Math 101

ADVANCED ABSTRACT ALGEBRA

Unit-I
Sylows First, Second and Third theorems, p-sylow Subgroups, Double cosets conjugate groups, Normal and Subnormal series, Composition series, Jordan Holder theorem, Solvable groups, and commutator subgroups.

Unit-II
Modules, Cyclic modules, Simple modules, finitely generated modules, Fundamental structure theorem for finitely generated modules,

Unit-III
Field theory, Extension fields, Algebraic Extensions, Roots of polynomials, Simple extension, Splitting fields.

Unit-IV
Elements of Galois Theory, Fixed Fields, Normal extensions, Group of automorphisms, Galois group, Fundamental theorem of Galois theory.

Unit-V

Text Books:

Reference Books:
Math 102

ANALYSIS

Unit-I
Metric spaces: compact sets, perfect sets, connected sets, compactness and completeness, limit and continuity of function defined on metric spaces, limits of functions, continuous functions.

Unit-II
Continuity and Compactness, continuity and connectedness, monotonic functions: definition and existence of Riemann – Stieltjes integral, properties of the integral, integration and differentiation, the fundamental theorem of calculus, integration of vector-valued functions.

Unit-III
Sequence & Series of function point wise & uniform Convergence, Cauchy Criterion for uniform Convergence, Weierstrass M-Test for uniform Convergence of Series, Uniform Convergence & Continuity, Uniform Convergence & R-S integral Uniform Convergence & differentiation, Weierstrass approximation Theorem.

Unit-IV
Lebesgue outer measure, Measurable sets & its properties, Borel set & their measurability, Non-measurable set, measurable functions, characteristic function & simple function, Littlewood’s three Principles.

Unit-V
Lebesgue integral of bounded function over a set of finite measure, Integration of Non-negative function, The general Lebesgue integral, Monotonic Convergence Theorem, Lebesgue convergence Theorem, Fatou’s Lemma.

Text Books:
1. Principles of Mathematical Analysis by Walter Rudin.
2. Real Analysis (UNIT IV & V) by H. L. Royden.

Reference Books:
1. Mathematical Analysis by Malik & Arora, New Age International Publisher.
2. Lebesgue Measure & Integration by Jain & Gupta, New Age International Publishers.
Math 103  Integral Transforms

Unit-I
Laplace Transform, Properties of Laplace Transform, Laplace Transform of the
derivatives of function, Inverse Laplace transform, Properties of inverse Laplace transform,
Inverse Laplace transform of derivatives, convolution theorem, Heaviside’s expansion theorem.

Unit-II
Application of Laplace Transform to solution of differential equations; solutions
of initial Value problems, Solution of differential equations with constant coefficients, Solution
of system of two simultaneous differential equations, Application of Laplace Transform to the
solution of integral equations with convolution type kernel.

Unit-III
Applications of Laplace Transform to the solution of initial –boundary value
problems:- Solution of Heat equation, Solution of wave equation, Solution of Laplace equation.

Unit-IV
Fourier Transforms, Fourier sine transform, Fourier cosine transform, inverse
Fourier Transform, Inverse Fourier sine Transform, Inverse Fourier cosine Transform,
Properties of Fourier Transforms, Modulation theorem, Convolution theorem, Fourier
Transform of the derivatives of functions, Parseval’s identity.

Unit-V
Application of Fourier Transforms to the solution of initial –boundary value
problems:- Solution of Heat equation, Solution of diffusion equation, Solution of wave equation,
Solution of Laplace equation.

Text Boks
1. Integral Transforms by Vashishtha and Gupta.
2. Integral Transforms by Goyal and Gupta.

Reference Books
1. Integral Transforms by Sneddon.
Math 104  COMPUTER FUNDAMENTALS AND PROGRAMMING IN C

UNIT-I
An overview of functioning of a computer system, Components of a computer system, I/O and auxiliary storage devices, machine and high level languages, assembler, compiler and interpreters, flow charts and pseudo codes, Basic concepts of operating system.

UNIT-II

UNIT-III
Operators and expression in C-Precedence and associativity, Control flow statements Conditional branching, the switch statement, looping, nested loops, the break and continue statement, the go to statement, infinite loops.

UNIT-IV
Arrays and multidimensional arrays. Storage classes-fixed vs. automatic duration scope, global variable the register specifier, Functions –user defined and library function, Introduction to pointers, structures and unions.

UNIT-V
Introduction to C++: Declaration & Definition of Variables, Data Types, Operators, OOPS Fundamentals: OOPS Versus procedural programming. OOPS terminology, Data abstraction, Data hiding, Encapsulation, Class, Object, Inheritance, Polymorphism.

Text books:
1. Computer fundamental by Rajaraman
2. Operating systems concepts by Peterson
5. Schaum’s outline series.

Reference Books:
1. Let us C by Y. Kanetkar.
Math 105

MECHANICS

Unit-I

Unit-II
Cyclic coordinates, Routh’s equations, Poisson’s Bracket, Poisson’s identity, Jacobi-Poisson Theorem, Motivating Problems of calculus of variations, Shortest distance, Minimum surface of revolution, Brachistochorde Problems, Isoperimetric problems, Geodesic.

Unit-III
Fundamental lemma of calculus of variation, Euler’s equation for one dependent function, Generalization of Euler’s equations to (i) ‘n’ dependent functions, (ii) higher order derivatives.

Unit-IV

Unit-V
Hamilton-Jacobi equation, Jacobi theorem, Method of separation of Variables, Lagrange Brackets, Condition of canonical character of a transformation in terms of Lagrange brackets and Poisson brackets, Invariance of Lagrange brackets and Poisson brackets under canonical transformations.

Text Books: