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| **COURSE #: 20100**  **COURSE TITLE: Calculus I**  CAREER: undergraduate  CATEGORY: regular  TERM OFFERED: Fall, Spring, Summer  PRE-REQUISITES: C or better in Math 19500 or placement. Credit will be given for only one of Math 20100 or Math 20500.  PRE/CO-REQUISITES:  HOURS/CREDITS: 4 HR/WK; 4 CR  DATE EFFECTIVE: Fall 2022  COURSE SUPERVISOR: **Cheikhna Mahawa Diagana** | | | | | **CATALOG DESCRIPTION:**  Limits, continuity, derivatives, differentiation and its applications, differentials, definite and indefinite integrals.    Text: Stewart: **Early Transcendentals (9th ed.), Clegg and Watson** | | |
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|  | |  | Topics and Allotted Times | | | |
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| Suggested Periods | Sec | Topics | | | | Suggested problems | |
| 1 | 1.1 | Functions and Their Graphs | | | | 1-4,7,9,12,15,18, 24, 35, 40, 41,43,47-49, 66, 68,8, 85, 86 | |
| 1 | 1.2 | A catalog of Essential Functions | | | | 1-4, 5,7, 9,12 | |
| 1 | 1.3 | New Function and Old functions | | | | 1-3, 5, 6, 13, 17, 23,33,34,35,37,43,45,55, 57, 59 | |
| 1 | 1.4 | Exponential Functions | | | | 1-3, 9, 13, 15, 17, 19, 29, 30 | |
| 2 | 1.5 | Inverse Functions and Logarithms | | | | 2-8, 10,15,17,19, 20, 23,26, 30, 35, 41,44(b), 46,57,69 | |
| 0.5 | 2.1 | Tangent and Velocity Problems | | | | 2, 5, 7 | |
| 2 | 2.2 | Limit of a Function | | | | 1-9, 11, 15, 17, 19, 41, 29, 30, 31, 50\* | |
| 1 | 2.3 | Calculating Limits using Limit Laws | | | | 1,2, 3,7,10,14,18,19,22,25,32,34,39-42,44,52,53,61,62,67 | |
| 1 | 2.4 | The Precise Definition of a Limit | | | | 1-4, 17,18 | |
| 1.5 | 2.5 | Continuity | | | | 1,3,6,7,11,13,16-18,21-24,26,28,31,37,45,47-50,53,55-58,73 | |
| 1.5 | 2.6 | Limits Involving Infinity; Horizontal Asymptotes | | | | 1,3,5,7,10,17,21-23,25,26,28,29,32,35,36,38-41,49,57,59,67 | |
| 2 | 2.7 | Derivatives as Rate of Change | | | | 1,5,7,8,9(a)-(b),12,13,15,17,22,27,43-48,57,58 | |
| 2 | 2.8 | The Derivative as a Function | | | | 1,3,21-32,39,41-44,49,65 | |
| 1 | 3.1 | Derivatives of Poly and Exponential Functions | | | | 3,8,11,14,17,19,25,31,33,34,37,41,53,59-63,75,85,86 | |
| 2 | 3.2 | Product Rules and Quotient Rules | | | | 1,3-30,31,34,35,37,45,46,49,52,53,63\* | |
| 1 | 3.3 | Derivatives of Trigonometric Functions | | | | 1,3,6,12,13,17,22,25,29,37,41,45,48,49,52,53,57,58,61,62 | |
| 2 | 3.4 | The Chain Rule | | | | 8,10,13,14,19,23,25,27,29,33,37,41,43,53,58,68,69,71,73,84 | |
| 1 | 3.5 | Implicit Differentiation | | | | 1,3,5,7,9,12,16,17,21,23,25,27,29,31,33,39,43,49,50\*,63,64 | |
| 2.5 | 3.6 | Derivatives of Inverse Functions and Logarithms | | | | 3,5,9,11,13,17,21,27,29,35,38,39,45,47,49,56,58\*,59,63,65,75 | |
|  | **A46** | Derivatives of Inverse Fun and Log (**Appendix F)** | | | | **Page 225:** 83-86 | |
| 1 | 3.7 | Rate of Change in Natural and Social Sciences | | | | 1,5,6,7,8,9,11, 35\* | |
| 1.5 | 3.9 | Related Rates | | | | 1-7,9,12,15,17,25 | |
| 1 | 3.10 | Linearization and Differentials | | | | 1-5,11,13,17,19,21,27,29,31-36,41,42,51,52 | |
| 1 | 4.1 | Maximum and Minimum Values | | | | 1,2,3,5,7,11,17,19,27,31,35,42-44,51,53,55,59,66\* | |
| 1 | 4.2 | The Mean Value Theorem | | | | 1,5,6,9,11,15,17,23,29,30,39 | |
| 1 | 4.3 | What Derivatives Tell us about Graph’s Shape | | | | 1,7-9,11,12,17,23,26,27,30,31,35,37,39,41,43,44,46,54,60,63,84 | |
| 2 | 4.4 | Indeterminate Forms and L’Hôpital’s Rule | | | | 1-4,5,7,9,11,13,15,18,19,21,23,25,27,33,34,37,41,47,51,53,56,75\* | |
| 2 | 4.5 | Summary of Curve Sketching | | | | 1-8, 11,13,15,21,23,25,27,29,31,34,37,45,51,52,55,67,71,76\* | |
| 1 | 4.7 | Optimization Problems | | | | 1,3,4,7,8,11,14,18-21,25,26,41,81 | |
| 1.5 | 4.9 | Antiderivatives | | | | 1,3,4,7,9,11,15,19,23,27-29,3540,45,51,54-56,61,65,67,70,83 | |
| 1 | 5.1 | Area and Distance problems | | | | 1-3,7-9,13,15-23, 25\* | |
| 1 | **A36** | Sigma Notation/Limit of Finite Sums (**Appendix E)** | | | | 1-10, 12,14,17,19,20, 22, 24,27,28,34,36,41,43,45,48-50 | |
| 1 | 5.2 | The Definite Integral\* | | | | 1-8,11,14,19,21,23,25,27-34-36,39,41,43,46,52,57,59,61,62,67 | |
| 1.5 | 5.3 | The Fundamental Theorem of Calculus | | | | 3-6,9,13,15,20,25,31,33,35,37,421,42,49,51,53,63,6771,73,75,77 | |
| 1 | 5.4 | Indefinite Integrals and the Net Change Theorem | | | | 1,3,7,9,17,24,31,38,44,46,53,59,61,69 | |
| 2.5 | 5.5 | The Substitution Rule | | | | 1-8,14,16,21-27,29,32,3537,39,45,51,59,65,70,75,77,84\*,93\*,98\* | |
| 1 | 6.1 | Areas Between Curves | | | | 1-7,9,11,13,17,19,21,24,24,30,35,37,41,42,44,61,64\*,65\*,69\* | |
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| **49** |  | **Total** | | | |  | |

