



HOLY ANGEL UNIVERSITY
School of Arts and Sciences
General Education Department

COURSE OUTLINE: INTEGRAL CALCULUS
1st Semester, SY 2020-2021

Faculty:

Holy Angel University VM

Vision: To become a role-model catalyst for countryside development and one of the most influential, best-managed Catholic universities in the Asia-Pacific region.

Mission: To offer accessible quality education that transforms students into persons of conscience, competence and compassion.

School of Arts and Sciences VM

Vision: To serve as an avenue for developing students' learning competencies within and across the many disciplines of human inquiry, particularly in mass media and psychology, attaining excellence in instruction, research and community development.

Mission: To produce professionally competent, morally upright, socially responsive and spiritually mature persons through holistic and transformative liberal education

Core Values:

1. We embody Christ-Centeredness.
2. We reflect Integrity.
3. We exemplify Excellence.
4. We are a Community.
5. We engage with Societal Responsibility.

Program Learning Outcomes Common to All

Upon completion of the course, the students should be able to:

- 1. Engage in lifelong learning and be cognizant of the need to keep abreast of the developments in the specific field of practice (PQF level 6 descriptor)
- 2. Effectively communicate orally and in writing using both English and Filipino
- 3. Work effectively and independently in multidisciplinary and multi-cultural teams (PQF level 6 descriptor)
- 4. Recognize professional, social, and ethical responsibility
- 5. Appreciate “Filipino historical and cultural heritage” (based on RA 7722)

CORE VALUES VIS-À-VIS PROGRAM OUTCOMES COMMON TO ALL PROGRAMS	CHRIST CENTEREDNESS	INTEGRITY	EXCELLENCE	COMMUNITY	SOCIETAL RESPONSIBILITY
1. The ability to engage in lifelong learning and understanding of the need to keep abreast of the developments in the specific field of practice. (PQF level 6 descriptor)			X		
2. The ability to effectively communicate orally and in writing using both English and Filipino.			X		
3. The ability to work effectively and independently in multi-disciplinary and multi-cultural teams. (PQF level 6 descriptor)		X		X	
4. A recognition of professional, social, and ethical responsibility	X			X	X
5. An appreciation of "Filipino historical and cultural heritage" (based on RA 7722)	X			X	X

Institutional Student Learning Outcomes

Upon completion of the course, the students have displayed and mastered the skills in:

- 1. Communication
- 2. Valuing and ethical reasoning
- 3. Critical and Creative Thinking
- 4. Applied and Collaborative Learning
- 5. Aesthetic Engagement
- 6. Civic and Global Learning
- 7. Information and Communication Technology (ICT) Literacy

Course Learning Outcomes: At the end of the course, the students will be able to:

- 1. Demonstrate mastery of the major concepts in Integral Calculus.
- 2. Demonstrate skills for specific problems that he/she may encounter in more advanced courses.
- 3. Demonstrate operational knowledge on the theorems and concepts of the Integrals, transcendental functions, techniques of integration and their applications.
- 4. Apply techniques and manipulative skills in handling problems of calculus nature.
- 5. Use (graphing) calculator effectively.
- 6. Exhibit self-reliance, patience, and perseverance when working with word problems.
- 7. Affirm honesty and integrity in the application of calculus to various human endeavor.

COURSE OUTCOMES VIS-À-VIS INSTITUTIONAL STUDENT LEARNING OUTCOMES	Communication	Valuing and Ethical Reasoning	Critical and Creative Thinking	Civic and Global Learning	Applied and Collaborative Learning	Aesthetic Engagement	Information and Communication Technology (ICT) Literacy
1. Demonstrate mastery of the major concepts in Integral Calculus.			X		X		
2. Demonstrate skills for specific problems that he/she may encounter in more advanced courses.	X	X	X		X		
3. Demonstrate operational knowledge on the theorems and concepts of the Integrals,	X		X	X	X	X	

transcendental functions, techniques of integration and their applications.							
4. Apply techniques and manipulative skills in handling problems of calculus nature.	X	X	X	X	X	X	X
5. Use graphing/calculator effectively.			X		X	X	X
6. Exhibit self-reliance, patience, and perseverance when working with word problems.		X	X	X	X		
7. Affirm honesty and integrity in the application of calculus to various human endeavor.	X	X	X	X	X		

