|  |  |  |
| --- | --- | --- |
|  | **Mutah University**  **Detailed Syllabus Form** | Description: C:\Users\lamasat.lamasat-PC\Pictures\Picture1.png |

**First :** Course Information**:**

|  |  |
| --- | --- |
| * Course Number: 0302292 | * Course Title: Mathematical Physics 1 |
| * Credit Hours: 3 | * College: Science |
| * Pre-requisite: Calculus3 (0301201) | * Department: Physics |
| * Instructor: Dr. Amer Al-Oqali | * Semester & Academic Year:   First Semester 2016/2017 |
| * the time of the lecture: Sun, Tues, Thurs 11-12. | * Office Hours: Sun, Tues, Thurs 12-1 |

**Second :** General Course Description

This course covers the following topics: Principles of Integral Evaluation, Different system of coordinates, Multi dimensional differential operators and its application in Physics, Complex number, Differential equations and Fourier Series.

**Third :** Course Objectives

* Present new types of integrals
* Introduce different system of coordinates
* Using multi dimensional differential operators in different system of coordinates
* Present the complex numbers
* Solving first order and second order differential equations
* Present Fourier series

**Fourth:** Expected Learning Outcomes

* apply new methods to solve multiple integrals
* Introduce the student to the boundary value problems
* Student should be able to solve related problems in electromagnetic theory and in waves and vibrations**.**

**Fifth :** Course Plan Distribution & Learning Resources

|  |  |  |
| --- | --- | --- |
| **Learning Resources** | **Topics to be Covered** | **Week**  **No.** |
| **Chapter 1** | Vector Analysis.   * Scalars and vectors * Vector Algebra * Rotation of Axes * Scalar or Dot Product * Triple Product * Gradient * Vector Integration * Divergence * Gauss's Divergence Theorem * The Curl * Stokes' Theorem * Green's Theorem * Potential Theorem * Poisson Equation and Laplace's Equations . |  |
| **Chapter 2** | **Curvilinear Coordinate**.   * Cartesian, spherical, and cylindrical coordinates * transformation from spherical * to Cartesian Coordinates. * transformation from Cartesian * to Spherical Coordinates. * transformation from cylindrical * to Cartesian Coordinates. * transformation from Cartesian * to cylindrical Coordinates. * separation of variables in   Cartesian coordinates.   * separation of variables in   Spherical coordinates.   * separation of variables in   Cylindrical coordinates. |  |
| **Chapter 3** | Complex Numbers   * Introduction, * graphical representation of complex number * complex conjugate * Addition, subtraction, multiplication and division of complex numbers * De Moivre’s formula * powers and roots of a complex number * function of complex variable * examples and applications |  |
| **Chapter 4** | Determinants   * Definition and Properties * Laplace's Development of Minors * Properties of Determinants * Solution of a set of Homogeneous Equations * Solution of Nonhomogeneous Equations |  |
| **Chapter 5** | Matrices   * Basic Definition * Laws and Properties of Matrices * Special Matrices * Trace * Matrix Inversion * Orthogonal Matrices * Eigenvalues and Eigenvectors * Reduction of Matrix to Diagonal Form * Hermitian Matrix, Unitary Matrix |  |
| **Chapter 6** | Ordinary Differential Equation   * Introduction * separable equations, * linear equations, * exact equations * homogenous differential equations, * Bernoulli equation, * homogenous second order linear differential equations with constant coefficients, * Inhomogeneous second order linear differential equations with constant coefficients |  |
| **Chapter 7** | Fourier Series   * Introduction * useful integrals * calculations of Fourier coefficients * general form of Fourier series * complex form of Fourier series * periodic functions with interval 2, * Fourier expansion of even and   odd functions,   * completeness relation (Parseval’s theorem) * some properties and uses of Fourier series |  |

**Sixth :** Teaching Strategies and Methods

|  |  |
| --- | --- |
| **Teaching Strategies and Methods** | No |
|  | **1** |
|  | **2** |
|  | **3** |
|  | **4** |
|  | **5** |

**Seventh :** Methods of Assessment

|  |  |  |  |
| --- | --- | --- | --- |
| **Proportion of Final Evaluation** | **Evaluation Methods of** | **Week & Date** | **No.** |
| 25% | First Exam | 6th Week 1/11/2016 | **1.** |
| 25% | Second Exam | 12th Week 13/12/2016 | **2.** |
| 50% | Final Exam | To be announced later | **3.** |
|  |  |  | **4.** |
|  |  |  | **5** |
| **(100%)** |  | **Total** | |

**Eighth :** Required Textbooks

**- Primary Textbook:**

Introduction to Mathematical Physics , Nabil. Laham and Nabil. Ayoub,

2nd Edition, 2004.

**- Secondary References**

Mathematical methods in the physical science, 2nd Edition Mary Boas

**Ninth :** General Instructions

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| --- | --- |
| **Additional Notes, Office hours, Incomplete Exams, Reports, Papers, …etc** | **No** |
|  | **1** |
|  | **2** |
|  | **3** |
|  | **4** |
|  | **5** |