**MTH202A** – Mathematical Analysis 2 *Prerequisite: MTH201A Prerequisite to: MTH221A, MTH203A*

 *MTH257A, STT300A*

**Instructor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

 **Consultation Hours: \_\_\_\_\_\_\_\_\_\_\_\_\_**

**Contact details: \_\_\_\_\_\_\_\_\_\_\_\_\_
Class Schedule and Room: \_\_\_\_\_\_\_\_**

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| **Course Description**  |
| **This is second course in Calculus . It covers techniques of integration, indeterminates, improper integrals, sequences and series, parametric equations, polar coordinates, cylindrical surfaces, surfaces of revolutions and quadric surfaces, limits and continuity of functions of several variables, partial derivatives and total differentials.** |

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| **Learning Outcomes** |
| On completion of this course, the student is expected to present the following learning outcomes in line with the Expected Lasallian Graduate Attributes (ELGA) and the outcomes prescribed by the CHED Memorandum Order for the BS Mathematics program.

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| ELGA | Learning Outcome |  Program Outcome |
| Critical and Creative ThinkerEffective CommunicatorLifelong Learner | At the end of the course, the student will be able to | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| apply appropriate differential and integral calculus concepts, thinking processes, tools, and technologies in the solution to various conceptual or real-world problems. | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 | 🗸 |  | 🗸 |

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| **Program Outcomes (BS Mathematics)** |
| A graduate of the program should be able to |
| 1. Apply analytical, critical and problem solving skills using the scientific method.
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| 1. Carry out basic mathematical and/or statistical computations and use appropriate technologies in the analysis of data, and in pattern recognition, generalization, abstraction, critical analysis, and problem solving.
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| 1. Gain mastery in the core areas of mathematics: algebra, analysis and geometry
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| 1. Demonstrate skills in pattern recognition, generalization, abstraction, critical analysis, problem-solving and rigorous argument.
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| 1. Develop an enhanced perception of the vitality and importance of mathematics in the modern world, including the interrelationships within mathematics and its connection to other disciplines
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| 1. Appreciate the concept and role of proof and reasoning and demonstrate knowledge in reading and writing mathematical proofs.
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| 1. Make and evaluate mathematical conjectures and arguments and validate their own mathematical thinking
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| 1. Communicate mathematical ideas orally and in writing using clear and precise language
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| **Final Course Output** |
| As evidence of attaining the above learning outcomes, the student is required to submit the following during the indicated dates of the term.

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| Learning Outcome | Required Output | Due Date |
| At the end of the course, the student will be able to apply appropriate differential and integral calculus concepts, thinking processes, tools, and technologies in the solution to various conceptual or real-world problems. | * Carefully crafted compilation of solved problems on integration using various techniques of integration; exploring graphmatica software in sketching polar curve, cylindrical and quadric surfaces; power series approximation of certain function values as compared to values generated by scientific calculators.
 | Week 13 |

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| **Rubric for assessment for compilation of solutions to problems** |
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| CRITERIA | Excellent (4) | Good (3) | Satisfactory (2) | Needs Improvement (1) |
| **Understanding****(50%)** | The solution shows a deep understanding of the problem including the ability to identify the appropriate mathematical concepts and information necessary for its solution. | The solution shows that student has a broad understanding of the problem and the major concepts necessary for its solution. | The solution is not complete indicating that parts of the problem are not understood. | There is no solution, or the solution has no relationship to the task. |
| **Strategies and Procedures****(15%)** | Uses a very efficient strategy leading directly to a solution.Applies procedures accurately to correctly solve the problem and verifies the result. | Uses strategy that leads to a solution of the problem. All parts are correct and a correct answer is achieved. | Uses a strategy that is partially useful, leading some way toward a solution but not to a full solution of the problem. Some parts may be correct but a correct answer is not achieved. | No evidence of a strategy or procedure uses strategy that does not help solve the problem. |
| **Communication****(10%)** | There is a clear, effective explanation, detailing how the problem is solved.There is a precise and appropriate use of mathematical terminology and notation. | There is a clear explanation and appropriate use of accurate mathematical representation. | There is some use of appropriate mathematical representation but explanation is incomplete and not clearly presented. | There is no explanation or the solution cannot be understood or it is unrelated to the problem. |
| **Integration****(10%)** | Demonstrates integration of the concepts presented | Demonstrates some integration of the concepts presented | Demonstrates limited integration of the concepts presented | Demonstrates no integration of the concepts presented |
| **Accuracy of Computations/****Solutions****(15%)** | Computations /solutions are correct and explained correctly  | Computations/solutions are correct but not explained well. | Computations/solutions have some errors. | Incorrect computations/solutions  |

