



Ministry of Higher Education and
Scientific Research - Iraq
University of Diyala
College of Engineering
Department of Chemical Engineering



MODULE DESCRIPTOR

وصف المادة الدراسية

| Module Information معلومات المادة الدراسية | | | |
|--|----------------------|--------------------------------------|--|
| Module Title | MATHEMATICS I | | Module Delivery |
| Module Type | BASIC | | Theory Lecture Tutorial |
| Module Code | E-101 | | |
| ECTS Credits | 6 | | |
| SWL (hr/sem) | 150 | | |
| Module Level | 1 | Semester (s) offered | |
| Administering Department | | College | Engineering |
| Module Leader | | e-mail | |
| Module Leader's Acad. Title | | Module Leader's Qualification | |
| Module Tutor | | e-mail | |
| Peer Reviewer Name | | e-mail | |
| Review Committee Approval | | 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, Indicative Contents and Brief Description

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

| | |
|--|--|
| <p>Module Aims أهداف المادة الدراسية</p> | <p>This module aims to provide students with an understanding of, and competence in the use of, mathematical techniques that are relevant to the solution of engineering problems. It will also give students a firm foundation from which to develop solutions to a wider and deeper range of engineering problems that they will encounter throughout their undergraduate engineering program of study.</p> |
| <p>Module Learning Outcomes مخرجات التعلم للمادة الدراسية</p> | <ol style="list-style-type: none"> 1. Preliminaries : Explain mathematical coordinate systems, representing line, slope of line, shifting of lines 2. Vectors: Demonstrate an understanding of vectors in plane and space. 3. Function: Demonstrate an understanding of function and related variables, range and domain of function, types of functions and their graphs. 4. Limits and Continuity: Demonstrate an understanding of the fundamental concepts of calculus including limits, continuity, and differentiability. 5. Derivatives: Apply the techniques of differentiation at different types of functions including transcendental functions 6. Applications of derivatives: Apply the techniques of differentiation to solve problems involving rates of change, linearization, curve sketching, mean value theorem and Initial value problem. 7. Complex numbers: Demonstrate an understanding of complex numbers with basic operations and their mathematical and graphical representations including Euler's Formula |
| <p>Indicative Contents المحتويات الإرشادية</p> | <p>The topics listed under the indicative content below are the underpinning areas of knowledge and understanding that will be obtained from successful completion of the module. The mathematical topics are illustrated in the context of relevant engineering scenarios.</p> <ul style="list-style-type: none"> • Preliminaries Cartesian coordinates, polar coordinates, slope of lines, angle of inclination. • Functions, types of functions, graph of the functions, domain and range of function • Review of trigonometric function: graph of trigonometric function, range and domain of trigonometric functions, identities. • Limits and Continuity: Properties, limits involving infinity, |

| | |
|--|--|
| | <p>continuity.</p> <ul style="list-style-type: none"> • Transcendental functions: Inverse function, graph of inverse function, Logarithmic and exponential functions, inverse trigonometric functions, hyperbolic functions, inverse hyperbolic functions. • Derivatives: Definition, rules of derivative, Implicit differentiation, L hospital's rule, derivative of inverse functions • Applications of derivatives: rate of change problems, Relative maximum and relative minimum, Curve sketching with 1st and 2nd derivative, Linearization, Mean value theorem, Initial value problem,. • Complex numbers: Basic definitions. The geometric representations of the complex numbers, argand diagram, Basic operations with complex numbers, Euler's Formula • Vectors: Introduction to vectors |
| <p>Course Description</p> | <p>This course lays the foundation for a robust understanding of mathematical concepts that underpin the various disciplines within engineering. It covers a breadth of topics ranging from coordinate systems, slopes of lines, and angles of inclination to the introduction of two- and three-dimensional coordinate systems. A focus is also given to the understanding and manipulation of functions, including domain and range determination and function composition. The course incorporates a substantial overview of trigonometry, limits, continuity, derivatives, including their applications in real-world engineering contexts in addition to complex numbers and their mathematical representation. By the end of the course, students will have a sound understanding of these principles, preparing them for more advanced engineering courses in their respective fields.</p> |
| <p>Learning and Teaching Strategies استراتيجيات التعلم والتعليم</p> | |
| <p>Strategies</p> | <p>Begin In Mathematics I, then employ a range of teaching strategies to ensure first-year engineering students fully grasp the various mathematical concepts. Instructional methods include interactive lectures, where core mathematical principles are explained in detail, and practical problem-solving sessions to provide hands-on learning experiences. Collaborative group work encourages peer-to-peer learning and reinforces understanding through shared insights. Regular formative assessments will be conducted to monitor students' understanding of the material, and feedback will be promptly given to guide their learning process. Instructors will maintain office hours for personalized support, and online resources will be available to supplement classroom instruction. Emphasis will be placed on relating mathematical concepts to real-world engineering applications to make the learning experience more relevant and engaging. These strategies aim to develop students' critical thinking skills, enhance their problem-solving abilities, and prepare them for advanced engineering studies.</p> |

