



# LAHORE COLLEGE FOR WOMEN UNIVERSITY

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## DEPARTMENT OF ELECTRICAL ENGINEERING Course Descriptive File

|    |  |  |
|----|--|--|
| 1  | Course Title                                   | Methods in Interdisciplinary Engineering   |
| 2  | Course Code                                    | IDEE-300   |
| 3  | Credit Hours                                   | 3(3,0)   |
| 4  | Pre-requisites                                 | Calculus, Differential Equations, Linear Algebra   |
| 5  | Co-requisites                                  | Communication Systems, Linear Control Systems  |
| 6  | Semester                                       | V  |
| 7  | Resource Person Theory                         | Ms. Ismat Hira   |
| 8  | Contact Hours (Theory)                         | 48   |
| 9  | Contact Hours (Lab)                            | 48   |
| 10 | Office Hours                                   | 8AM to 4PM   |
| 11 | Email  | ismat_hira@yahoo.com   |
| 12 | Course Outline as per Scheme of Studies ( SoS) | Matrices and Vectors, differential calculus, including the concepts of gradient, divergence and curl. Divergence and Stokes theorems. Introduction to partial differential equations and Fourier series. Equations of heat conduction, wave propagation and Laplace. Complex variables and the Cauchy-Riemann conditions. Cauchy theorem and conformal mapping.  |
| 13 | Course Objectives as per SoS                   | On successful completion of this course students will be able to<br>1-Understand linear algebra and its applicability in different engineering fields.<br>2-Incorporate the knowledge of calculus and transforms to support their concurrent and subsequent engineering studies.<br>3-Have the idea of vector calculus, its physical interpretation and applications in real life examples.  |
| 14 | Books  | <p><b>Text Book:</b></p> <p>T1. Advanced Engineering Mathematics- E. Kreyszig, John Wiley &amp; Sons.<br/>T2. Calculus and Analytic Geometry- G. B. Thomas, R. L. Finney, Pearson Education, Asia.<br/>T3. Higher Engineering Mathematics- B. S. Grewal, Khanna Publications.<br/>T4. Special fuctions for Scientists and Engineers -W.W. Bell</p> <p><b>Reference Books:</b></p> <p>R1. Differential and Integral Calculus Volume 1 &amp;2- Piskunov, CBS<br/>R2. Advanced Engineering Mathematics: Jain and Iyenger, Narosa Publications</p> |



15 Course Learning Outcomes (CLOs)

| Ser | CLO  | Domain    | Taxonomy level | PLO |
|-----|--|-----------|----------------|-----|
| 1.  | Use matrices, determinants and techniques for solving systems of linear equations in the different areas of Linear Algebra.                    | Cognitive | 4              | 2   |
| 2.  | Calculate and relate the transforms used in different Engineering Field.   | Cognitive | 4              | 3   |
| 3.  | Calculate line integral, surface integral and volume integral and correlate them with the application of Stokes, Green and Divergence theorem. | Cognitive | 4              | 3   |

16 Marks Breakup

Theory

|                         |     |
|-------------------------|-----|
| Quizzes                 | 10% |
| Assignments             | 10% |
| Midterm exam            | 40% |
| Terminal exam (3 hours) | 50% |
| Total (theory)          | 100 |

| 17   |   |       |                |   |               |  |
|------|---|-------|----------------|---|---------------|--|
| Week | Topic   | CLO   | Taxonomy Level | Specific Outcome  | Contact Hours | Assessment                               |
| 1.   | System Abstraction and state space  | CLO-1 | C2             | Understand linear algebra and its applicability in different engineering fields.                      | 03 hours      | Assignment A1<br>Quiz 1<br>Mid Term exam |
| 2.   | Matrix Manipulations<br>Solution of Algebraic Equations, Eigenvalues and Eigenvectors | CLO-1 | C2             | Understand linear algebra and its applicability in different engineering fields.                      | 03 hours      |  |
| 3.   | Review of Vectors, Dot and Cross Product, Scalar and Vector Triple                    | CLO-1 | C3             | Understand linear algebra and its applicability in different engineering fields.                      | 03 hours      |  |
| 4.   | Ring and Fields   | CLO-1 | C3             | Understand linear algebra and its applicability in different engineering fields.                      | 03 hours      |  |
| 5.   | Galois Field and applications   | CLO-1 | C4             | Understand linear algebra and its applicability in different engineering fields.                      | 03 hours      | Assignment A2<br>Quiz 2<br>Mid Term exam |
| 6.   | Line Integrals in Space, Independence of Path   | CLO-3 | C3             | Have the idea of vector calculus, its physical interpretation and applications in real life examples. | 03 hours      |  |
| 7.   | Divergence of a Vector Field, Divergence (or Gauss) Theorem                           | CLO-3 | C3             | Have the idea of vector calculus, its physical interpretation and applications in real life examples. | 03 hours      |  |
| 8.   | Curl of a Vector Field, Stokes Theorem and its Application                            | CLO-3 | C3             | Have the idea of vector calculus, its physical interpretation and applications in real life examples. | 03 hours      |  |
| 9.   | Grad, Div , and Curl in Orthogonal Coordinates  | CLO-3 | C4             | Have the idea of vector calculus, its physical interpretation and applications in real life examples. | 03 hours      |  |

