Arab Academy for Science, Technology & Maritime Transport
College of Engineering & Technology
Department of basic and applied sciences

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**University/Academy:** Arab Academy for Science, Technology & Maritime Transport
**Faculty/Institute:** College of Engineering & Technology
**Program:** B.Sc. Mechanical Engineering

**Form No. (12)**
**Course Specification**

### 1- Course Data

| Course Code:<br>**BA 224** | Course Title:<br>**Math 4** | | Academic Year/Level:<br>2nd / 4th |
|---|---|---|---|
| Specialization: | No. of Instructional Units | Lecture | Practical |
| | **3 Credits** | **2hrs.** | **2hrs.** |

### 2- Course Aim

1-To introduce the basic Vector Differential Calculus and its applications.
2- To introduce the basic Vector integral Calculus and its applications.
3- To introduce the Complex Analysis.

### 3- Intended Learning Outcome (ILO's)

| a- Knowledge and Understanding | K1) Concepts and theories of mathematics and sciences, appropriate to the discipline.<br>Recall basic rules of vector analysis (K1)<br>Define Partial Differentiation and Derivatives of vector functions (K1)<br>Define the different vector operators (K1)<br>Define how to solve line integral (K1)<br>Define meaning of conservative vector fields (K1)<br>Define how to solve Surface Integrals / Green's Theorem (K1)<br>Define how to solve Triple Integrals and Divergence (Gauss' Theorem) (K1)<br>Define how to solve Stoke's Theorem (K1)<br>Define different types of integrals theorem (K1)<br>Define Complex numbers and functions and forms of representation (K1)<br>Define Analytic functions and Harmonic functions (K1)<br>Define Line complex integrals and Cauchy's Integrals Theorem (K1)<br>Define Zeros and poles of Analytic functions/ Residues and their evaluation (K1)<br>Define Residue Theorem / Application to Real Integral (K1) |
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| b- Intellectual Skills | I2) Select appropriate solutions for engineering problems based on analytical thinking.<br>Explain the different vector operators (I2)<br>Explain the meaning of independent of path (I2)<br>Explain meaning of conservative vector fields (I2) |

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| c- **Professional Skills** | P1) Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve engineering problems<br>Apply basic rules of partial differentiation in driving the derivatives of the vector functions.(P1)<br>Apply Green's theorem (P1)<br>Apply Gauss theorem (P1)<br>Apply Stok's theorem (P1) | |
| d- **General Skills** | | |

## 4- Course Content

| Lecture | | |
|---|---|---|
| Wk | Hrs | Description |
| 1 | 2 | Vector Algebra / Dot and cross product and Applications. |
| 2 | 2 | Partial Differentiation / and Derivatives of vector functions. |
| 3 | 2 | Gradient / Divergence/ curl/ Laplacian. |
| 4 | 2 | Line Integrals / line Integrals Independent of the path / Exactness. |
| 5 | 2 | Conservative vector fields. |
| 6 | 2 | Double Integrals in Cartesian and polar coordinates / Green's Theorem |
| 7 | 2 | Surface Integrals / Stokes' Theorem /7th week Exam. |
| 8 | 2 | Triple Integrals / Divergence (Gauss' Theorem). |
| 9 | 2 | Review on Integrals Theorems. |
| 10 | 2 | Complex numbers and functions / forms of representation. |
| 11 | 2 | Analytic functions/ Harmonic functions. |
| 12 | 2 | Line complex integrals / Cauchy's Integrals Theorem /12th week Exam. |
| 13 | 2 | Zeros and poles of Analytic functions/ Residues and their evaluation. |
| 14 | 2 | Residue Theorem / Application to Real Integral |
| 15 | 2 | General Revision. |
| 16 | 2 | Final Exam |

## 5- Teaching and Learning Methods

1. Lectures
2. Tutorials
3. Individual coursework

## 6-Teaching and Learning Methods for Students with Special Needs

1. Consulting with lecturer during office hours
2. Consulting with teaching assistant during office ours
3. Private sessions for redelivering the lecture contents
4. An academic supervisor is appointed for handicapped students. Constant follow ups are done for handicapped students after each assessment to evaluate their academic level of achievement.

## 7- Student Assessment

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| a- **Procedures used:** | 1. Written examinations to assess the Intended learning outcomes.<br>2. Continuous assessment (reports, discussions, etc……) to assess the Intellectual skills. |
| b- **Schedule:** | Assessment 1: 7th Week Written Exam<br><br>Assessment 2: 12th Week Written Exam<br><br>Assessment 3: Continuous Assessments<br><br>Assessment 4: 16th Week Final Written Exam |

| c- | Weighing of Assessment: | $7^{th}$ Week Examination : 30 % |
|---|---|---|
| | | $12^{th}$ Week Examination: 20 % |
| | | Final-term Examination: 40 % |
| | | Oral Examination        : 0 % |
| | | Semester Work          : 10 % |
| | | Total                  : 100% |

**8- List of References:**

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| **a-** | **Course Notes** | No notes |
| **b-** | **Required Books (Textbooks)** | Advanced Engineering Mathematics, Erwin Kreyszig |
| **c-** | **Recommended Books** | Advanced Engineering Mathematics, D. G. Zill, W. S. Wright |
| **d-** | **Periodicals, Web Sites, ..., etc.** | |

**Course coordinator:**                    **Program Manager:**