**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 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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