| Student Workload (SWL) الحمل الدراسي للطالب | | | | |
|--|----|-----|--|--|
| Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل | | 78 | Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً | |
| In class lectures | 53 | | 5.2 | |
| In class tests | 10 | | | |
| Tutorial | 15 | | | |
| Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل | | 72 | Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً | |
| Assignment | 20 | | 4.8 | |
| Preparation for tests | 20 | | | |
| Homework | 32 | | | |
| Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل | | 150 | | |

| Module Evaluation تقييم المادة الدراسية | | | | | |
|---|---------------------|-----------|------------------|-----------------|---------------------------|
| | | Time (hr) | Weight (Marks) | Week Due | Relevant Learning Outcome |
| Formative assessment | Quizzes | 2 | 10% (10) | 3,5, 10, 12, 14 | LO #1, 2, 3, 4,5 and 7 |
| | Assignments | 6 | 20% (20) | 4, 8, 12 | LO # 1, 2, 3, 4, 5 and 6 |
| Summative assessment | Midterm Exam | 2 | 20% (20) | 7 | LO # 1,4 |
| | Final Exam | 3 | 50% (50) | 16 | All |
| Total assessment | | | 100% (100 Marks) | | |

| Delivery Plan (Weekly Syllabus) المنهاج الأسبوعي النظري | |
|---|--|
| | Material Covered |
| Week 1 | Cartesian coordinates, slope of lines, angle of inclination, functions, types of functions, graph of the functions, domain and range ,identifying functions, Circles and parabolas |
| Week 2 | Introduction to vectors |
| Week 3 | •Preliminaries Sum, differences, products and quotients of Composite functions, shifting a graph of a function, scaling and reflecting a graph of a function, Absolute value |
| Week 4 | •Review of trigonometric function graph of trigonometric function, range and domain, identities |
| Week 5 | •Limits and Continuity Properties, limits involving infinity, continuity |

| | |
|----------------|--|
| Week 6 | •Transcendental functions Inverse function, graph of inverse function, Logarithmic and exponential functions, trigonometric functions , inverse trigonometric functions, hyperbolic functions, inverse hyperbolic functions |
| Week 7 | •Derivatives Definition, rules of derivative, slopes , tangent lines, chain rule, derivative of trigonometric functions, Implicit differentiation, L hospital's rule |
| Week 8 | derivative of inverse trigonometric functions, derivative of exponential and logarithmic functions |
| Week 9 | •Applications of derivatives Speed and acceleration, Relative maximum and relative minimum |
| Week 10 | Curve sketching with 1st and 2nd derivative |
| Week 11 | Linearization |
| Week 12 | rate of change problems |
| Week 13 | Mean value theorem -Initial value problem |
| Week 14 | Complex numbers: Basic definitions. The geometric representations of the complex numbers, argand diagram |
| Week 15 | Basic operations with complex numbers, Euler's Formula |
| Week 16 | Final Exam |

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

| | Material Covered |
|---------------|------------------|
| Week 1 | |
| Week 2 | |
| Week 3 | |
| Week 4 | |
| Week 5 | |
| Week 6 | |
| Week 7 | |

Learning and Teaching Resources

مصادر التعلم والتدريس

| | Text | Available in the |
|--|------|------------------|
| | | |

| | | Library? |
|--------------------------|---|----------|
| Required Texts | George B. Thomas and Ross L. Finney, "Calculus and Analytic Geometry, Addison- Wesley | Yes |
| Recommended Texts | Thomas Calculus, by George B.Thomas,Jr,Elevnth Edition Media Upgrade 2008 | Yes |
| Websites | | |

APPENDIX:

| GRADING SCHEME مخطط الدرجات | | | | |
|--|-------------------------|-------------|-----------|---------------------------------------|
| Group | Grade | التقدير | Marks (%) | Definition |
| Success Group (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 (0 - 49) | FX – Fail | مقبول بقرار | (45-49) | More work required but credit awarded |
| | F – Fail | راسب | (0-44) | Considerable amount of work required |
| Note: | | | | |
| NB 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. | | | | |