Syllabus for the Complementary course in Mathematics for the First Degree Programme in Computer Science

UNIVERSITY OF KERALA

Semester I

MATHEMATICS I
Calculus and Number Theory
Code: MM1131.10

Instructional hours per week: 4  No. of Credits: 3

**MODULE 1**

Differerentiation and its Applications  18 Hours

**Differentiation:** Hyperbolic and inverse hyperbolic functions.

**Applications:** $n$th - derivative of - polynomials, exponential, sine, cosine and their product, Leibnitz Theorem (Without Proof) and its applications.

**MODULE 2**

Integration and its Applications  18 Hours

**Definite and Indefinite Integrals:** Integration techniques - substitution, rational functions with degree of numerator less than and greater than or equal to the degree of denominator, partial fraction and integration by parts.

**Applications:** Area of a curve, area between two curves, length of a plane curve, area of a surface of revolution and volume of revolution. (volume by cylindrical shells, volume by slicing are excluded)

**MODULE 3**

Ordinary Differential Equations  18 Hours

**Ordinary Differential Equations:** Solution of Higher Order differential equations with constant coefficients (homogeneous and non-homogeneous - exponential, sine, cosine and hyperbolic functions and their combinations), solution of first and second order simultaneous system of equations, Cauchy-Euler type differential equations, Legendre’s differential equations.

**MODULE 4**

Number Theory  18 Hours

**Numbers:** Euclid’s Algorithm - GCD of 2 natural numbers, Divisors of a given natural number, Highest power of a prime.

**Congruences:** Euler’s function $\phi(n)$ and its properties(without proof of theorems), Fermat’s and Wilson’s Theorems, Euler’s extension of Fermat’s theorem( Only Statements) and its applications to find the remainder when divisible by a given number.

**References**


**REMARK**

* Excercise and problems should be solved and graphed using a Computer Algebra System (CAS).
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Semester II

MATHEMATICS II
Discrete Mathematics
Code: MM1231.10

Instructional hours per week: 4 No. of Credits: 3

MODULE 1

Mathematical Logic 18 Hours

Proposition and Connectives: Conditional and Biconditional Equivalence of Propositions, Tautology and Contradictions, Duality Theorem and its properties, Algebra of Proposition.

Normal Form: Principal Disjunctive, Principal Conjunctive Normal Forms and its applications using with and without truth tables


MODULE 2

Predicate Logic 18 Hours

Quantifiers: Essential and Universal quantifier, Free and Bound Variables.


MODULE 3

Set Theory 18 Hours

Partition of Set: POSET - HASSE diagrams for partial ordering - lub, glb.

Lattices: Definition and Examples, principle of duality, Properties - Idem Potency, commutatively, associativity, absorption(sub lattices excluded).

Group Theory: Definition, Examples, Order of a Group and its elements.

MODULE 4

Coding Theory and Combinatorics 18 Hours

Coding Theory: Group Code, Encoders and Decoders, Hamming Codes - Hamming distance, decoding and encoding function - correction and detection of errors in Group Codes - parity check matrix and its properties.

Combinatorics: Recurrence relations of degree $k$ with constant coefficients (Homogeneous and Non-homogeneous) and its solutions (Nonhomogeneous including Polynomial, Trigonometric $\sin(ax)$ or $\cos(ax)$ exponential - excluding their product combinations)- Generating function Method of is also included.

References for Module 1 and Module 2


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