

<p>Kingdom of Saudi Arabia Ministry of Higher Education Qassim University College of Engineering</p>		<p>المملكة العربية السعودية وزارة التعليم العالي جامعة القصيم كلية الهندسة</p>
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Math 621 Engineering Mathematics

College: College of Engineering

Department of: Mathematics, College of Science

First: Course Definition

1- Course Code: MATH 621

2- Units: 3

3 – Semester:

4 - Prerequisite :

5- Co-requisite:

6- Location (if not on main Campus):

Second: Course Objectives

Upon completion of this course, the student will....

1. Be able to know the applications of Fourier Transform.
2. Be able to classify Partial Differential Equations (PDEs).
3. Be able to find the analytical solutions of Partial Differential Equations.
4. Be able to familiar with the basic concepts of Analytic Functions.
5. Be able to understand the definitions and properties to Integral Formula, Power Series, Cauchy's, Taylor's, Maximum Modulus, Laurent's, Residue and Rouches Theorems, Argument Principle and Conformal Mapping.
6. Be able to understand the application to Harmonic Functions, Laplace Equation in Fluid Mechanics and applications of Residue Theorem.

Third: Course Specifications

Fourier Analysis and Partial Differential Equations (PDE), Complex Numbers and Functions, Complex Integration, Power Series, Taylor Series, Laurant Series and Residue Integration, Complex Analysis to Potential Theory.

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1- Topics to be covered

Subject	Weeks	Units
Fourier Analysis: Fourier Series, Forced Oscillations; Approximation by Trigonometric Polynomials	1	3
Sturm-Liouville Problems; Orthogonal Functions; Generalized Fourier Series	1	3
Fourier Integral, Fourier Transforms; Partial Differential Equations: Modeling	1	3
Solution by Separating Variables; D'Alembert's Solution of the Wave Equation	1	3
Modeling; Heat Equation; Membrane	1	3
Laplace in Polar, Cylindrical & Spherical Coordinates; Complex Analysis: Introduction;	1	3
Derivative; Analytic Functions; Cauchy-Riemann Equations; Laplace Equation; Exponential Function	1	3
Trigonometric and Hyperbolic Functions; Complex Logarithm; Complex Integration: Complex line integrals	1	3
Cauchy's Integral Theorem and Formula ; Derivatives of Analytic Functions	1	3
Power and Taylor Series: Sequences, Series, Convergence Tests; Power Series; Functions given by Power Series;	1	3
Taylor and Maclaurin Series; Laurent Series;	1	3
Singularities and Zeros; Residue Integration Method; Residue Integration of Real Integrals	1	3
Conformal Mapping: Geometry of Analytic Functions; Mobius Transform	1	3
Special Linear Fractional Transformations; Potential Theory: Electrostatic Fields; Use of Conformal mapping; Heat Problems; Fluid Flow; Poisson's Integral Formula	1	3

2- Course components (Total hrs in the Semester): 42

Lecture	Exercise	Other
42	-	-

3- Intended Learning Outcomes of the Course (ILO's)

a. Knowledge

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i) Description of the knowledge to be acquired:

- Fourier Analysis
- Partial Differential Equations
- Complex Analysis
- Complex Integration
- Power and Taylor Series
- Conformal Mapping
- Potential Theory

ii) Teaching strategies to be used to develop that knowledge

- Class Lectures
- Home Assignments
- Tutorial Class

iii) Methods of assessment of knowledge acquired

- **Quizzes:** To assess understanding of Fourier analysis, partial differential equations and complex analysis.
- **Discussion Group/Course Project:** To assess interactive and communication abilities.
- **Mid Term Exams:** To assess understanding of Fourier analysis, partial differential equations and complex analysis problems and finding the solutions of engineering and scientific problem using different techniques.
- **Final Exam:** To assess understanding and applications of Fourier analysis, partial differential equations and complex analysis.

b- Cognitive (Intellectual) Skills

i) Cognitive skills to be developed

- Ability to connections the problems of Fourier analysis to the problems from the physical world.
- Modeling and solving partial differential equations related to boundary and initial value problems of mechanics, heat flow, electrostatics and other fields.
- Compute difficult real and complex integrals by using complex integration.

ii) Teaching strategies to be used to develop these cognitive skills

- Class Lectures
- Home Assignments
- Tutorial Classes

iii) Methods of assessment of student's cognitive skills

- **Quizzes:** To assess understanding of Fourier analysis, partial differential equations and complex analysis.
- **Discussion Group/Course Project:** To assess interactive and communication abilities.

