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: nth - derivative of - polynomials, exponential, sine, cosine and their product, Leibnitz Theorem (Without Proof) and its applications.

MODULE 2

Integration and its Apllications 18 Hours

Definite and Indefinite Integrals: Integration techniques - ubstitution, 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 Algorithom - 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

1 **Howard Anton, Irl C. Bivens, Stephen Davis,** *Calculus*, 10th Edition, John Wiley & Sons.

2 **B. S. Grewal**, *Higher Engineering Mathematics*, 42th Edition, Khanna Publishers.

3 **Zafar Ahsan**, *Differential Equations and Their Applications*, Second Edition, Prentice Hall of India.

4 **Erwin Kreyszig**, *Advanced Engineering Mathematics*, 10th Edition, Wiley-India.

5 **Lindsey N Childs**, *A concrete Indroduction to Higher Algebra*, Second Edition, Springer.

6 **S Barnard and J M Child**, *Higher Algebra*, Enlarged Edition, Macmillan And Company Limited.

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
Theory of Inference: Rules of Inference - Rule P, Rule T and Rule CP, Consistant and Inconsistant premises, Indirect Method of Proof using these inference rules.

MODULE 2

Predicate Logic 18 Hours

Quantifiers: Essential and Universal quantifier, Free and Bound Variables.
Rules of Specifications: Rule US, ES, UG, EG. Using these, convert a given statement into symbolic notation. Derivation from Premises using truth table and without using truth table.

MODULE 3

Set Theory 18 Hours

Partition of Set: POSET - HASSE diagrams for partial ordering - lub, glb.
Lattices: Definiion 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 Nonhomogeneous) and its solutions (Nonhomogeneeous 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

1 **T Veerarajan,** *Discrete Mathematics with Graph Theory and Combinatorics*, Tata McGraw-Hill, New Delhi, 2007.

2 **Seymour Lipschutz, Marc Lars Lipson**, *Discrete Mathematics*, Schaum's Solved Problems Series, McGraw-Hill International Editions.

3 **Ralph P Grimaldi, B V Ramana**, *Discrete and Combinatorial Mathematics*, 5th Edition, Pearson Education.

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