COURSE OUTCOMES					
VIS-À-VIS	PO1	PO2	PO3	PO4	PO5
PROGRAM OUTCOMES COMMON TO ALL PROGRAMS					
1. Demonstrate mastery of the major concepts in Integral Calculus.	X			X	
2. Demonstrate skills for specific problems that he/she may encounter in more advanced courses.	X	X	X	X	
3. Demonstrate operational knowledge on the theorems and concepts of the Integrals, transcendental functions, techniques of integration and their applications.	X	X	X	X	
4. Apply techniques and manipulative skills in handling problems of calculus nature.	X	X	X	X	
5. Use graphing/calculator effectively.	X		X		
6. Exhibit self-reliance, patience, and perseverance when working with word problems.	X	X		X	X
7. Affirm honesty and integrity in the application of calculus to various human endeavor.	X		X	X	X

I. Course Description : This course deals with the inverse operation of differentiation and, by taking up the fundamental theorems, connects the differential calculus to this branch of calculus. The use of graphics calculators and computer algebra systems will be an integral part of the course. At the end of the semester, the students are expected to solve separable differential equations and apply the definite integral to compute a wide variety of entities such as the area of a plane region, volumes of various kinds of solids, length of arc, force caused by fluid pressure, reaction rates, logistic growth and many others in real- life applications.

II. Course Credit : 3 Units

III. Prerequisite : Calculus I

IV. Textbook :

V. Requirements : Class Standing: Quizzes, Assignments, Drills/Exercises, Projects
Major Exams: Prelims, Midterms and Final Exam

VI. Course Outline :

Time Frame Weeks	Intended Learning Outcomes	Course Outcomes	Course Content	Teaching-Learning Activities	Assessment
1	1. Understand the VMGO's of HAU and CICT and the course content, policies and requirements. 2. Illustrate the formulas from Differential Calculus and solve differential problems.	CLO7 CLO1 CLO2 CLO3	i. VMGO's of HAU and the students' home college/ school ii. Syllabus in INTEGRAL CALCULUS	Lecture discussion of classroom rules and expectations Drills/Exercises	Course outline seen and signed by student Written commitment

	3. Identify the important terms of integration, its symbols and notations.		iii. Class Management: Requirements and Policies I. INTEGRALS A. Review of Differentiation Formulas B. The Integral: Definition, Symbols and Notations		
2	1. Enumerate and differentiate the types of integrals and the basic integration formulas. 2. Explain the concept of constant of integration	CLO1 CLO2 CLO3	C. Types of Integrals D. The Basic Integration Formulas E. The Constant of Integration	Online discussion (Synchronous) Video Watching: https://www.khanacademy.org/math/ap-calculus-ab/ab-integration-new/ab-6-1/v/introduction-to-integral-calculus Drills/ Exercises	Problem Sets
3 – 5	1. Evaluate the integrals of algebraic and transcendental functions. 2. Illustrate the methods and techniques used in transforming trigonometric integrals into integrals which can be evaluated using the basic integration formulas. 3. Enumerate and apply the formulas used to evaluate integrals that give inverse trigonometric functions. 4. Integrate other functions using the additional integration formulas	CLO1 CLO2 CLO3 CLO4 CLO7	F. Integration of Logarithmic and Exponential Functions G. Integration of Trigonometric Integrals H. Integration of Inverse Trigonometric Functions Additional Formulas	Online discussion (Synchronous/ Asynchronous) Assignment Drills/ Exercises Quiz	Project: VLOG illustrating the application of integration in the real world and/or everyday life
6	PRELIMINARY EXAMINATION: Learning Paper				
7 – 9	1. Evaluate integrals using integration by parts.	CLO1 CLO2 CLO3	II. INTEGRATION PROCEDURES A. Integration by Parts B. Algebraic Substitution C. Miscellaneous Substitution	Online discussion (Synchronous/ Asynchronous) Assignment	Quiz/ Problem Sets