**OCOURSE LEARNING OUTCOMES**

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| **After taking this course, the student should be able to:** | **Contributes to Departmental Learning Outcome(s):** |
| 1. Evaluate limits, including the use of L’Hôpital’s Rule. | a, b, e1, e2 |
| 2. Differentiate algebraic and transcendental functions. | a, b, e1, e2 |
| 3. Solve maximum and minimum problems. | a, b, c, e1, e2 |
| 4. Apply methods of calculus to sketch curves. | a, b |
| 5. Anti-differentiate algebraic and transcendental functions. | a, b, c, e1, e2 |
| 6. Approximate integrals by Riemann sums. | e1, e2, g |
| 7. Evaluate elementary integrals using substitution. | a |

**COURSE ASSESSMENT TOOLS**

1. Term average, based mostly on in-class examinations: 60% of grade

2. Comprehensive written final exam: 40% of grade.

**DEPARTMENTAL LEARNING OUTCOMES**

***The mathematics department, in its varied courses, aims to teach students to***

*a. perform numeric and symbolic computations  
b. construct and apply symbolic and graphical representations of functions  
c. model real-life problems mathematically  
d. use technology appropriately to analyze mathematical problems  
e. state (e1) and apply (e2) mathematical definitions and theorems  
f. prove fundamental theorems*

*g. construct and present (generally in writing, but, occasionally, orally) a rigorous mathematical argument*