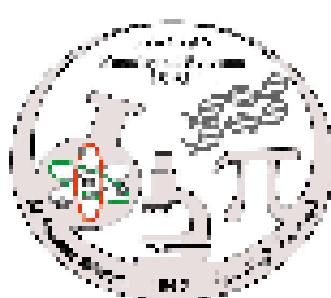


|                                      |                                                                                                                                                                       |                                                          |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|
| <b>The Hashemite University</b>      |   | <b>Advanced Calculus<br/>(101401)<br/>3 Credit Hours</b> |
| <b>Faculty of Science</b>            |                                                                                                                                                                       | <b>Pre-requisite: 101201</b>                             |
| <b>Department of<br/>Mathematics</b> |                                                                                                                                                                       | <b>Summer Semester<br/>2021/2022</b>                     |
| <b>Course Syllabus</b>               |                                                                                                                                                                       |                                                          |

| Course Information     |                                                                                                                                                                                                                                                  |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lecture's Time</b>  | 9:20-10:35 Sun, Mon, Tue, Wed.                                                                                                                                                                                                                   |
| <b>Lecture's Room</b>  | 134 ج.ل                                                                                                                                                                                                                                          |
| <b>Instructor</b>      | Dr. Mohammad Safi                                                                                                                                                                                                                                |
| <b>Office Location</b> | Math 316                                                                                                                                                                                                                                         |
| <b>Office Hours</b>    | By appointment                                                                                                                                                                                                                                   |
| <b>Text Book</b>       | Advanced Calculus, by Wilfred Kaplan ,5th edition.                                                                                                                                                                                               |
| <b>References</b>      | <p>(1) Advanced Calculus and its Applications to the Engineering and Physical Sciences by J. Amazigo and L. Rubinfeld (1980).</p> <p>(2) Calculus of Several Variables, by S. Lang.</p> <p>(3) Vector Calculus, by J. Marsden and A. Tromba.</p> |
| <b>Website</b>         | <a href="http://staff.hu.edu.jo/safi">http://staff.hu.edu.jo/safi</a>                                                                                                                                                                            |

#### Grading Policy and Exam Material:

|                    | Evaluation | Exam Material         |
|--------------------|------------|-----------------------|
| <b>First Exam</b>  | 30 %       | Chapter 2             |
| <b>Second Exam</b> | 30 %       | Chapter 3 & Chapter 4 |
| <b>Final Exam</b>  | 40 %       | All Chapters          |

| Teaching and Learning Methods                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>☒ Illustrating each new concept by examples.</li> <li>☒ Illustrating theorems which constitute the core of the course.</li> <li>☒ Solving some examples and assigning homework.</li> <li>☒ Discussing some of the student' s solutions of some homework problems.</li> <li>☒ Making exams followed by a discussion of the problems of each exam.</li> </ul> |

| Week | Section | Topics                                                                    |
|------|---------|---------------------------------------------------------------------------|
|      |         | <b>Chapter 2: Differential Calculus of Functions of Several Variables</b> |
| 1    | 2.1     | Functions of Several Variables                                            |
|      | 2.2     | Domains and Regions                                                       |
|      | 2.3     | Functional Notation * Level Curves and Level Surfaces                     |
|      | 2.4     | Limits and Continuity                                                     |
|      | 2.5     | Partial Derivatives                                                       |
|      | 2.6     | Total Differential * Fundamental Lemma                                    |
| 2    | 2.7     | Differential of Functions of n Variables * The Jacobian Matrix            |
|      | 2.8     | Derivatives and Differentials of Composite Functions                      |
|      | 2.9     | The General Chain Rule                                                    |
|      | 2.10    | Implicit Functions                                                        |
|      | 2.12    | Inverse Functions *Curvilinear Coordinates                                |
|      | 2.14    | The Directional Derivative                                                |
|      | 2.15    | Partial Derivatives of Higher Order                                       |
|      | 2.16    | Higher Derivatives of Composite Functions                                 |
| 3    | 2.18    | Higher Derivatives of Implicit Functions                                  |
|      | 2.19    | Maxima and Minima of Functions of Several Variables                       |
|      | 2.20    | Extrema for Functions with Side Conditions * Lagrange Multipliers         |
|      |         | <b>Chapter 3: Vector Differential Calculus</b>                            |
| 3    | 3.2     | Vector Fields and Scalar Fields                                           |
|      | 3.3     | The Gradient Field                                                        |
|      | 3.4     | The Divergence of a Vector Field                                          |
| 4    | 3.5     | The Curl of a Vector Field                                                |
|      | 3.6     | Combined Operations                                                       |
|      | 3.7     | Curvilinear Coordinates in Space m Orthogonal Coordinates                 |
|      |         | <b>Chapter 4: Integral Calculus of Functions of Several Variables</b>     |
| 4    | 4.3     | Double Integrals                                                          |
|      | 4.4     | Triple Integrals and Multiple Integrals in General                        |
|      | 4.5     | Integrals of Vector Functions                                             |
| 5    | 4.6     | Change of Variables in Integrals                                          |
|      | 4.7     | Arc Length and Surface Area                                               |
|      | 4.8     | Improper Multiple Integrals                                               |
|      | 4.9     | Integrals Depending on a Parameter * Leibnitz's Rule                      |
|      |         | <b>Chapter 5: Vector Integral Calculus</b>                                |
| 5    | 5.2     | Line Integrals in the Plane                                               |
|      | 5.3     | Integrals with Respect to Arc Length Basic Properties of Line integrals   |
| 6    | 5.4     | Line Integrals as Integrals of Vectors                                    |
|      | 5.5     | Green’ s Theorem                                                          |
|      | 5.6     | Independence of Path * Simply Connected Domains                           |
|      | 5.7     | Extension of Results to Multiply Connected Domains                        |
| 7    | 5.8     | Line Integrals in Space                                                   |
|      | 5.9     | Surfaces in Space * Orientability                                         |
|      | 5.10    | Surface Integrals                                                         |
|      | 5.11    | The Divergence Theorem                                                    |
|      | 5.12    | Stokes's Theorem                                                          |