	2. Evaluate integrals using algebraic and miscellaneous substitutions. 3. Evaluate integrals using trigonometric substitution	CLO4 CLO6 CLO7	D. Trigonometric Substitution	Drills/Exercises	
10 – 11	1. Enumerate and illustrate the four cases used in resolving into partial fractions. 2. Evaluate integrals using partial fractions 3. Apply the Fundamental theorems of Calculus in solving problems	CLO1 CLO2 CLO3 CLO4 CLO6	E. Partial Fraction F. Fundamental Theorem of Calculus	Online discussion (Synchronous/ Asynchronous) Assignment Drills/Exercises Quiz	e-Portfolio
12	MIDTERM EXAMINATION: Math Investigation				
13 - 15	1. Evaluate definite integrals. 2. Illustrate and label the diagram of the equations of the given curves showing the area to be determined and the volume of solids of revolution. 3. Solve the area of simple regions, regions bounded by curves, and the volume of solids of revolution using the appropriate solutions.	CLO2 CLO1 CLO3 CLO4 CLO5 CLO6	III. THE APPLICATION OF INTEGRALS A. The Definite Integral and Its Application B. Plane Area in Rectangular Coordinate C. Plane Area in Polar Coordinate D. Volumes of Solids of Revolutions	Online discussion (Synchronous/ Asynchronous) Assignment Drills/Exercises Problem Posing Activity	Problem Sets
16 - 17	1. Solve the centroid of plane region and solids of revolution. 2. Solve problems on moment of inertia and other word problems. 3. Perform double and iterated integration	CLO2 CLO3 CLO4 CLO5 CLO6 CLO7	E. Physical Application 1. Center of Mass 2. Moment of Inertia 3. Word Problems F. Iterated Integrals	Online discussion (Synchronous/ Asynchronous) Assignment Drills/Exercises Quiz	Problem Posing Activity
18	FINAL EXAMINATION: Graphic Organizer				

VII. References:

Books:

Lactuan, L. (2017). Integral Calculus. Jimczyville Publications
Tolentino, R. (2015). Integral Calculus. Booklore Publishing
Galliguez, T. (2011). Integral Calculus. C&E Publishing
Lal, B. (2017). Topics in Integral Calculus: Vol. Seventh edition. Laxmi Publications Pvt Ltd. [eBOOK]

Online References:

ExpoLog, L., & BarCharts, I. (2016). Calculus 2. QuickStudy Reference Guides.
Li, Voon Li. et. al. (June 2017). Misconceptions and Errors in Learning Integral Calculus from <https://eric.ed.gov/?id=EJ1207815>

ACADEMIC INTEGRITY:

All students are expected to be academically honest. Cheating, lying, and other forms of immoral and unethical behavior will not be tolerated. Any student found guilty of cheating in examinations or plagiarism in submitted course requirements will (at a minimum) receive an F or failure in the course requirement or in the course. Plagiarism and cheating refer to the use of unauthorized books, notes, or otherwise securing help in a test; copying tests, assignments, reports or term papers; representing the work of another person as one's own; collaborating without authority, with another student during an examination or in preparing academic work; signing another student's name on an attendance sheet; or otherwise practicing scholastic dishonesty.

Classroom Policies:

1. Attendance and Punctuality
The student is expected to come to class regularly and on time. For absences, please refer to Policy on Absences below.
2. Active class participation
The student is expected to participate actively in class recitations, discussions, and other activities as the case maybe. Please refer also to Expectations from Student below.
3. Group work requirements
The student is expected to work harmoniously with his/her group mates and contribute to the preparation of their group work.
4. Peer group evaluation
The student shall also be evaluated by his/her peers and feedback shall be taken into consideration.

Expectations from students:

The student's responsibility is to come to each class prepared. He/She is also expected to take all examinations on the date scheduled. He/She is also expected to attend each class and participate actively in the discussions.

POLICY on ABSENCES:

The allowed number of absences for college students enrolled in a 1-hour class is a maximum of 10 absences and 7 absences for a 1-1/2 hour class-based on student handbook. Request for excused absences or waiver of absences must be presented upon reporting back to class. Special examinations will be allowed only in special cases, such as prolonged illness. It is the responsibility of the student to monitor her own tardy incidents and absences that might be accumulated leading to a grade of “FA.” It is also his/her responsibility to consult with the teacher, chair, or dean should his/her case be of special nature.

GRADING SYSTEM:

Grading Scheme: 70% Class Standing & 30% Major Examination(s)

Formula:

CSM- Class Standing Midterms

ME- Midterm Examination

CSF- Class Standing Final

FE- Final Examination

Final Grade =
$$\frac{70\% \text{ (CSM)} + 30\% \text{ (ME)} + 70\% \text{ (CSF)} + 30\% \text{ (FE)}}{2}$$

50% Passing

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RUBRIC A: RUBRIC FOR LEARNING PAPER

