



Ministry of Higher Education and  
Scientific Research - Iraq

University of Warith Al-Anbiyaa  
Engineering College  
Biomedical Engineering Department



### Module Information

|                                    |                       |                     |                               |                                                                                                                                                                                                                                                                                                        |                         |
|------------------------------------|-----------------------|---------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| Module Title                       | Engineering Analytics |                     |                               | Module Delivery                                                                                                                                                                                                                                                                                        |                         |
| Module Type                        | Basic                 |                     |                               | <div><input checked="" type="checkbox"/> Theory</div> <div><input checked="" type="checkbox"/> Lecture</div> <div><input checked="" type="checkbox"/> Lab</div> <div><input type="checkbox"/> Tutorial</div> <div><input type="checkbox"/> Practical</div> <div><input type="checkbox"/> Seminar</div> |                         |
| Module Code                        | ENG-202               |                     |                               |                                                                                                                                                                                                                                                                                                        |                         |
| ECTS Credits                       | 5                     |                     |                               |                                                                                                                                                                                                                                                                                                        |                         |
| SWL (hr/sem)                       | 80                    |                     |                               |                                                                                                                                                                                                                                                                                                        |                         |
| Module Level                       |                       | 3                   | Semester of Delivery          |                                                                                                                                                                                                                                                                                                        |                         |
| Administering Department           |                       | BME-111             | College                       | ENG                                                                                                                                                                                                                                                                                                    |                         |
| Module Leader                      | Ahmed Merza           |                     |                               | e-mail                                                                                                                                                                                                                                                                                                 | ahmed.merza@uowa.edu.iq |
| Module Leader's Acad. Title        |                       | Assistant Professor | Module Leader's Qualification |                                                                                                                                                                                                                                                                                                        | Ph.D.                   |
| Module Tutor                       |                       |                     |                               | e-mail                                                                                                                                                                                                                                                                                                 |                         |
| Peer Reviewer Name                 |                       |                     | e-mail                        |                                                                                                                                                                                                                                                                                                        |                         |
| Scientific Committee Approval Date |                       |                     | Version Number                |                                                                                                                                                                                                                                                                                                        | 1.0                     |

### Relation with other Modules

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

| Module Aims, Learning Outcomes and Indicative Contents |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Module Aims</b>                                     | <ol style="list-style-type: none"> <li>1. The student will be able to use numerical methods to solve equations and apply them appropriately.</li> <li>2. Acquire experience and knowledge in different types of differential equations and their numerical solution methods.</li> <li>3. Acquire experience and knowledge in solving different types of integrals numerically.</li> <li>4. Enable the student to demonstrate a solid understanding of mathematical concepts throughout the academic stages and apply them in the engineering field.</li> <li>5. Develop an understanding of the fundamental ideas and concepts of numerical methods.</li> </ol> |
| <b>Module Learning Outcomes</b>                        | <ol style="list-style-type: none"> <li>1. How to write programs using <b>MATLAB</b> to solve mathematical problems and obtain numerical solutions.</li> <li>2. Solving mathematical models that represent various physical and engineering systems numerically, and determining the best fit for experimental data.</li> <li>3. Skills in computing different types of integrals using various numerical methods.</li> <li>4. Skills in solving differential equations using a range of numerical methods.</li> <li>5. • Skills in solving exercises from the prescribed textbook and supplementary references that have practical applications.</li> </ol>     |
| <b>Indicative Contents</b>                             | <p>Indicative content includes the following.</p> <p>Solution of non-linear equations (8 hrs)</p> <p>Numerical Integration (8 hrs)</p> <p>Linear Interpolation (12 hrs)</p> <p>Finite differences (12 hrs)</p> <p>Numerical solution of ODE (12 hrs)</p>                                                                                                                                                                                                                                                                                                                                                                                                        |

| Learning and Teaching Strategies |                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Strategies</b>                | <p>The main strategy to be adopted in delivering this unit is to encourage students to prepare solutions, measure concentration, and practice laboratory techniques. This will be achieved through classroom sessions, interactive tutorials, and by considering simple experimental activities that include sampling tasks of interest to the students.</p> |

| Student Workload (SWL)   |  |                        |  |
|--------------------------|--|------------------------|--|
| Structured SWL (h/sem)   |  | Structured SWL (h/w)   |  |
| Unstructured SWL (h/sem) |  | Unstructured SWL (h/w) |  |
| Total SWL (h/sem)        |  |                        |  |

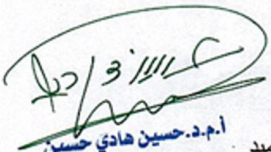
| Module Evaluation    |                 |             |                  |            |                           |
|----------------------|-----------------|-------------|------------------|------------|---------------------------|
|                      |                 | Time/Number | Weight (Marks)   | Week Due   | Relevant Learning Outcome |
| Formative assessment | Quizzes         | 2           | 10% (10)         | 5, 10      | LO #1, 2                  |
|                      | Assignments     | 2           | 10% (10)         | 2, 12      | LO #1, 2                  |
|                      | Projects / Lab. | 1           | 10% (10)         | Continuous | LO #1, 2                  |
|                      | Report          | 1           | 10% (10)         | 13         | LO #1, 2                  |
| Summative assessment | Midterm Exam    | 3 hrs.      | 10% (10)         | 7          | LO #1, 2                  |
|                      | Final Exam      | 3 hrs.      | 50% (50)         | 16         | LO #1, 2                  |
| Total assessment     |                 |             | 100% (100 Marks) |            |                           |

| Delivery Plan (Weekly Syllabus) |                                                            |
|---------------------------------|------------------------------------------------------------|
|                                 | Material Covered                                           |
| Week 1                          | Linear Interpolation: Newton-Gregory                       |
| Week 2                          | Linear Interpolation: Lagrange interpolating polynomial    |
| Week 3                          | Interpolation: General Equation                            |
| Week 4                          | Numerical integration: Equal segments Trapezoidal method   |
| Week 5                          | Numerical integration: Unequal segments Trapezoidal method |
| Week 6                          | Numerical integration: Simpson's rules                     |
| Week 7                          | Numerical Integration: Gaussian Quadrature Method          |
| Week 8                          | Solution of non-linear equations: Bisection method         |
| Week 9                          | Solution of non-linear equations: Newton Raphson method    |
| Week 10                         | Solution of non-linear equations: Secant method            |
| Week 11                         | Numerical solution of ODE: Taylor series                   |
| Week 12                         | Euler method and modified Euler method                     |
| Week 13                         | Runge - Kutta method                                       |
| Week 14                         | Finite differences method                                  |
| Week 15                         | Matrix method                                              |
| Week 16                         | Final Exam Preparation Week                                |

| Learning and Teaching Resources |                                                               |                           |
|---------------------------------|---------------------------------------------------------------|---------------------------|
|                                 | Text                                                          | Available in the Library? |
| Required Texts                  | Numerical Methods of Engineers, Chapra & Canale, 6th Edition. | Yes                       |
| Recommended Texts               |                                                               | No                        |
| Websites                        |                                                               |                           |

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

  
 Head of the Department  
 Dr. Osama Abdulbari

  
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 أ.م. أحمد هammad