**MATP113** – *Mathematical Analysis 1 for Physics (4 units)*  *Prerequisite: Prerequisite to: MATP114*

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

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

**Class days and Time: \_\_\_\_\_\_\_\_\_\_\_\_\_**

**Estimated Time of Study Outside Class: Approximately 13 hours**

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

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| **Course Description** |
| This is first course in Calculus. It covers limits, continuity, derivatives of algebraic and transcendental functions (exponential, logarithmic, trigonometric, hyperbolic and their inverses), applications of derivatives, differentials, antiderivatives, definite integrals, Fundamental Theorem of Calculus and applications of definite integrals in finding area of plane region and length of arc. |

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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.   |  |  |  | | --- | --- | --- | | 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 optimization, rate of change, curve sketching, finding areas of plane regions , arc length that will manifest the application of the concepts learned | Week 13 | |
| **Rubric for assessment for compilation of solutions to problems** |
| |  |  |  |  |  | | --- | --- | --- | --- | --- | | 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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| **Grading System** | |
| |  |  |  |  | | --- | --- | --- | --- | |  | **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% 4.0  89-94% 3.5  83-88% 3.0  78-82% 2.5  72-77% 2.0  66-71% 1.5  60-65% 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** |
| |  |  |  |  | | --- | --- | --- | --- | | **LEARNING**  **OUTCOME** | **TOPIC** | **WEEK NO.** | **LEARNING**  **ACTIVITIES** | | At the end of the course, the student will be able to:   * Sketch graphs of functions; evaluate limits and determine continuity of different types of functions; and find derivatives of algebraic,trigonometric, exponential and logarithmic as well as inverse trigonometric and hyberbolic functions. * Apply the concepts of limits, continuity and derivatives in solving various real-world problems like optimization and related rates problems. * Evaluate definite integrals and apply the concept in finding area of a plane region, volume of a solid of revolution, length of arc of a curve and solving work problems. | **FUNCTIONS, LIMITS AND CONTINUITY**   * 1. Graphical Approach to   Limits of Functions  (recall & review)   * 1. Definition of the Limit of a Function and Limit Theorems   2. One-sided Limits   1.4 Infinite Limits  (vertical asymptotes)   * 1. Limits at Infinity (horizontal asymptotes)   2. Continuity of a Function at a Number   3. Continuity of a Composite Function, Continuity on an Interval   **QUIZ 1**  **II. THE DERIVATIVE**  **AND DIFFERENTIATION**   * 1. The Tangent Line and the Derivative   2. Differentiability and Continuity   3. Theorems on Differentiation of Algebraic Functions & Higher-Order Derivatives   4. The Derivative of a Composite Function and the Chain Rule   5. The Derivative of the Power Function for Rational Exponents and Implicit Differentiation   6. Derivatives of   Trigonometric Functions  2.7 The Inverse of a  Functions (review)   * 1. Derivatives of Logarithmic and Exponential Functions   2. Logarithmic   Differentiation  2.10 Derivatives of  Inverse Trigonometric  Functions  2.11 Hyperbolic Functions and their Derivatives  **QUIZ 2**  **III. BEHAVIOR OF**  **FUNCTIONS AND THEIR GRAPHS,EXTREME FUNCTION VALUES AND APPROXIMATIONS**   * 1. Maximum and Minimum Function Values   2. Applications Involving an Absolute Extremum on a Closed Interval   3. Increasing and Decreasing Functions and the First Derivative Test   4. Concavity and Points of Inflection and the Second Derivative Test   5. Summary of Sketching Graph of Functions   6. Rectilinear Motion and Derivatives as Rate of Change   **QUIZ 3**  **IV. THE DEFINITE**  **INTEGRAL**  **AND**  **INTEGRATION**  4.1 The Differential  4.2 Anti-differentiation  4.3 Some Techniques  of  Antidifferentiation  4.4 The Definite  Integral and Area  4.5 The Fundamental  Theorem of  Calculus  (no proof)    **QUIZ 4**  **V. APPLICATIONS OF THE DEFINITE**  **INTEGRALS**  5.1 Area of a Plane  Region  5.2 Length of Arc of  the Graph of a  Function  **FINAL EXAMINATION** | Week 1-2  (8) hrs  Week 3 - 5  (12) hrs  Week 6-8.5  (14) hrs  Week 8.5-11.5  (12) hrs  Week 11.5 -13  (6) hrs  Week14  (3 hrs) | * Library work * Cooperative Learning * Skills exercises * Student self-assessment and reflection * Quizzes * Seatworks * *Problem Sets*\* |     **Total: 52 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, 2012  Edwards, 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 Mifflin  Larson, 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-Hill  Smith, 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.edu  Dawkins, 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. |

Approved by:  **DR. JOSE TRISTAN F. REYES**

Chair, Mathematics and Statistics Department

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*Term 1, 2018-2019 / S.Y.Tan*