Criterion	Standard
Responsiveness to Topic Score _____/10	9-10 – clearly addresses the topic and responds effectively to all aspects of the assignment; 7-8 – clearly address the topic, but may respond to some aspects of the assignment more effectively than others 5-6 – addresses the topic, but may slight some aspects of the topic 3-4 – indicates confusion about the topic or neglects important aspects of the assignment 1-2 – suggests an inability to comprehend the assignment or to respond meaningfully to the topic
Communication of Ideas Score _____/ 10	9-10 – explores the issues showing thorough comprehension of the text; goes beyond the obvious or class discussion 7-8 – shows some depth and complexity of thought 5-6– may treat the topic simplistically or repetitively; doesn’t demonstrate sufficient comprehension of the text 3-4– lacks focus, demonstrates confused or simplistic thinking, or fails to communicate ideas 1-2 – is unfocused, illogical, incoherent or disorganized
Organization Score _____/ 5	5 – is coherently organized (i.e. stays on target with the topic), with ideas supported by apt reasons 4 – is well organized and developed with appropriate reasons and examples 3 – is adequately organized and developed, generally supporting ideas with reasons and examples 2 – is poorly organized and/or undeveloped; lacks support from the text 1– is undeveloped; provides little or no relevant support
Math Content Score _____/25	21-25 Demonstrates masterful knowledge of the subject matter. 16-20 Demonstrates above average knowledge of the subject matter. 11-15 Demonstrates adequate/ average knowledge of the subject matter. 6-10 Demonstrates below average knowledge of the subject matter. 0-5 Demonstrates a very poor knowledge of the subject matter.

RUBRIC B: MATHEMATICS PROBLEM SOLVING SCORING GUIDE

(SOURCE: <http://www.nwrel.org/msec>)

	EMERGING	DEVELOPING	PROFICIENT	EXEMPLARY
Conceptual Understanding Key Question: <i>Does the student's interpretation of the problem using mathematical representations and procedures accurately reflect the important mathematics in the problem?</i>	1. Your mathematical representations of the problem were incorrect. 2. You used the wrong information in trying to solve the problem. 3. The mathematical procedures you used would not lead to a correct solution. 4. You used mathematical terminology incorrectly.	1. Your choice of forms to represent the problem was inefficient or inaccurate. 2. You used some but not all of the relevant information from the problem. 3. The mathematical procedures you used would lead to a partially correct solution. 4. You used mathematical terminology imprecisely.	1. Your choices of mathematical representations of the problem were appropriate. 2. You used all relevant information from the problem in your solution. 3. The mathematical procedures you chose would lead to a correct solution. 4. You used mathematical terminology correctly.	Your choice of mathematical representations helped clarify the problem's meaning. 2. You uncovered hidden or implied information not readily apparent. 3. You chose mathematical procedures that would lead to an elegant solution. 4. You used mathematical terminology precisely.
Strategies and Reasoning Key Question: <i>Is there evidence that the student proceeded from a plan, applied appropriate strategies, and followed a logical and verifiable process toward a solution?</i>	1. Your strategies were not appropriate for the problem. 2. You didn't seem to know where to begin. 3. Your reasoning did not support your work. 4. There was no apparent relationship between your representations and the task 5. There was no apparent logic to your solution. 6. Your approach to the problem would not lead to a correct solution.	1. You used an oversimplified approach to the problem. 2. You offered little or no explanation of your strategies. 3. Some of your representations accurately depicted aspects of the problem. 4. You sometimes made leaps in your logic that were hard to follow. 5. Your process led to a partially complete solution.	1. You chose appropriate, efficient strategies for solving the problem. 2. You justified each step of your work. 3. Your representation(s) fit the task. 4. The logic of your solution was apparent. 5. Your process would lead to a complete, correct solution of the problem. 1. You chose innovative and insightful strategies for solving the problem. 2. You proved that your solution	1. You chose innovative and insightful strategies for solving the problem. 2. You proved that your solution was correct and that your approach was valid. 3. You provided examples and/or counterexamples to support your solution. 4. You used a sophisticated approach to solve the problem

