|  |  |  |
| --- | --- | --- |
|  | **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$l$,
* 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** |