks. Students are expected to be prepared for both the "skills" part of the exam, which addresses more routine problems, and the "conceptual" part of the exam, which asks more open-ended, challenging problems.
Homework will be assigned on a daily basis. It is imperative that students keep up with this homework so as to get the most out of the classroom experience. If a student comes to class unprepared, they jeopardize the integrity of the learning environment. That is, they do not merely cheat themselves; they cheat the other students at their table, and in fact, the entire class. I expect each student to have made an honest attempt at completing the homework assigned the previous class period. Students will be asked to engage in the dialogue of problem solving, and help their classmates understand the content of the course.

Sequence of Topics and Activities
Approximate timetable for topics:
Weeks 1-2: Techniques of integration – integration by parts, partial fractions, trigonometric substitution, trigonometric powers.
Weeks 2-3: Approximating Definite Integrals – Riemann Sums, Simpsons Rule;
Weeks 4: Improper Integrals
Weeks 5: Volumes of solids of revolution and related topics.
Weeks 6: Taylor Polynomials
Weeks 7-9: Sequences and Series
Weeks 10 – 15: Maclaurin and Taylor series19. Miscellaneous exercises.
Week 16: Calculus of polar coordinates and vectors;
Weeks 17: Slope fields and differential equations
Week 17: Catch-up and additional topics.

Assessment/Evaluation:

Semester Grades:

Quizzes/Exams	- 60%
Problem Sets	- 20%
Semester Exam	- 20%