King Abdulaziz University
Mathematics Department

Descriptions of Mathematics Courses

Dr. H. Al-Sulami

\[ y' = 3y - 4y^{2} + x^{2} \]

\[ \int f(x) \, dx = \lim_{n \to \infty} \sum_{k=1}^{n} f(x_k) \Delta x \]

\[ T = \{(a), (b), \{a, b\}, \emptyset\} \]

\[ x_{n+1} = x_n - \frac{f(x_n)}{f'(x_n)} \]
Calculus I

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MATH 110</td>
<td>Calculus I</td>
<td>3</td>
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</table>

Objectives of the course

To show the importance of calculus in science and engineering and the correlation between them. To provide the basic principles of calculus and its applications.

To improve the students logical thinking and mathematical skills to solve mathematical problems.

Course description

Basic concepts of algebra: Real number system, exponents, operations on polynomials, and factoring.

Equations and inequalities: Solving first and second degree equations and inequalities.

Line and graphs of second degree equations:

Functions: Definition, ways of representing a function, graph, domain, and range of a function. Types of functions, polynomials, power functions, rational functions, algebraic functions, and trigonometric functions and their identities. Transformations of functions, combinations (algebra) and composition of functions.

The limit of a function: Definition, one-side limit, infinite limits, and vertical asymptote. Limit laws, limits for trigonometric functions, and the squeeze theorem.

Continuity: Continuity at a point, types of discontinuity, continuity on an interval, all theorems of continuity, and the Intermediate Value Theorem.

Limits at infinity: Definition, laws, horizontal asymptote, and infinite limits at infinity.

Derivatives: Definition, interpretations of the derivative as the slope of the tangent and rate of change.

The derivative as a function: Identify the graph of the derivative of a function, notations, and how a function can fail to be differentiable.

Derivatives of polynomials:

The product and quotient rules:
Derivative of trigonometric:
The chain rule:
Implicit differentiation:
Higher derivative:
Some application of differentiation:
The definite integrals: Riemann sum, evaluating integral, and properties of the definite integral. The fundamental theorem of calculus:
Indefinite integrals:
The substitution method:

Main text book

Subsidiary Books
Calculus II

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
</tr>
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<tbody>
<tr>
<td>2</td>
<td>MATH 202</td>
<td>Calculus II</td>
<td>3</td>
<td>2</td>
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</table>

Objectives of the course

To show the importance of calculus in science and engineering and the correlation between them. To provide the basic principles of calculus and its applications.

To improve the students logical thinking and mathematical skills to solve mathematical problems.

Course description


Applications of differentiation: Related rates, Linear approximations and differentials. Rolle’s Theorem and the Mean Value Theorem. Maximum and minimum values, absolute and local extreme values, the extreme value theorem, Fermat's theorem, critical numbers, finding the absolute extreme of a function on closed interval, and increasing/decreasing test. Concavity and inflection points. Curve sketching of elementary functions. Optimization problems.

Techniques of integration: Integration by part, Trigonometric integrals, Trigonometric substitution. Integration of rational function by partial fractions. Improper Integrals


Main text book

Subsidiary Books


Calculus III

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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<tbody>
<tr>
<td>3</td>
<td>MATH 203</td>
<td>Calculus III</td>
<td>3</td>
<td>MATH 202</td>
</tr>
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</table>

Objectives of the course

To show the importance of calculus in science and engineering and the correlation between them. To provide the basic principles of calculus and its applications.

To improve the students logical thinking and mathematical skills to solve mathematical problems.

Course description

Parametric equations and polar coordinates: Curves defined by parametric equations. Calculus with parametric curves, tangents, areas, arc length, and surface area. Polar coordinates, definition, polar curves, symmetry, and tangents to polar curves. Areas and length in polar coordinates. Conic sections. Conic sections in polar coordinates.


Main text book

Subsidiary Books


Differential Equations I

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>MATH 204</td>
<td>Differential Equations I</td>
<td>3 - 3</td>
<td>MATH 202</td>
</tr>
</tbody>
</table>

Objectives of the course

To introduce the basic concepts of differential equations and their applications in science and engineering. To improve the students logical thinking and skills to solve differential equations problems.

To study first order ordinary differential equations, higher order linear ordinary differential equations, and Laplace transform to obtain solutions.

Course description

Basic concepts and terminology:

Existence and uniqueness theorem:

Methods of solution for first order differential equations: Applications.

Higher order linear ordinary differential: Methods of solution, Cauchy-Euler equation.