|     |  |            |           |  |          |   |
|-----|--|------------|-----------|--|----------|---|
| 10. | Application of Vector Theorems to Fluid Flow and Heat Conduction   | CLO-3      | <b>C4</b> | Have the idea of vector calculus, its physical interpretation and applications in real life examples.                | 03 hours |   |
| 11. | Expansion of a Periodic Function as a Fourier Series<br>Fourier Series for Even and Odd Periodic Functions<br>16- Parseval's Identity, Fourier Transform as a limit of a Periodic Function of Infinite Period. | CLO-2      | <b>C3</b> | Incorporate the knowledge of calculus and transforms to support their concurrent and subsequent engineering studies. | 03 hours |   |
| 12. | Introduction to PDEs, Derivation and Solution of the Wave Eq., D'Alembert's Solution   | CLO-2      | <b>C3</b> | Incorporate the knowledge of calculus and transforms to support their concurrent and subsequent engineering studies. | 03 hours | <b>Class Viva</b>   |
| 13. | Wave Equation Solutions in 2D and 3D<br>Solution of the Heat Conduction Equation by Variable Separation  | CLO-3      | <b>C3</b> | Incorporate the knowledge of calculus and transforms to support their concurrent and subsequent engineering studies. | 03 hours | Assignment A3,<br>A4<br>Quiz 3,4, 5, 6<br>Final Term exam |
| 14. | Derivation, Solution and Application of the Laplace Equation   | CLO-3      | <b>C4</b> | Incorporate the knowledge of calculus and transforms to support their concurrent and subsequent engineering studies. | 03 hours |   |
| 15. | Revision   | CLO-1,2, 3 | <b>C4</b> | Incorporate the knowledge of calculus and transforms to support their concurrent and subsequent engineering studies. | 03 hours |   |

|     |          |               |           |  |          |  |
|-----|----------|---------------|-----------|--|----------|--|
| 16. | Revision | CLO-1,2,<br>3 | <b>C4</b> |  | 03 hours |  |
|-----|----------|---------------|-----------|--|----------|--|

- Every instructor have his/her plan for course material used for assignments and quizzes, table above is just a guideline.

**18**      **Course Learning Outcomes (CLOs) and Assessment Plan**

| Activity \ CLO  | CLO 1 | CLO2 | CLO3 | * |
|-----------------|-------|------|------|---|
| Quiz 1          | ✓     |      |      |   |
| Quiz 2          |       |      | ✓    |   |
| Assignment 1    | ✓     |      |      |   |
| Assignment 2    |       |      | ✓    |   |
| MID TERM EXAM   | ✓     |      | ✓    |   |
| Quiz 1          |       | ✓    |      |   |
| Quiz 2          |       | ✓    |      |   |
| Assignment 1    |       | ✓    |      |   |
| FINAL TERM EXAM |       | ✓    | ✓    |   |

|  |                                |
|--|--------------------------------|
| <b>Lab Details</b>   |                                |
| <b>Computer Resources</b>                                      |                                |
| <ul style="list-style-type: none"> <li>• Applicable</li> </ul> |                                |
| <b>21</b>  | <b>Mapping of CLOs to PLOs</b> |

| PLO<br>CLOs | PLO1 | PLO2 | PLO3 | PLO4 | PLO5 | PLO6 | PLO7 | PLO8 | PLO9 | PLO10 | PLO11 | PLO12 |
|-------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| CLO1        |      | C4   |      |      |      |      |      |      |      |       |       |       |
| CLO2        |      |      | C4   |      |      |      |      |      |      |       |       |       |
| CLO3        |      |      | C4   |      |      |      |      |      |      |       |       |       |

