

## Course Description Form

1. Course Name: Applied Mathematics	
Applied Mathematics	
2. Course Code:	
Math 316	
3. Semester / Year:	
First/ Third	
4. Description Preparation Date:	
23/3/2024	
5. Available Attendance Forms:	
Internal Mode of Attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
4 hours per week (theory)/ 4 units	
7. Course administrator's name (mention all, if more than one name)	
Name: Dr.Zainab Riyadh Shaker Email: zaianb.riyadh22@nahrainuniv.edu.iq	
8. Course Objectives	
<b>Course Objectives</b>	<ol style="list-style-type: none"> <li>1. To introduce students to the new method solving Second and third Order Differential Equations Using Power Series Method.</li> <li>2. Study and solutions of Special unctions/Equations.</li> <li>3. Study and solution of Fourier series method</li> </ol>
9. Teaching and Learning Strategies	
<b>Strategy</b>	<p><b>A- Cognitive goals.</b></p> <ol style="list-style-type: none"> <li>1. Students will enhance their logical thinking and problem structuring abilities, and further develop their understanding of the concept of proof.</li> <li>2. Enable students to obtain knowledge and understanding of the basic principles applied mathematics.</li> <li>3. Empower students to obtain knowledge and understanding the power series method and Fourier Series Analysis in applied mathematics.</li> <li>4. Enable students to gain knowledge and understanding of how laws are linked.</li> <li>5. Support students to identify the most important applications in mathematics such solving some complicated equations with complex roots and how to make a mathematical analysis using Fourier series.</li> </ol> <p><b>B. The skills goals special to the course.</b></p> <ol style="list-style-type: none"> <li>1. The student will be able to use power series method to solve 2nd or even 3rd order DEs.</li> <li>2. Studying and finding the analytical solutions for different special functions/equations</li> <li>3. Fourier series will be discussed and studying intensively.</li> </ol> <p>Teaching and Learning Methods</p> <ol style="list-style-type: none"> <li>1. Giving theoretical lectures.</li> <li>2. Giving descriptive homework.</li> <li>3. Direct questions to students to test their understanding of the topic.</li> </ol>

4. Assigning students homework.  
 5. Solving problem sheets and past examination papers.

**Assessment methods**

1. Monthly exams and daily quizzes.
2. Programmed mid-term exams.
3. Homework's.
4. Direct oral questions.

**C. Affective and value goals**

1. Enabling students to solve second and third order DEs.
2. Enabling students to solve problems related to the derivations of laws and their equations.
3. Enabling students to solve mathematical problems using the simplest means.

**Teaching and Learning Methods**

Assessment methods  
 Assessment weighting used for 2-3 attempts.  
 Weighting:  
 Homeworks and quizzes 15%  
 Exams 85%

**D. General and rehabilitative transferred skills(other skills relevant employability and personal development)**

1. The ability to self-research to solve applied mathematical problems.
2. Handling various type of differential equation using efficient methods and its benefits and use in mathematics.

**10. Course Structure**

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4		Introduction to Linear Equations and Power Series. Studying the convergence of power series.		
2	4		Ordinary Points and Singular Points. Regular Singular Points, The Indicial Equation.		
3	4		Form and Validity of The Solution Near a Regular Singular Point. Indicial Equation with Difference of Roots NonIntegral.		
4	4		Differentiation of a Product of Equation. Indicial Equation with Equal Roots. Non-homogenous case.		
5	4		Indicial Equation with Difference of Roots a Positive Integer (Non Logarithmic Case, Logarithmic Case). Solution of Large x (Point at Infinity).		
6	4		Special Functions: The Gamma, Beta and Error Functions		

7	4		Bessel's Functions: Bessel's Equation, Repeated Relation, Integral Form for Bessel's Functions, Modified Bessel's Functions		
8	4		Legender Equation, Legender Polynomial.		
9	4		Generating Function for Legender Polynomials, Orthogonalily for Legender Polynomials Associated Legender Equation.		
10	4		Hypergeometric Equation and The Confluent Hypergeometric Equation		
11	4		Laguerre Polynomials Hermite Polynomials		
12	4		Fourier Series: Orthogonalily of a Set of Sine and Cosine.		
13	4		Fourier Series: An Expansion Theorem. Examples of Fourier series: Even and odd Functions.		
14	4		Fourier Sine Series, Fourier Cosine Series. Change of Interval. Complex Form of Fourier Series. Differentiation and Integration of Fourier Series. Fourier Transform.		
15	4		Integral Transforms. Fourier Integrals. Fourier Transforms. Fourier Sine & Cosine Transform. Convolution Theory of Fourier Transform.		

## 11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc

## 12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Elementary Differential Equations, by E. D. Rainville and P. E. Bedeint Fourier series and Boundary Value Problems (Brown and Churchill Series) 8th Edition.
Main references (sources)	lementary Differential Equations, by E. D. Rainville and P. E. Bedeint
Recommended books and references (scientific journals, reports...)	طرق في الرياضيات التطبيقية, تأليف د. باسل يعقوب Any website that specializes and reliable to study applied mathematics.
Electronic References, Websites	