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| **Requirements** |
| **Grading System** |
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|  | **FOR EXEMPTED STUDENTS** **(w/out Final Exam)** | **FOR STUDENTS** **with FINAL EXAM** |
| *with* *no missed quiz* | *With* *one missed quiz* |
| Average of quizzes  | 90% | 60% | 55% |
| Project Output | 10% | 10% | 10% |
| Final exam | - | 30% | 35% |

 | **Scale:**95-100% 4.089-94% 3.583-88% 3.078-82% 2.572-77% 2.066-71% 1.560-65% 1.0<60% 0.0 |

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| **Requirements** |
| At least 5 quizzes, 1 final exam, Seatwork, Assignments, Recitation, Group Work |

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| **Learning Plan** |
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| **LEARNING****OUTCOME** | **TOPIC** | **WEEK NO.** | **LEARNING****ACTIVITIES** |
| At the end of the course, the student will be able to:* Compute derivatives and integrals of transcendental functions; use some techniques of integration other than the elementary methods; obtain parametric equations and their derivatives.
* Sketch the graph of polar curves, cylinders and quadric surfaces, calculate the area in polar coordinates, test convergence or divergence of series and illustrate power series representation of certain functions.
* Evaluate limits, determine continuity and find derivatives of functions of more than one variable.
 | **I. INTEGRALS OF /** **INTEGRALS** **YIELDING** **TRANSCENDENTAL**  **FUNCTIONS**1.1 Integrals Yielding the  Natural Logarithmic  Function 1.2 Integrals of Exponential  Functions1.3 Integrals of Trigonometric  Functions1.4 Integrals Yielding  Inverse Trigonometric  Functions**II. TECHNIQUES OF**  **INTEGRATION**2.1 Integration by Parts2.2 Trigonometric Integrals (Powers of Sine,  Cosine, Tangent,  Cotangent , Secant  and Cosecant)* 1. Integration of Algebraic

Functions by  Trigonometric  Substitution2.4 Integration of Rational Functions by Partial  Fractions **QUIZ 1****III. INDETERMINATE**  **FORMS AND**  **IMPROPER**  **INTEGRALS**3.1 Cauchy’s Mean Value  Theorem and  Indeterminate Form 0/0 3.2 L’Hopital’s Rule and  Other Indeterminate  Forms * 1. Improper Integrals

 with Infinite Limits of  Integration3.4 Other Improper Integrals  **QUIZ 2****IV. SEQUENCES AND**  **INFINITE SERIES** 4.1 Sequences4.2 Infinite Series of  Constant Terms* 1. Infinite Series of

 Positive Terms * 1. Infinite Series of Positive

 and Negative Terms 4.5 Summary of Tests for  Convergence or Divergence of an Infinite Series4.6 Power Series4.7 Differentiation and  Integration of Power  Series 4.8 Taylor Series and  Polynomial Formula **QUIZ 3****V. PARAMETRIC**  **EQUATIONS*** 1. Parametric Equations

 and Plane Curves* 1. Length of Arc of a Plane

 Curves **VI. POLAR GRAPHS** 6.1 Polar Coordinates  and Polar Graphs* 1. Length of Arc and

 Areas of a Region for  Polar Graphs **QUIZ 4****VII. SURFACES IN SPACE**7.1Three-Dimensional  Space 7.2 Surfaces (Cylindrical  and Quadrics) **Quiz 5****VIII. DIFFERENTIAL CALCULUS OF FUNCTIONS OF MORE THAN ONE VARIABLE**  8.1 Functions of More Than One Variable8.2 Limits and Continuity  of Functions of More  Than One Variable 8.3 Partial Derivatives 8.4 Differentiability and  the Total Differential* 1. The Chain Rule for

 Functions of More  Than One Variable**IX. MULTIPLE INTEGRATION** 9.1 Evaluation of Double and Triple Integrals**FINAL EXAMINATION** | Week 1(5 + 1) hrsWeek 2 - 2.5(7.5+1.5) hrsWeek 2.5 – 4(7.5 +1.5) hrsWeek 5 – 7.5(17.5 + 3.5) hrsWeek 7.5 - 8(2.5 + 0.5) hrsWeek 9-9.5(7.5+1.5)hrsWeek 9.5 -11(7.5+1.5) hrsWeek 12-12.5(7.5+1.5) hrsWeek12.5-13(2.5 +0.5)hrsWeek 14 (3 hrs) | * Library work
* Cooperative Learning
* Skills exercises
* Student self-assessment and reflection
* Quizzes
* Seatworks
* *Problem Sets*\*
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 **Total: (65 + 13 ) hrs** |

\*Problem sets are given weekly and the students are expected to work on the solutions for their fourth hour activity. At the end of the term, the solutions to the problems will be compiled and submitted as course outputs.

