Ministry of Higher Education and
Scientific Research - Iraq
Al-Furat Al-Awsat Technical University
Technical College /Al-Mussaib
Department of Electrical Engineering techniques

## MODULE DESCRIPTOR FORM
نموذج وصف المادة الدراسية

### Module Information
معلومات المادة الدراسية

| Module Title | **INTEGRAL MATHEMATICS** | Module Delivery | |
|---|---|---|---|
| **Module Type** | BASIC | ✓ **Theory** Lecture Lab | |
| **Module Code** | ATU23025 | | |
| **ECTS Credits** | 5 | ✓ **Tutorial** Practical | |
| **SWL (hr/sem)** | 125 | ✓ **Seminar** | |
| **Module Level** | ١ | **Semester of Delivery** | 1 |
| **Administering Department** | DEPARTMENT OF ELECTRICAL ENGINEERING TECHNIQUES | **College** | Al-Furat Al-Awsat Technical University Technical College /Al-Mussaib |
| **Module Leader** | Ahmed Mahdi | **e-mail** | ahmed-hamza@atu.edu.iq |
| **Module Leader's Acad. Title** | Assist. lec. | **Module Leader's Qualification** | M.Sc. |
| **Module Tutor** | None | **e-mail** | None |
| **Peer Reviewer Name** | None | **e-mail** | None |
| **Review Committee Approval** | 21/06/2023 | **Version Number** | 1.0 |

### Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

| Prerequisite module | None | **Semester** | |
|---|---|---|---|
| **Co-requisites module** | None | **Semester** | |

### Module Aims, Learning Outcomes and Indicative Contents
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

| **Module Objectives** أهداف المادة الدراسية | **To teach the students:** ١- Indefinite integral and the Fundamental Theorem of calculus ٢- Methods of integration: by parts, trigonometric substitutions, completing the square, partial fractions ٣- Definite integral ٤- Application of integrations: Area of a region under a graph of a continuous function, arc length, volume of a solid of revolution, surface area ٥–Determinants and Matrices. |
|---|---|
| **Module Learning Outcomes** مخرجات التعلم للمادة الدراسية | 1. Learning about the Indefinite integral. 2. Learning the Functions of several variables. 3. Learning the Methods of integration 4. Learning the Definite integral. 5. Application of integrations 6. Determinants and Matrices. |

| | |
|---|---|
| **Indicative Contents**<br>المحتويات الإرشادية | Indicative content includes the following:<br>❖ <u>Indefinite integral –</u> For most students the assumptions I've made above about their exposure to Indefinite integral is the extent of their exposure. Problems tend to arise however because most instructors seem to assume that either students will see beyond this exposure in some later class or have already seen beyond this in some earlier class. Students are then suddenly expected to know more than basic Indefinite integral but often haven't actually seen it anywhere and have to quickly pick it up on their own in order to survive in the class. [12 hrs]<br>❖ <u>Methods of integration –</u> In this section we introduce the concept of a Methods of integration and give several examples of solving them. We also revisit the gradient that we first saw a few chapters ago.<br>Line Integrals – Part I – In this section we will start off with a quick review of parameterizing curves. This is a skill that will be required in a great many of the line integrals we evaluate and so needs to be understood. We will then formally define the first kind of line integral we will be looking at : line integrals with respect to arc length.<br>Line Integrals – Part II – In this section we will continue looking at line integrals and define the second kind of line integral we'll be looking at : line integrals with respect to x, y, and/or z. We also introduce an alternate form of notation for this kind of line integral that will be useful on occasion.<br>Line Integrals of Vector Fields – In this section we will define the third type of line integrals we'll be looking at : line integrals of vector fields. We will also see that this particular kind of line integral is related to special cases of the line integrals with respect to x, y and z.    [20 hrs]<br>❖ <u>Definite integral and its applications</u>- In this chapter will be looking at definite integrals, i.e. integrating functions of two variables in which the independent variables are from two dimensional regions, and triple integrals, i.e. integrating functions of three variables in which the independent variables are from three dimensional regions. [12 hrs]<br>❖ Determinants and Matrices [12hrs].<br>❖ Revision problem classes  [6 hrs] |

## Learning and Teaching Strategies
### استراتيجيات التعلم والتعليم

| | |
|---|---|
| **Strategies** | The main strategy that will be adopted in the delivery of this unit is to encourage students to participate in exercises, while improving and expanding their mathematical reasoning skills. |

