

DEPARTMENT OF MATERIALS SCIENCE AND TECHNOLOGY
COURSE SYLLABUS

| Course Details | | | | | |
|---------------------------------------|--|----------------------|-----------------|---------------------|-------------|
| Code | | Academic Year | | Semester | |
| MAT103 | | 1 | | 1 | |
| Title | | T | A | L | ECTS |
| Analysis I | | 3 | 2 | 0 | 6 |
| Language | German | | | | |
| Level | Undergraduate | X | Graduate | Postgraduate | |
| Department / Program | Materials Science and Technology | | | | |
| Forms of Teaching and Learning | Face to face | | | | |
| Course Type | Compulsory | X | Elective | | |
| Objectives | Analysis I | | | | |
| Content | Real Numbers, Number Representations, Difference, Range Equations, Inequalities, Solution Set Coordinate Systems, True, Slope Functions, Function Graph Limit, Continuity in Functions Difference, Increase / Decrease Rate, Tangent Derivative, Derivative Account, Function Derivative Applications of Derivative Account Integral Account, Definite and Indefinite Integral The Basic Theory of Analysis Applications of Integral Account Infinite Series, Taylor-Series, Fourier-Series | | | | |
| Prerequisites | | | | | |
| Coordinator | None | | | | |
| Lecturer(s) | Asist Prof.Dr. Canan Yıldız | | | | |
| Assistant(s) | Research Assist. Ozan Subaşı Research Assist. Süleyman Şişman | | | | |
| Work Placement | No | | | | |
| Recommended or Required Reading | | | | | |
| Books / Lecture Notes | Calculus: A Complete Course, Robert A. Adams,C Essex 7th Edition,Addison Wesley Longman Toronto 2010 Thomas' Calculus, 12th Edition, G.B Thomas, M.D.Weir, J.Hass and F.R.Giordano, Addison-Wesley, 2012 | | | | |
| Other Sources | Thomas' Calculus, 12th Edition, G.B Thomas, M.D.Weir, J.Hass and F.R.Giordano, Addison-Wesley, 201 | | | | |
| Additional Course Material | | | | | |
| Documents | | | | | |

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| | | | |
|------------------------------------|--------------|--|--------------------------|
| Assignments | | | |
| Exams | | | |
| Course Composition | | | |
| Mathematics und Basic Sciences | | 100% | |
| Engineering | | % | |
| Engineering Design | | % | |
| Social Sciences | | % | |
| Educational Sciences | | % | |
| Natural Sciences | | % | |
| Health Sciences | | % | |
| Expert Knowledge | | % | |
| Assessment | | | |
| Activity | Count | Percentage (%) | |
| Midterm Exam | 2 | 30 | |
| Quiz | | | |
| Assignments | | | |
| Attendance | | | |
| Recitations | | | |
| Projects | | | |
| Final Exam | 1 | 40 | |
| | Total | 70 | |
| ECTS Points and Work Load | | | |
| Activity | Count | Duration | Work Load (Hours) |
| Lectures | 14 | 3 | 42 |
| Self-Study | 14 | 5 | 70 |
| Assignments | 5 | 5 | 25 |
| Presentation / Seminar Preparation | | | |
| Midterm Exam | 1 | 3 | 3 |
| Recitations | 14 | 2 | 28 |
| Laboratory | | | |
| Projects | | | |
| Final Exam | 1 | 3 | 3 |
| | | Total Work Load | 171 |
| | | ECTS Points (Total Work Load / Hours) | 6 |
| Learning Outcomes | | | |

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| | |
|----|---|
| 1 | Understands the basic concepts of analysis: - The definition of the derivative as the "rate of change" and the limit of the ratio of the differences calculation, - Definition of the integral as infinite "Total" and a limit of Riemann-sums to be calculated as. |
| 2 | You can analyze the properties and behaviors of the functions and the function graph (asymptotes, critical points, with the help of derivative tests for slope and curvature). |
| 3 | The derivative account can be used to solve problems in the field of application (eg. Optimization, linked rates). |
| 4 | Integral calculation of curve length, volume and area calculation and application area can be used to solve other problems. |
| 5 | Certain and indefinite Integrals can be solved using various integration methods. |
| 6 | He can examine convergence behavior of improper integrals, convergent has non-integrals. |
| 7 | One can detect convergence / divergence of infinite series |
| 8 | One can calculate Taylor expansion around a point for a function. |
| 9 | |
| 10 | |
| 11 | |
| 12 | |

Weekly Content

| | |
|----|--|
| 1 | Functions: Functions and their graphs, Trigonometric functions |
| 2 | Limits and Continuity Rates of Change and Tangents to Curves, Limit of a Function and Limit Laws, The Sandwich (The Squeeze theorem), The Precise Definition of a Limit, One-sided Limits, Continuity, Types of Discontinuity, Continuous Functions, The Intermediate Value Theorem, Limits Involving Infinity, Asymptotes of Graphs |
| 3 | Differentiation: Tangents, Normal Lines, The Derivative at a Point, The Derivative as a Function, Differentiable on an Interval, One-sided Derivatives, Differentiation Rules, High order Derivatives, The Derivative as a Rate of Change |
| 4 | Derivatives of Trigonometric Functions, The chain rule, Implicit Differentiation, Linearization and Differentials |
| 5 | Applications of derivatives: Extrem Values of Functions, Critical Points, Rolle's Theorem, The Mean Value Theorem, Monotonic Functions and The First Derivative Test: Increasing Functions and Decreasing Functions, the First Derivative Test for Local Extrema |
| 6 | Concavity and Curve Sketching, The Second Derivative Test for Concavity, Point of Inflection The Second Derivative Test for Local Extrema, Graphing of $y=f(x)$, Antiderivatives, Indefinite Integrals |
| 7 | Integration: Area and Estimating with Finite Sums, Average Value of Nonnegative Continuous Functions, Sigma Notation and Limits of Finite Sums, Riemann Sums, Definite Integral, Properties of Definite Integral, Area Under the Graph of a nonnegative Function, Average Value of Continuous Functions |
| 8 | (Quiz exam) Mean Value Theorem for Definite Integrals, The Fundamental Theorem of Calculus: Fundamental Theorem Part 1, Fundamental Theorem Part 2, Total Area |
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|--|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| 15 | | | | | | | | |
| Contribution of Learning Outcomes to Program Objectives (1-5) | | | | | | | | |
| | P1 | P2 | P3 | P4 | P5 | P6 | P7 | P8 |
| 1 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
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| 12 | | | | | | | | |
| Contribution Level | 1: Low 2: Low-intermediate 3: Intermediate 4: High 5: Very High | | | | | | | |
| Compiled by: | | | | | | | | |
| Date of Compilation: | | | | | | | | |