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| **References** |
| Anton, H., Biven, I.C., and Davis, S., *Calculus* (10th ed.) Wiley, 2012Edwards, C.H. and Penney, D.E. (2008) *Calculus: Early Transcendentals* (7th ed.) Upper Saddle River, NJ: Pearson/Prentice Hall, 2007**Etgen, G., Salas, S., Hille, E., *Calculus: One and Several Variables,* (10th ed.), John Wiley and Sons, Inc. 2007**Larson, R.E, Hostetler, R. & Edwards, B.H. (2008) *Essential Calculus: Early Transcendental Functions*. Boston: Houghton MifflinLarson, R., Edwards, B., *Calculus* (10th ed.) Brooks/Cole, 2014**Leithold, L. (2002) *The Calculus 7* (Low Price Edition) Addison-Wesley**Simmons, G.F. (1996) *Calculus with Analytic Geometry* (2nd ed.) New York: McGraw-HillSmith, Robert T., Minton, Roland B. (2012), *Calculus* , New York : McGraw Hill Tan, Soo T. (2012) *Applied Calculus for the Managerial, Life, and Social Sciences : A Brief Approach*, Australia : Brooks/Cole Cengage Learning Stewart, J., *Calculus: Early Transcendentals* (8th ed.) Brooks/Cole, 2011 |
| **Online Resources** |
| *Free Calculus Tutorials and Problems* Accessed October 11, 2012 from <http://analyzemath.com/calculus/>*Visual* Calculus Accessed October 11, 2012 from <http://archives.math.utk.edu/visual.calculus> tutorial.math.lamar.eduDawkins, P. (2012) *Paul’s Online Math Notes* Accessed October 11, 2012 from <http://tutorial.math.lamar.edu> |

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| **Class Policies** |
| 1. The required minimum number of quizzes for a 3-unit course is 3, and 4 for 4-unit or 5 unit course. No part of the final exam may be considered as one quiz.
2. Cancellation of the lowest quiz is not allowed even if the number of quizzes exceeds the required minimum number of quizzes.
3. As a general policy, no special or make-up tests for missed exams other than the final examination will be given. However, a faculty member may give special exams for
4. approved absences (where the student concerned officially represented the University at some function or activity).
5. absences due to serious illness which require hospitalization, death in the family and other reasons which the faculty member deems meritorious.
6. If a student missed two (2) examinations, then he/she will be required to take a make up for the second missed examination.
7. If the student has no valid reason for missing an exam (for example, the student was not prepared to take the exam) then the student receives 0% for the missed quiz.
8. Students who get at least 89% in every quiz are exempted from taking the final examination. Their final grade will be based on the average of their quizzes and other prefinal course requirements. The final grade of exempted students who opt to take the final examination will be based on the prescribed computation of final grades inclusive of a final examination. Students who missed and/or took any special/make-up quiz will not be eligible for exemption.
9. Learning outputs are required and not optional to pass the course.
10. Mobile phones and other forms of communication devices should be on silent mode or turned off during class.
11. Students are expected to be attentive and exhibit the behavior of a mature and responsible individual during class. They are also expected to come to class on time and prepared.
12. Sleeping, bringing in food and drinks, and wearing a cap and sunglasses in class are not allowed.
13. Students who wish to go to the washroom must politely ask permission and, if given such, they should be back in class within 5 minutes. Only one student at a time may be allowed to leave the classroom for this purpose.
14. Students who are absent from the class for more than 5 meetings will get a final grade of 0.0 in the course.
15. Only students who are officially enrolled in the course are allowed to attend the class meetings.
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Approved by:

 **DR. JOSE TRISTAN F. REYES**

Chair, Mathematics and Statistics Department

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*T2, AY 2017-2018 / S.Y.Tan*