			was correct and that your approach was valid. 3. You provided examples and/or counterexamples to support your solution. 4. You used a sophisticated approach to solve the problem	
Computation & Execution Key Question: <i>Given the approach taken by the student, is the solution performed in an accurate and complete manner?</i>	1. Errors in computation were serious enough to flaw your solution. 2. Your mathematical representations were inaccurate. 3. You labeled incorrectly. 4. Your solution was incorrect. 5. You gave no evidence of how you arrived at your answer.	1. You made minor computational errors. 2. Your representations were essentially correct but not accurately or completely labeled. 3. Your inefficient choice of procedures impeded your success. 4. The evidence for your solution was inconsistent or unclear.	1. Your computations were essentially accurate. 2. All visual representations were complete and accurate. 3. Your solution was essentially correct. 4. Your work clearly supported your solution.	1. All aspects of your solution were completely accurate. 2. You used multiple representations for verifying your solution. 3. You showed multiple ways to compute your answer.
Communication Key Question: <i>Was I able to easily understand the student's thinking or did I have to make inferences and guesses about what they were trying to do?</i>	1. I couldn't follow your thinking. 2. Your explanation seemed to ramble. 3. You gave no explanation for your work. 4. You did not seem to have a sense of what your audience needed to know. 5. Your mathematical representations did not help clarify your thinking.	1. Your solution was hard to follow in places. 2. I had to make inferences about what you meant in places. 3. You weren't able to sustain your good beginning. 4. Your explanation was redundant in places. 5. Your mathematical representations were somewhat helpful in clarifying your thinking.	1. I understood what you did and why you did it. 2. Your solution was well organized and easy to follow. 3. Your solution flowed logically from one step to the next. 4. You used an effective format for communicating. 5. Your mathematical representations helped clarify your solution.	1. Your explanation was clear and concise. 2. You communicated concepts with precision. 3. Your mathematical representations expanded on your solution. 4. You gave an in-depth explanation of your reasoning.

RUBRIC MATHEMATICS INVESTIGATION

	Exceeds Standard [10]	Meets Standard [8]	Approaches Standard [6]	Standard Not Demonstrated [4]
Introduction: State Problem/ Experiment Purpose	- Problem correctly stated - Precise, clear, relevant explanation. - Includes hypothesis that addresses each variable	- Problem correctly stated - Basic, relevant explanation - Includes a hypothesis that includes variables	- Problem partially identified and/or - Limited, relevant explanation. And/or - Hypothesis is unclear	- Statement of problem is erroneous and/or irrelevant - Limited explanation - Hypothesis not included
Procedures	- Precisely, clearly describes all relevant variables - Identifies which variable is the independent and dependent variable - Identifies all/most of the constants	- Clearly describes all relevant variables - Identifies which variable is the independent and dependent variable - May identify some of the constants	- Attempts to describe variables - Attempts to identify which variable is the independent and dependent variable - May not include the constants	Attempts to describe variables
Analyze Data	- Collaborates with other groups to compare data - Creates appropriate tables, charts, and/or graphs with data - Data is organized, labeled, and units are included - Calculations are correct - Mathematical analysis is aimed at answering experiment question - Multiple graph forms are used and/or trends are identified	- Collaborates with other groups to compare data - Creates appropriate tables, charts, and/or graphs with data - Data is organized, labeled, and units are included - Calculations are correct - Mathematical analysis is aimed at answering experiment question	- Creates tables, charts, and/or graphs with data - Data organization is attempted - Labels/units may be incorrect/missing - Calculations are attempted - Mathematical analysis may not be directly aimed at answering experiment question	- Creates tables, charts, and/or graphs with data And/or - Data organization is not attempted - Labels/units missing - Calculations not attempted
Recommendations	- Stated conclusion is clearly stated - Directly relates to the experiment question - Directly supported by data - Identifies possible errors and/or proposes revisions - Energy and Gravity are related to findings	- Stated conclusion is clearly stated - Directly relates to the experiment question - Directly supported by data - Energy and Gravity are addressed	- Stated conclusion may be clearly stated And/or - Data may be referenced indirectly And/or - May not directly relate to the experiment question	- Stated conclusion is unclear And/or - May not directly related to the experiment question And/or - Data may be referenced indirectly or inaccurately

GRAPHIC ORGANIZER RUBRIC

DIRECTIONS: Using the following criteria, choose the appropriate number from the following scale that reflects your assessment of the student's work.

1 = Weak 2 = Moderately Weak 3 = Average 4 = Moderately Strong 5 = Strong

1. The graphic organizer has an appropriate title and labels.	
2. The graphic organizer's lines, boxes, and text are neat and legible.	
3. The information in the graphic organizer is accurate.	
4. The spelling, grammar, and punctuation of the text on the graphic organizer are accurate.	
5. The graphic organizer presents the information in a manner that is easy to follow.	
6. The relationships presented in the graphic organizer are correct and clear.	
7. The form in which the graphic organizer portrays the information is appropriate to the relationships being represented.	
8. The graphic organizer demonstrates an understanding of the topic, its relationships & related concepts.	
9. The graphic organizer fulfills all the requirements of the assignment.	
10. Overall, the graphic organizer represents the student's full potential.	

TOTAL:

Comments:_____