Laplace transform: Laplace transform and its applications to linear ordinary differential equations.

Main text book

Subsidiary Books


Linear Algebra

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>MATH 241</td>
<td>Linear Algebra</td>
<td>3   - 3</td>
<td>MATH 202</td>
</tr>
</tbody>
</table>

Objectives of the course

To introduce the basic topics of linear algebra such as matrices, vector spaces, linear transformations, bases and dimension.

To develop the students skills to solve linear equations in variables. To teach how to find eigenvalues and eigenvectors.

Course description

Introduction to systems of linear equations: Gaussian elimination and Gauss-Jordan elimination for solving equations

Matrices: Operations on matrices, properties of matrix operations, inverse of a matrix.

Determinant of a matrix: Elementary row operations, properties of determinants, Cramer’s rule.

Vector spaces: Subspaces, linear combinations, linear independence, bases and dimensions.

Rank of a matrix: The coordinates, change of bases

Linear transformations: Kernel, range, nullity of a linear transformation, linear transformations and matrices, symmetric matrices.

Eigenvectors: Introduction to eigenvalues, eigenvectors and eigenspaces.

Main text book

Subsidiary Books


Fundamentals of Mathematics

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>MATH 251</td>
<td>Fundamentals of Mathematics</td>
<td>3 Th. - 3 Pr.</td>
<td>MATH 101</td>
</tr>
</tbody>
</table>

Objectives of the course

To introduce the fundamentals concepts of mathematics.
To develop the skills to understand the logical and abstract concepts of contemporary mathematics. To develop the techniques to understand mathematical hypotheses, theorems, and proofs.

Course description

Logical statements: Symbols, notations, methods of proof, truth tables, quantifiers.
Sets: Basic operations on sets, De Morgan’s laws.
Relations: Equivalence relations, equivalence classes, partial ordering.
Functions: Types of functions, composition of functions, graphs, inverse functions.

Binary operations: Types and examples.
The division algorithms: The greatest common divisor, Euclidean algorithms.
Mathematical induction:

Main text book

Subsidiary Books

Geometry

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<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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<tbody>
<tr>
<td>7</td>
<td>MATH 261</td>
<td>Geometry</td>
<td>3</td>
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</tr>
</tbody>
</table>

Objectives of the course

To introduce the fundamentals concepts of mathematics. To improve the students logical thinking and imagination. To review the basic concepts of plane geometry.

Course description

Definitions of geometric terms:
Congruence of Triangles:
Perpendicularity in space geometry:
Parallelism in space:
Parallels and parallelograms:

Similar Triangles:
Area, Perimeter and Circumference:
Surface area and Volume:

Main text book


Subsidiary Books

Series and Vector Calculus

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<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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</thead>
<tbody>
<tr>
<td>8</td>
<td>MATH 304</td>
<td>Series and Vector Calculus</td>
<td>3</td>
<td>MATH 203</td>
</tr>
</tbody>
</table>

Objectives of the course

To show the importance of calculus in science and engineering and the correlation between them. To provide the basic principles of calculus and its applications.

To improve the students logical thinking and mathematical skills to solve mathematical problems.

Course description


Vector functions: Vector functions and space curves. Derivatives and integrals of vector functions. Arc length and curvature. Motion in space, velocity and acceleration. Kepler’s Laws of Planetary Motion.


Main text book

Subsidiary Books


Differential Equations II

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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<tbody>
<tr>
<td>9</td>
<td>MATH 305</td>
<td>Differential Equations II</td>
<td>3</td>
<td>MATH 204</td>
</tr>
</tbody>
</table>

Objectives of the course

To improve the students logical thinking and skills in solving differential equations problems. To introduce the series solutions method for solving ordinary differential equations. To introduce the basic concepts of special functions and orthogonal polynomials.

Course description

Series solutions about an ordinary point and a singular point:
The method of Frobenius:
Solution about the point at infinity:
Some special equations with variable coefficients:

Gamma and Beta functions:
Bessel and hypergeometric functions:
Orthogonal polynomials and general properties:
Legendre, Hermite and Laguerrre polynomials:

Main text book

Subsidiary Books


Real Analysis I

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>MATH 311</td>
<td>Real Analysis I</td>
<td>3 Th. 3 - 3</td>
<td>MATH 304,MATH 251</td>
</tr>
</tbody>
</table>

Objectives of the course

To introduce the system of real numbers and the completeness axiom.
To treat some concepts studied in calculus rigorously and correlate them with concepts studied in other courses. To introduce the methods and strategies of solving problems and writing proofs.

