

| Module Information                 |                                     |                               |   |  |
|------------------------------------|-------------------------------------|-------------------------------|---|--|
| معلومات المادة الدراسية            |                                     |                               |   |  |
| Module Title                       | Advanced Mathematics                |                               | Module Delivery   |  |
| Module Type                        | Core                                |                               | <input checked="" type="checkbox"/> Theory<br><input checked="" type="checkbox"/> Lecture<br><input type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |  |
| Module Code                        | UOMU023036                          |                               |   |  |
| ECTS Credits                       | 4                                   |                               |   |  |
| SWL (hr/sem)                       | 210                                 |                               |   |  |
| Module Level                       | UGII                                | Semester of Delivery          | 3   |  |
| Administering Department           | Technical building and Construction | College                       | Al-Mustaqlbal university  |  |
| Module Leader                      | Baneen Mohammed Hilal               | e-mail                        | baneen.mohammed.hilal@uomus.edu.iq  |  |
| Module Leader's Acad. Title        | Ass.lec.                            | Module Leader's Qualification |   |  |
| Module Tutor                       |                                     | e-mail                        |   |  |
| Peer Reviewer Name                 | Ass.lec.Alaa Haseen                 | e-mail                        |   |  |
| Scientific Committee Approval Date |                                     | Version Number                | 1.0   |  |

| Relation with other Modules       |                     |          |        |
|-----------------------------------|---------------------|----------|--------|
| العلاقة مع المواد الدراسية الأخرى |                     |          |        |
| Prerequisite module               | Applied Mathematics | Semester | L 1 S1 |
| Co-requisites module              | None                | Semester |        |

| Module Aims, Learning Outcomes and Indicative Contents   |   |
|--|---|
| أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية |   |
| Module Aims  | The student must know the advanced theories in mathematics needed in construction engineering . |

|                                 |  |
|---------------------------------|--|
| <b>Module Learning Outcomes</b> | <p>Upon completion of the course, students should be able to:</p> <ol style="list-style-type: none"> <li>1. Skill of thinking</li> <li>2. Skill of conclusion and evaluation</li> <li>3. Skill analysis</li> <li>4. The skill of observation</li> <li>5. The student's ability to excel and cognitive perception to diagnose theories and general</li> <li>6. Principles in the study.</li> <li>7. Future planning to link, what students learn in daily life.</li> <li>8. Practice different patterns in mathematical proofs.</li> <li>9. Self-reliance in getting to the idea and how to manage solving the scientific problem.</li> <li>10. Statistical concepts and applications in civil engineering.</li> <li>11. Critical Thinking</li> <li>12. Analytical methods in solving problems</li> <li>13. Identify operational problems to carry out civil engineering studies and evaluate alternative solutions.</li> </ol>   |
| <b>Indicative Contents</b>      | <p>Multiple integrals ,double integrals , area by double integration , triple integrals , volume by double and triple integrations. [ 4 hrs.]</p> <p>Polar coordinates , curves by polar coordinates ,area by polar double integrations , cylindrical and spherical coordinates, equations of solids</p> <p>Ordinary differential equations of first order ,separable , homogeneous , exact and not exact , linear and Bernoulli first order equations , general and condition solutions , applications. [ 4 hrs.]</p> <p>Linear differential equations with constant coefficients, homogeneous and non-homogeneous equations , equation of higher order , general and condition solutions , applications. [ 4 hrs.]</p> <p>Partial derivatives with two and more two variables , higher- order partial derivatives , chain rule for partial derivatives , maxima &amp; minima of function of two variables , saddle point and relative extrema. [ 4 hrs.]</p> <p>Vector analysis , dot and cross product of vector functions , velocity and acceleration ,gradient of vector fields,divergance and curl of vector fields .</p> <p>Equations of the lines and surfaces in space , intersection of lines and surfaces using vectors , lagrange multipliers with two and more constraints.</p> <p>Complex numbers and functions , demoivres theorem, roots ,argand diagram, cauchy – rehmann equations. [ 4 hrs.]</p> <p>Limits , Infinite sequences , convergence and divergence , infinite series , geometric and ordinary series , positive and alternative series , test of convergences. [ 4 hrs.]</p> <p>Power series , maclaurin series taylor and trigonometric series .</p> |

|  |  |
|--|--|
|  | <p>Fourier series for periodic function , euler coefficients , applications Green,s theorem for enclosed curves , line integral. [ 4 hrs.]</p> <p>Matrices , Adjoins &amp; inverses , solving linear equations using the inverse of matrix , determinants and cramer method to solve linear equations , Gaussian elimination and gauss-seidel elimination. [ 4 hrs.]</p> <p>Improper integration and Laplace transform of some common functions , properties of Laplace transform. [ 4 hrs.]</p> |
|--|--|

| <b>Learning and Teaching Strategies</b><br>استراتيجيات التعلم والتعليم |  |
|--|--|
| <b>Strategies</b>  | <p>Assessment is based on</p> <ol style="list-style-type: none"> <li>1. Exams.</li> <li>2. Student feedback.</li> <li>3. Preparation of scientific reports.</li> </ol> |