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- **Final Exam:** To assess understanding and applications of Fourier analysis, partial differential equations and complex analysis.

c. Interpersonal Skills and Responsibility

i) Description of the interpersonal skills and capacity to carry responsibility to be developed

- Team Work
- Ideas development and sharing with others

ii) Teaching strategies to be used to develop these skills

- Lectures
- Home Assignments
- Tutorial Classes

iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

- **Quizzes:** To assess understanding of Fourier analysis, partial differential equations and complex analysis.
- **Discussion Group/ Course Project:** To assess interactive and communication abilities.
- **Mid Term Exams:** To assess understanding of Fourier analysis, partial differential equations and complex analysis problems and finding the solutions of engineering and scientific problem using different techniques.
- **Final Exam:** To assess understanding and applications of Fourier analysis, partial differential equations and complex analysis.

d. Communication, Information Technology and Numerical Skills

i) Description of the skills to be developed in this domain

- Ability to understand the concepts of Fourier analysis, partial differential equations, complex analysis and their properties.
- Find the solutions of engineering and scientific problems by using different techniques.
- Ability to form the mathematical models.

ii) Teaching strategies to be used to develop these skills

- Class Lectures
- Home Assignments
- Tutorial Classes

iii) Methods of assessment of students interpersonal skills and capacity to carry responsibility

- **Quizzes:** To assess understanding of Fourier analysis, partial differential equations and complex analysis.
- **Discussion Group/ Course Project:** To assess interactive and communication abilities.

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- **Mid Term Exams:** To assess understanding of Fourier analysis, partial differential equations and complex analysis problems and finding the solutions of engineering and scientific problem using different techniques.
- **Final Exam:** To assess understanding and applications of Fourier analysis, partial differential equations and complex analysis.

e. Psychomotor (if applicable) & Other Non-cognitive Skills

i) Description of the psychomotor or other skills to be developed and the level of performance required
- NA

ii) Teaching strategies to be used to develop these skills-
- NA

iii) Methods of assessment of student's psychomotor skills
- NA

4- Student Assessment Schedule

No.	Assessment tool (test, group project, examination etc.)	Week due	Weight
1	Quizzes		12%
2	Mid Term Exam 1	6	15%
3	Mid Term Exam 2	12	15%
4	Overall Course Performance		8%
5	Final Exam	16	50%

5- Student Support

- Providing electronic library of textbooks and scientific periodicals.
- Providing 6 office hours per week by each staff members.

6- Learning Resources

i) Essential Books (References)
- E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Inc. 10th Ed. ISBN: 978-0-470-64613-7

ii) Course Notes
- Will be taken by the student inside the classroom

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iii) Recommended Books

- Laurence C. E., Partial Differential Equations; Graduate Studies in Mathematics, Vol. 19, AMS, 2010.

iv) Electronic Books & Web Sites:

- www.ebook3000.com

v) Periodicals

- NA

7- Course Evaluation and Improvement Processes

i) Strategies for Obtaining Student Feedback on Effectiveness of Teaching

- Students' questioners.
- Students' evaluation of course and instructor.

ii) Other Strategies for Evaluation of Teaching by the Instructor or by the Department

- Public faculty seminars.
- Assessment by external evaluators of students achievements.

iii) Processes for Improvement of Teaching

- Assessment of students' work by external examiners.
- Analysis of students' evaluation of course and instructor.

iv) Processes for verifying standards of student achievement

- Check marking by an independent faculty member of a sample of student work.
- Periodic exchange and remarking of a sample of assignments/exams with a external evaluator.

v) Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

- Assessment and evaluation of the level of achieving the course outcomes through a continuous improvement process (part of a quality assurance system established by the university).
- Consequently actions are to be taken to improve the course delivery when necessary.
- Review of the course objectives, outcomes and curriculum every 2 years.

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