Course description

The real number system: The algebraic properties, the order properties, the completeness axiom and its consequences.

Sequences of real numbers: Convergent sequences, limit theorems, monotone sequences, subsequences, limit superior and inferior of a sequence, Cauchy sequences.

Topology of the real line: Open sets, closed sets, limit point of a set, Bolzano-Weierstrass Theorem, compact sets, Heine-Borel Theorem.

Limits and continuity: Limit of a function, continuous functions, and uniform continuity.
Differentiation: The derivative, the Mean-Value Theorem, L'Hospital's Rule.

Main text book


Subsidiary Books

Real Analysis II

Objectives of the course

To continue the treatment of MATH 311 rigorously.
To extend the concepts of analysis for the space $\mathbb{R}$ to the space $\mathbb{R}^n$.
To practice the methods and strategies of solving problems and writing proofs.

Course description

Riemann Integration:
Series of real numbers:
Sequences and series of functions:

Topology of $\mathbb{R}^n$:
Completeness and compactness in $\mathbb{R}^n$:
Continuity and uniform continuity of functions on $\mathbb{R}^n$:
Differentiability of functions of two-variables: Inverse Function Theorem and Implicit Function Theorem.

Main text book

Subsidiary Books


Mathematical Software and Programming

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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<tbody>
<tr>
<td>12</td>
<td>MATH 331</td>
<td>Mathematical Software and Programming</td>
<td>Th. 3 Pr. -</td>
<td>3 MATH 304,CS201</td>
</tr>
</tbody>
</table>

Objectives of the course

To provide the students with basic skills in using mathematical software and programming package. Using new mathematical software and programming package must be approved by the department board.

The detailed course content together with objectives and references should be approved by the department board every time a new mathematical software and programming package is offered.

Course description

An introduction to the use of mathematical software and programming package:

Using mathematical software and programming package for writing mathematical documents, symbolic computing, numerical computing, and programming.
Applied Mathematics

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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<tbody>
<tr>
<td>13</td>
<td>MATH 332</td>
<td>Applied Mathematics</td>
<td>3</td>
<td>MATH 304</td>
</tr>
</tbody>
</table>

Objectives of the course

The purpose of this course is to teach areas in applied mathematics that are not covered by pure mathematics courses.

Course description

The course content together with objective and references should be approved by the department board every time a new subject is offered:
Mathematics of Finance

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>MATH 333</td>
<td>Mathematics of Finance</td>
<td>3 Th. 3 Pr. 3</td>
<td>MATH 202</td>
</tr>
</tbody>
</table>

Objectives of the course

To introduce the students to the mathematics of finance and its use in banks, business, and trade.

Course description

Elements of Investments:
Portfolio Theory:
Debt Securities:
Security Analysis:
Derivative Markets:
Active Investment Management:

Main text book


Subsidiary Books

Abstract Algebra I

Objectives of the course

To introduce the basic concepts of abstract algebra.
To develop the students abstract and logical thinking capabilities.
To develop the students mathematical ability to handle abstract proofs.

Course description

Binary operations:
Groups: Subgroups, and basic properties. Generators, cyclic subgroups.

Permutations and Cayley’s Theorem:
Normal subgroups, factor groups:
Isomorphism theorems of groups.:
Rings, subrings, ideals, division rings, and fields.:
Homomorphisms between rings:

Main text book

Subsidiary Books


Abstract Algebra II

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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<tbody>
<tr>
<td>16</td>
<td>MATH 343</td>
<td>Abstract Algebra II</td>
<td>3</td>
<td>MATH 342</td>
</tr>
</tbody>
</table>

Objectives of the course

To introduce the basic concepts of abstract algebra.
To develop the students abstract and logical thinking capabilities.
To develop the students mathematical ability to handle abstract proofs.

Course description

Finitely generated abelian groups: Direct products.
The fundamental theorem of abelian groups : Without proof.
A review of groups of small orders and the theory of p-groups:
Sylow’s Theorems :Without proofs, applications to finite groups.

Rings: Ideals and factor rings. Integral domains.
Homomorphisms between rings:
Isomorphism theorems of rings:
Rings of polynomials:Irreducible polynomials, Eisenstein criterion.
Unique factorization domains and Euclidean domains:
Introduction to field theory:

Main text book

Subsidiary Books


Training

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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<tbody>
<tr>
<td>17</td>
<td>MATH 390</td>
<td>Training</td>
<td>1 2 2</td>
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</tr>
</tbody>
</table>

Objectives of the course

To train the student to transmit what he has studied.