## Student Workload (SWL)
### الحمل الدراسي للطالب

| | | | |
|---|---|---|---|
| **Structured SWL (h/sem)**<br>الحمل الدراسي المنتظم للطالب خلال الفصل | 93 | **Structured SWL (h/w)**<br>الحمل الدراسي المنتظم للطالب أسبوعيا | 6.2 |
| **Unstructured SWL (h/sem)**<br>الحمل الدراسي غير المنتظم للطالب خلال الفصل | 32 | **Unstructured SWL (h/w)**<br>الحمل الدراسي غير المنتظم للطالب أسبوعيا | 2.13 |
| **Total SWL (h/sem)**<br>الحمل الدراسي الكلي للطالب خلال الفصل | 125 | | |

## Module Evaluation
### تقييم المادة الدراسية

| | | Time/Number | Weight (Marks) | Week Due | Relevant Learning Outcome |
|---|---|---|---|---|---|
| **Formative assessment** | **Quizzes** | 5 | 10% (10) | 4,6 ,8,10,11 | LO #1, 2, and 4 |
| | **Assignments** | 12 | 10% (10) | Continuous | All |
| | **Projects / Lab.** | 0 | 0 | | |
| | **Report** | 0 | 0 | | |
| **Summative assessment** | **Midterm Exam** | 2 hr | 20% (20) | 8 | LO # 1-6 |
| | **Final Exam** | 3 hr | 60% (60) | 15 | All |
| **Total assessment** | | | 100% (100 Marks) | | |

| **Delivery Plan (Weekly Syllabus)** ||
|---|---|
| المنهاج الاسبوعي النظري ||
| | **Material Covered** |
| **Week 1** | **Definite integral** |
| **Week 2** | **Integral calculus, Standard integration .** |
| **Week 3** | **Method of integration.** |
| **Week 4,5** | **Methods of integration: by parts, trigonometric substitutions, completing the square.** |
| **Week 6** | **Integration using algebraic substitutions, trigonometric substitutions, hyperbolic substitutions, and partial fractions.** |
| **Week 7** | **Definite integral** |
| **Week 8,9** | **Application of integrations: Area of a region under a graph of a continuous function, arc length, volume of a solid of revolution, surface area** |
| **Week 10,11** | **Integration using Tables and Computer Algebra Systems CAS, Numerical Integration (Trapezoidal Approximation, Midpoint Approximation, Simpson's Approximation, and Error Bounds)** |
| **Week 12** | **Theory of matrices and determinants. Properties of matrix operations** |
| **Week 13,14** | **matrix transpose, matrix inverse, Applications to linear equations, Cramer's Rule.** |
| **Week 14** | **Eigen values and eigenvectors.** |
| **Week15** | **Final exam** |

| **Learning and Teaching Resources** |||
|---|---|---|
| مصادر التعلم والتدريس |||
| | **Text** | **Available in the Library?** |
| **Required Texts** | **Advance Engineering Mathematics, Alan Jeffrey, ٢٠٠٢** | Yes |
| **Recommended Texts** | **Calculus II &Calculus III, Paul Dawkins, ٢٠٠٧** | No |
| **Websites** | https://tutorial.math.lamar.edu/Classes/CalcIII/CalcIII.aspx <br> https://tutorial.math.lamar.edu/Classes/CalcII/CalcII.aspx | |

**APPENDIX:**

<table>
<tr><td colspan="5" align="center">**GRADING SCHEME**<br>مخطط الدرجات</td></tr>
<tr><td>**Group**</td><td>**Grade**</td><td>التقدير</td><td>**Marks (%)**</td><td>**Definition**</td></tr>
<tr><td rowspan="5">**Success Group**<br>(٥٠ - ١٠٠)</td><td>**A – Excellent**</td><td>امتياز</td><td>٩٠ - ١٠٠</td><td>Outstanding Performance</td></tr>
<tr><td>**B -** Very Good</td><td>جيد جدا</td><td>٨٠ - ٨٩</td><td>Above average with some errors</td></tr>
<tr><td>**C – Good**</td><td>جيد</td><td>٧٠ - ٧٩</td><td>Sound work with notable errors</td></tr>
<tr><td>**D -** Satisfactory</td><td>متوسط</td><td>٦٠ - ٦٩</td><td>Fair but with major shortcomings</td></tr>
<tr><td>**E – Sufficient**</td><td>مقبول</td><td>٥٠ - ٥٩</td><td>Work meets minimum criteria</td></tr>
<tr><td rowspan="2">**Fail Group**<br>(٠ – ٤٩)</td><td>**FX** – Fail</td><td>مقبول بقرار</td><td>(٤٥-٤٩)</td><td>More work required but credit awarded</td></tr>
<tr><td>**F** – Fail</td><td>راسب</td><td>(٠-٤٤)</td><td>Considerable amount of work required</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Note:</td><td></td><td></td></tr>
</table>

NB Decimal places above or below ٠٫٥ will be rounded to the higher or lower full mark (for example a mark of ٥٤٫٥ will be rounded to ٥٥, whereas a mark of ٥٤٫٤ will be rounded to ٥٤. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.