# Course Description(暫定)

## Department of Mathematics

| Nature of the course<br>☑ required  ☐ elective | Area 麻煩老師勾選類別，或直接填寫_____。<br>☐ Algebra ☐ Analysis ☐ Geometry ☐ Statistics<br>☐ Applied Mathematics ☐ Discrete Mathematics ☐ Others |
|---|---|

| Calculus | ☑ Calculus A   ☐ Calculus B | | | | |
|---|---|---|---|---|---|
| Course number | 201 101A1 | Section number | 08-13 | Number of credits | 4 |
| Course title | Calculus | | | | |
| Instructor | 張秋俊(08)、莊正良(09)、王偉仲(10)、蔡炅男(11)、黃漢水(12) 、余正道(13) | | | | |

I.   Contents：

<table>
<tr><td colspan="4" align="center">上學期：單變數微積分</td></tr>
<tr><td>章節</td><td>週次</td><td>課次</td><td>課程進度</td></tr>
<tr>
<td rowspan="2">1. Functions and Models</td>
<td rowspan="2">第一週<br>9/14-9/18</td>
<td>1</td>
<td>[1.5] Exponential Functions<br>[1.6] Inverse Functions and Logarithms</td>
</tr>
<tr>
<td>2</td>
<td>[2.1] The Tangent and Velocity Problems<br>[2.2] The Limit of a Function</td>
</tr>
<tr>
<td rowspan="2">2. Limits and Derivatives</td>
<td rowspan="2">第二週<br>9/21-9/25</td>
<td>1</td>
<td>[2.3] Calculating Limits Using the Limit Laws<br>[2.4] The Precise Definition of a Limit</td>
</tr>
<tr>
<td>2</td>
<td>[2.5] Continuity<br>[2.6] Limits at Infinity; Horizontal Asymptotes<br>[2.7] Derivatives and Rates of Change</td>
</tr>
<tr>
<td rowspan="6">3. Differentiation Rules</td>
<td rowspan="2">第三週<br>9/28-10/2</td>
<td>1</td>
<td>[2.8] The Derivative as a Function<br>[3.1] Derivatives of Polynomials and Exponential Functions</td>
</tr>
<tr>
<td>2</td>
<td>[3.2] The Product and Quotient Rules<br>[3.3] Derivatives of Trigonometric Functions</td>
</tr>
<tr>
<td rowspan="2">第四週<br>10/5-10/9</td>
<td>1</td>
<td>[3.4] The Chain Rule<br>[3.5] Implicit Differentiation<br>[3.6] Derivatives of Logarithmic Functions</td>
</tr>
<tr>
<td>2</td>
<td>緩衝時間</td>
</tr>
<tr>
<td rowspan="2">第五週<br>10/12-10/16</td>
<td>1</td>
<td>[3.7] Rates of Change in the Natural and Social Sciences（※）<br>[3.8] Exponential Growth and Decay<br>[3.9] Related Rates</td>
</tr>
<tr>
<td>2</td>
<td>[3.10] Linear Approximations and Differentials<br>[3.11] Hyperbolic Functions（※）<br>[4.1] Maximum and Minimum Values</td>
</tr>
<tr>
<td rowspan="2">4. Applications of Differentiation</td>
<td rowspan="2">第六週<br>10/19-10/23</td>
<td>1</td>
<td>[4.2] The Mean Value Theorem<br>[4.3] How Derivatives Affect the Shape of a Graph</td>
</tr>
<tr>
<td>2</td>
<td>[4.4] Indeterminate Forms and L'Hospital's Rule</td>
</tr>
</table>

| | | | |
|---|---|---|---|
| | 第七週<br>10/26-10/30 | 1 | [4.5] Summary of Curve Sketching<br>[4.6] Graphing with Calculus and Calculators<br>[4.7] Optimization Problems |
| | | 2 | [4.8] Newton's Method（※）<br>[4.9] Antiderivatives |
| 5. Integrals | 第八週<br>11/2-11/6 | 1 | [5.1] Areas and Distances<br>[5.2] The Definite Integral |
| | | 2 | [5.3] The Fundamental Theorem of Calculus<br>[5.4] Indefinite Integrals and the Net Change Theorem |
| 6. Applications of Integration | 第九週<br>11/9-11/13 | 1 | [5.5] The Substitution Rule<br>[6.1] Areas between Curves |
| | | 2 | [6.2] Volumes<br>[6.3] Volumes by Cylindrical Shells |
| | | | 期中考 11/14（六）9：00～11：30 考試範圍 1.5～5.5 |
| | 第十週<br>11/16-11/20 | 1 | 緩衝時間 |
| | | 2 | [6.4] Work（※）<br>[6.5] Average Value of a Function |
| 7. Techniques of Integration | 第十一週<br>11/23-11/27 | 1 | [7.1] Integration by Parts<br>[7.2] Trigonometric Integrals |
| | | 2 | [7.3] Trigonometric Substitution |
| | 第十二週<br>11/30-12/4 | 1 | [7.4] Integration of Rational Functions by Partial Fractions |
| | | 2 | [7.5] Strategy for Integration<br>[7.6] Integration Using Tables and Computer Algebra Systems<br>[7.7] Approximate Integration |
| | 第十三週<br>12/7-12/11 | 1 | [7.8] Improper Integrals |
| | | 2 | 緩衝時間 |
| 8. Further Applications of Integration | 第十四週<br>12/14-12/18 | 1 | [8.1] Arc Length<br>[8.2] Area of a Surface of Revolution |
| | | 2 | [9.1] Modeling with Differential Equations<br>[9.2] Direction Fields and Euler's Method |
| 9. Differential Equations | 第十五週<br>12/21-12/25 | 1 | [9.3] Separable Equations<br>[9.4] Models for Population Growth |
| | | 2 | [9.5] Linear Equations<br>[9.6] Predator-Prey Systems （※） |
| 10. Parametric Equations and Polar Coordinates | 第十六週<br>12/28-1/1 | 1 | [10.1] Curves Defined by Parametric Equations<br>[10.2] Calculus with Parametric Curves |
| | | 2 | 1/1(五) 元旦放假 |
| | 第十七週<br>1/4-1/8 | 1 | [10.3] Polar Coordinates<br>[10.4] Areas and Lengths in Polar Coordinates |
| | | 2 | 緩衝時間 |
| | | | 期末考 1/9（六）9：00～11：30 考試範圍 6～10 |

（※）此符號標示之課程，可由任課教師自行決定是否為教學內容，不列入考試範圍中。

II.　Course prerequisite：

　　High School Mathematics

III.　Reference material ( textbook(s) )：

　　James Stewart, Calculus Early Transcendentals, 6$^{th}$ edition.

IV.　Grading scheme：

　　Midterm exam: 40%, Final exam: 40%, Quizzes and/or homework: 20%

V.　Others：

　　☆08-12班：上課時間：三 78 五 12 、 實習課時間：三 9

　　　　13班：上課時間：二 78 四 56 、 實習課時間：二 9

　　☆各班實習課分組教室：將公告於微積分甲統一教學網站公佈。

　　☆微積分甲統一教學網站：http://www.math.ntu.edu.tw/~mathcal/a/ 。

　　☆各班助教 Office Hour 時間：將公告於微積分甲統一教學網站公佈。

　　☆習題：習題繳交與否依各授課教師規定；習題解答將於公佈於微積分甲統一教學網站。

　　☆期中、期末考題目以英文命題。

VI.　Course Goal：

　　Study the process of approximation and its limitation (errors), learn the tools and techniques for analyzing regular mappings with applications, and deepen the understanding of elementary functions.