To train the student to prepare lectures note and to develop the student teaching capabilities.

Course description

Directed Readings in intermediate and high school mathematics as well as the textbooks of MATH 101, MATH 202, MATH 203, and MATH 304:

Participating in tutorial classes of MATH 101 and MATH 202 under the supervision of a faculty member.

References
Topics in Differential Equations

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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<tr>
<td>18</td>
<td>MATH 406</td>
<td>Topics in Differential Equations</td>
<td>3 Th. - 3 Pr. - 3 Credit</td>
<td>Department approval</td>
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</table>

Objectives of the course

The purpose of this course is to teach areas in differential equations that are not covered in the other differential equations courses.

Course description

The course content together with the objectives and references should be approved by the department board every time a new subject is offered:
Complex Analysis

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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</thead>
<tbody>
<tr>
<td>19</td>
<td>MATH 413</td>
<td>Complex Analysis</td>
<td>3</td>
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</tbody>
</table>

Objectives of the course

To recognize the importance and usefulness of complex analysis.
To extend some concepts studied in Math 311 and calculus courses.
To introduce the methods and strategies of solving problems and writing proofs.

Course description

The complex number system: Algebraic properties, polar and exponential forms, powers and roots, complex domain.

Complex functions: Limits, continuity, Cauchy-Riemann equations, analytic functions.

Elementary functions and their properties: Exponential, trigonometric, hyperbolic, logarithmic, inverse trigonometric and inverse hyperbolic functions.

Complex Integration: Contours, contour integrals, antiderivatives, Cauchy Integral Theorem, Cauchy Integral formula and its consequences.


Calculus of residues:

Main text book

Subsidiary Books


Topics in Analysis

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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<tbody>
<tr>
<td>20</td>
<td>MATH 414</td>
<td>Topics in Analysis</td>
<td>3</td>
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</tbody>
</table>

Objectives of the course

The purpose of this course is to teach areas in analysis that are not covered in the other analysis courses.

Course description

The course content together with the objectives and references should be approved by the department board every time a new subject is offered:
## Numerical Analysis

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
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<th>Pre-requisites</th>
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<tbody>
<tr>
<td>21</td>
<td>MATH 421</td>
<td>Numerical Analysis</td>
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</tbody>
</table>

### Objectives of the course

To provide the numerical methods of solving the non-linear equations, interpolation, differentiation, and integration. To improve the student’s skills in numerical methods by using the numerical analysis software and computer facilities.

### Course description


Interpolation: Lagrange, Newton divided difference formulas.

Numerical differentiation: First derivative, higher derivatives.

Numerical integration: Trapezoidal rule, Simpson’s rule, Gaussian integration.

Algorithms and programs:

### Main text book


### Subsidiary Books


Topics in Numerical Analysis

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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<tbody>
<tr>
<td>22</td>
<td>MATH 423</td>
<td>Topics in Numerical Analysis</td>
<td>2 1 3</td>
<td>Department approval</td>
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</table>

Objectives of the course

The purpose of this course is to teach areas in numerical analysis that are not covered in the other numerical analysis courses.

Course description

The course content together with the objectives and references should be approved by the department board every time a new subject is offered:
Advanced Mathematical Software

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>MATH 434</td>
<td>Advanced Mathematical Software</td>
<td>3</td>
<td>MATH 331</td>
</tr>
</tbody>
</table>

Objectives of the course

Students will learn mathematical software as a means of doing mathematics by computer. Using new mathematical software package must be approved by the department board.

The detailed course content together with objectives and references should be approved by the department board every time a new mathematical software package is offered.

Course description

The topics, which the students will learn, include: functions and their graphs; polynomials; rational functions; trigonometric expressions; manipulation and simplification of expressions; computing limits, derivatives and integrals; series; vectors and matrices; parametric curves and surfaces; linear systems; vector spaces; eigenvalues and eigenvectors; numerical calculations; operating on algebraic expressions; and generating graphics.
Number Theory

<table>
<thead>
<tr>
<th>Number</th>
<th>Course Code</th>
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<th>Number of Units</th>
<th>Pre-requisites</th>
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<tbody>
<tr>
<td>24</td>
<td>MATH 444</td>
<td>Number Theory</td>
<td>3</td>
<td>MATH 251</td>
</tr>
</tbody>
</table>

Objectives of the course

To give a simple account of classical number theory and its fascinating properties.