| <b>Student Workload (SWL)</b><br>الحمل الدراسي للطالب |     |                               |   |
|---|-----|-------------------------------|---|
| <b>Structured SWL (h/sem)</b>                         | 129 | <b>Structured SWL (h/w)</b>   | 9 |
| <b>Unstructured SWL (h/sem)</b>                       | 81  | <b>Unstructured SWL (h/w)</b> | 5 |
| <b>Total SWL (h/sem)</b>                              |     | 210                           |   |

| <b>Module Evaluation</b><br>تقييم المادة الدراسية |                     |                    |                       |                 |                                  |
|---|---------------------|--------------------|-----------------------|-----------------|----------------------------------|
|   |                     | <b>Time/Number</b> | <b>Weight (Marks)</b> | <b>Week Due</b> | <b>Relevant Learning Outcome</b> |
| <b>Formative assessment</b>                       | <b>Quizzes</b>      | 4                  | 20% (20)              | 3,5,6,10        |                                  |
|   | <b>Assignments</b>  | 2                  | 10% (10)              | 7, 8            |                                  |
|   | <b>Seminar</b>      | 1                  | 10% (10)              | 11              |                                  |
| <b>Summative assessment</b>                       | <b>Midterm Exam</b> | 2 hr               | 10% (10)              | 12              |                                  |
|   | <b>Final Exam</b>   | 3hr                | 50% (50)              | 16              |                                  |
| <b>Total assessment</b>                           |                     | 100% (100 Marks)   |                       |                 |                                  |

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري محتوى كل اسبوع يجب ان يغطي الوقت المحدد

|                | <b>Material Covered</b>  |
|----------------|--|
| <b>Week 1</b>  | Multiple integrals ,double integrals , area by double integration , triple integrals , volume by double and triple integrations.   |
| <b>Week 2</b>  | Polar coordinates , curves by polar coordinates ,area by polar double integrations , cylindrical and spherical coordinates, equations of solids  |
| <b>Week 3</b>  | Ordinary differential equations of first order ,separable , homogeneous , exact and not exact , linear and Bernoulli first order equations , general and condition solutions , applications                      |
| <b>Week 4</b>  | Linear differential equations with constant coefficients, homogeneous and non-homogeneous equations , equation of higher order , general and condition solutions , applications.                                 |
| <b>Week 5</b>  | Partial derivatives with two and more two variables , higher- order partial derivatives , chain rule for partial derivatives , maxima & minima of function of two variables , saddle point and relative extrema. |
| <b>Week 6</b>  | Vector analysis , dot and cross product of vector functions , velocity and acceleration ,gradient of vector fields,divergance and curl of vector fields .  |
| <b>Week 7</b>  | Equations of the lines and surfaces in space , intersection of lines and surfaces using vectors , lagrange multipliers with two and more constraints.  |
| <b>Week 8</b>  | Complex numbers and functions , demoivres theorem, roots ,argand diagram, cauchy – rehmann equations.  |
| <b>Week 9</b>  | Limits , Infinite sequences , convergence and divergence , infinite series , geometric and ordinary series , positive and alternative series , test of convergences  |
| <b>Week 10</b> | Power series , maclaurin series taylor and trigonometric series .  |
| <b>Week 11</b> | Fourier series for periodic function , euler coefficients , applications   |
| <b>Week 12</b> | Green's theorem for enclosed curves , line integral  |
| <b>Week 13</b> | Matrices , Adjoins & inverses , solving linear equations using the inverse of matrix , determinants and cramer method to solve linear equations , Gaussian elimination and gauss-seidel elimination.             |
| <b>Week 14</b> | Improper integration and Laplace transform of some common functions, properties of Laplace transform.  |
| <b>Week 15</b> | Preparatory week before the final Exam   |

## Learning and Teaching Resources

مصادر التعلم والتدریس

|                          | <b>Text</b>  | <b>Available in the Library?</b> |
|--------------------------|--|----------------------------------|
| <b>Required Texts</b>    | <ol style="list-style-type: none"> <li>1. Advanced Engineering Mathematics /C. Ray Wylie</li> <li>2. Engineering mathematics / G. S . Sharma &amp;I . J. S . Sarna</li> <li>3. Applied Mathematics for Engineers &amp; physicists / Pipes &amp; Harvill .</li> </ol> |                                  |
| <b>Recommended Texts</b> |  |                                  |

|          |  |  |
|----------|--|--|
| Websites |  |  |
|----------|--|--|

| Grading Scheme<br>مخطط الدرجات |                  |                     |           |                                       |
|--------------------------------|------------------|---------------------|-----------|---------------------------------------|
| Group                          | Grade            | التقدير             | Marks (%) | Definition                            |
| Success Group<br>(50 - 100)    | A - Excellent    | امتياز              | 90 - 100  | Outstanding Performance               |
|                                | B - Very Good    | جيد جدا             | 80 - 89   | Above average with some errors        |
|                                | C - Good         | جيد                 | 70 - 79   | Sound work with notable errors        |
|                                | D - Satisfactory | متوسط               | 60 - 69   | Fair but with major shortcomings      |
|                                | E - Sufficient   | مقبول               | 50 - 59   | Work meets minimum criteria           |
| Fail Group<br>(0 - 49)         | FX – Fail        | راسب (قيد المعالجة) | (45-49)   | More work required but credit awarded |
|                                | F – Fail         | راسب                | (0-44)    | Considerable amount of work required  |
|                                |                  |                     |           |                                       |

**Note:** Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. 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.