Course description

Divisibility Theory:

Theory of primes:

Congruences:

Quadratic residues:

Diophantine equations:

Number-theoretic functions:

Main text book


Subsidiary Books

Topics in Algebra

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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</thead>
<tbody>
<tr>
<td>25</td>
<td>MATH 445</td>
<td>Topics in Algebra</td>
<td>3</td>
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</tr>
</tbody>
</table>

Objectives of the course

The purpose of this course is to teach areas in algebra that are not covered in the other algebra courses.

Course description

The course content together with the objectives and references should be approved by the department board every time a new subject is offered:
Euclidean and Non-Euclidean Geometry

Objectives of the course
To increase the student knowledge about geometry and its applications. To improve the students skills in geometry. To study the fundamental concepts of geometry and design theory.

Course description
Axiomatic approach to Euclidean geometry:
Use of logic in mathematical reasoning:
Hilbert’s formulation:
Removal of parallel axiom:
The discovery of non-Euclidean geometries:
Independence of parallel postulate:
Loboachevskian and Hyperbolic Geometry:

Main text book

Subsidiary Books
Differential Geometry

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
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<tbody>
<tr>
<td>27</td>
<td>MATH 463</td>
<td>Differential Geometry</td>
<td>3</td>
<td>MATH 204</td>
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<td>MATH 304</td>
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</table>

Objectives of the course

To study the basic principles of differential geometry which relate curves and surfaces in space. To study parametric representations of curves and surfaces.

To recognize curves on surfaces and various types of curvatures and geodesics.

Course description

Introduction to Manifolds:
Functions of Several Variables and Mappings:
Differentiable Manifolds and Submanifolds:
Vector Fields on a Manifold:
Tensors and Tensor Fields on a Manifold:

Integration on Manifolds:
Differentiation on Riemannian Manifolds:
Curvature:

Main text book

Subsidiary Books


General Topology

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<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>MATH 464</td>
<td>General Topology</td>
<td>3</td>
<td>MATH 311</td>
</tr>
</tbody>
</table>

Objectives of the course

To deal with abstract mathematical concepts.

To develop the skills of writing clear and precise proofs. To study topological spaces and metric spaces.

To study continuous functions, connectedness, compactness, and separation axioms.

Course description

Definition of a topology: Open sets, closed sets, interior, closure, and boundary of a set.

Dense sets and separable spaces:

Bases and second countable spaces:

Finite product of spaces:

Subspaces:

Continuous functions and Homeomorphisms:

Separation axioms: $T_0$, $T_1$, $T_2$, regular, $T_3$, normal, and $T_4$ spaces

Metric spaces: Definitions of compact and connected spaces

Main text book

Subsidiary Books


Discrete Mathematics

<table>
<thead>
<tr>
<th>Number</th>
<th>Course and Code</th>
<th>Course Title</th>
<th>Number of Units</th>
<th>Pre-requisites</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td>MATH 471</td>
<td>Discrete Mathematics</td>
<td>3</td>
<td>MATH 251</td>
</tr>
</tbody>
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Objectives of the course

To improve the student’s logical thinking and dexterity in solving problems. To introduce the basic concepts discrete mathematics and its applications. To apply all of these by using the computers software.

Course description

Permutations and selections:
Binomial coefficient: Identities involving binomial coefficients
Selections with repetition allowed:
Multinomial coefficients:
The Pigeonhole Principle:
Partitions of integers:
Principle of Inclusion and Exclusion:
Derangements:
Partitions of sets:
Stirling numbers of the second kind:
Algorithms to determine components: Shortest and longest path algorithms. Floyd’s algorithm

Main text book

Subsidiary Books


History of Mathematics

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<tbody>
<tr>
<td>30</td>
<td>MATH 481</td>
<td>History of Mathematics</td>
<td>2</td>
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Objectives of the course

To improve the students understanding of the historical development of mathematics. To emphasize the role of mathematics in the rise of science.

Course description

Historical development of geometry, arithmetic, algebra, and calculus from ancient times to 20th century:

Main text book


Subsidiary Books

### Project in Mathematics

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<tbody>
<tr>
<td>31</td>
<td>MATH 482</td>
<td>Project in Mathematics</td>
<td>3 Th. 3 Pr.</td>
<td>3 Credit, Department approval</td>
</tr>
</tbody>
</table>

A supervised project emphasizes problems identification and formulation. It includes both oral and written reports of results by the students. Every project topic should be approved by the department board.