DETAILS OF UNDERGRADUATE COURSES OFFERED BY DEPARTMENT OF MATHEMATICS TO STUDENTS OF DIFFERENT DEPARTMENTS

For The Department of Urban & Regional Planning

Level - 1, Term - 1

MATH 101 (Algebra, Geometry and Matrix Algebra)

Mathematics - I (2.00 Credit Hours)

Algebra and Geometry: Algebra in system description. Graphs and coordinate geometry. Linear equations. Interpretation of linear inequalities. Graphical solution of equations. Function: Definition, implicit and inverse functions, the standard functions, the power function, the logarithmic function, the exponential function, trigonometric function, polynomial and rational functions, the hyperbolic function, the logistic function.

Matrix Algebra: Definition of matrix. Algebra of matrices. Multiplication of matrices. Transpose of a matrix and inverse of a matrix. Rank and elementary transformation of matrices. Solution of linear equations.

Level - 1, Term - 2

MATH 103 (Calculus and Differential Equation) Mathematics-II (2.00 Credit Hours)

Differential Calculus: Limits, continuity and differentiability. Successive differentiation. Maxima and minima of functions of single variable.

Integral Calculus: Integration by substitution and by parts. Standard integrals. Definite integrals. Area under plane curves.

Ordinary Differential Equation: Solution of first order differential equations by various methods. Solution of general linear equations of second and higher order with constant coefficients. Solution of homogeneous linear equations.

For The Department of Architecture

Level -1, Term-1

MATH 111 (Calculus and Solid Geometry)

2.00 Credit Hours

Differential Calculus: Definition of limit, continuity and differentiability. Successive and partial differentiation. Maxima and minima.

Integral Calculus: Integration by parts. Standard integrals. Definite integrals. Area under plane curves in Cartesian coordinates.

Solid Geometry: System of coordinates. Distance between two points. Section formula. Direction cosines. Equations of planes and straight lines. Shortest distance between two given straight lines. Standard equations of sphere and ellipsoid. Tangent planes.

For The Department of Bio Medical Engineering

Level-1, Term-1

MATH 113 (Calculus)

3.00 Credit, 3 hours/week

Differential Calculus: Limits, continuity and differentiability. Successive differentiation of various types of functions. Leibnitz's theorem. Rolle's theorem, Mean value theorem, Taylor's and Maclaurin's theorems in finite and infinite forms. Expansion of functions. Evaluation of indeterminate forms by L'Hospital's rule. Partial differentiation, Euler's theorem. Tangent and Normal. Subtangent and subnormal in Cartesian and polar coordinates. Determination of maximum and minimum values of functions with applications. Curvature. Asymptotes.

Integral Calculus: Integration by the method of substitution. Standard integrals. Integration by successive reduction. Definite integrals, its properties and use in summing series. Walli's formulae. Improper integrals. Beta function and Gamma function. Area under plane curves and area of a region enclosed by two curves in Cartesian and polar coordinates. Volume and surface area of solids of revolution.

Level-1, Term-2

MATH 115 (Complex Variable and Vector Calculus)

3.00 Credit, 3 hours/week

Complex Variable: Complex number system. General functions of a complex variable. Limits and continuity of functions of complex variables and related theorems. Complex differentiation and the Cauchy-Riemann equations. Infinite series & their convergence. Line integral of complex functions. Cauchy's integral formula. Liouville's theorem. Taylor's and Laurent's theorem. Singular points. Residue, Cauchy's residue theorem.

Vector Calculus: Differentiation and integration of vectors together with elementary applications. Line, surface and volume integrals. Gradient of a scalar function, divergence and curl of a vector function. Integral forms of gradient, divergence and curl. Gauss's divergence theorem, Stokes' theorem and Green's theorem for the plane.

Level-2, Term-1

MATH 213 (Differential Equations)

3.00 Credit, 3 hours/week

Ordinary Differential Equations: Formation of differential equations. Solution of first order differential equations by various methods. Solution of general linear equations of second and higher order with constant coefficients. Solution of homogeneous linear equations. Solution of differential equations of the higher order when dependent and independent variables are absent. Solution of differential equations by the method based on factorization of operators. Frobenius method.

Partial Differential Equations: Formation of partial differential equations. Solutions of linear and nonlinear partial differential equations of first order. Linear equations of higher order. Equations of the second order with variable coefficients. Wave equations. Particular solutions with boundary and initial conditions.

Level-2, Term-2

MATH 215 (Linear Algebra)

3.00 Credit, 3 hours/week

Definition of matrices. Algebra of matrices. Transpose of a matrix and inverse of a matrix. Factorization. Determinants. Quadratic forms. Matrix polynomials. Eigenvalues and eigenvectors. Diagonalization.

Introduction to systems of linear equations. Gaussian elimination. Euclidean n-space. Linear transformations from IR^n to IR^m. Properties of' linear transformations from IR^n to IR^m. Real vector spaces and subspaces. Basis and Dimension. Row space, column space and null space. Rank and Nullity. Inner products. Angle and orthogonality in inner product spaces. Orthogonal basis: Gram-Schmidt process and QR-Decomposition. Linear transformations: Kernel and Range. Application to Computed Tomography.

Level-3, Term-1

MATH 313 (Probability and Statistics)

3.00 Credit, 3 hours/week

Measures of central tendency and variation, Chebychev's theorem, z-scores, Frequency distribution, Graphical representation of data including stem, Leaf and Box Plot,

Skewness, Kurtosis. Probability theory: Rules of probability, Conditional probability, Bayes's Theorem, Counting techniques. Random Variable: Concept of random variable, Discrete and Continuous random variable, variance of random variable and their properties. Discrete and Continuous Probability Distributions: Binomial, Multinomial, Negative binomial, Normal, Poisson, Exponential, Uniform, Gamma distribution. Sampling Theory: Sampling distribution of mean, and Sampling procedures. Regression and Correlation: ANOVA. Statistical Inference: Estimation of parameters. Hypothesis Testing: z-test, t-test and Goodness of fit.

For The Department of Chemical Engineering

Level-1, Term-1

MATH 121 (Differential Calculus and Coordinate Geometry)

3.00 Credit Hours

Differential Calculus: Continuity and differentiability of functions. Successive differentiation of various types of functions. Leibnitz's theorem. Rolle's theorem and Mean value theorem. Expansion of functions. Partial differentiation. Tangent and normal in Cartesian and polar coordinates. Maximum and minimum. Indeterminate forms.

Coordinate Geometry: Change of axes. Transformation of coordinates, simplification of equation of curves. Conic section Pair of straight lines. System of circles. Parabola, Ellipse and Hyperbola.

Level-1, Term-2

MATH 123 (Integral Calculus and Differential Equations)

3.00 Credit Hours

Integral Calculus: Integration by the method of substitution. Integration by the method of successive reduction. Definite integrals with properties. Improper integrals. Beta function and Gamma function. Area under plane curves in Cartesian and polar coordinates. Area of the region enclosed by two curves in Cartesian and polar coordinates. Area and volume of surface of revolution.

Ordinary Differential Equations: Solution of first order differential equations by various methods. Solution of general linear equations of second and higher order with constant coefficients. Solution of homogeneous linear equations with applications. Solution of differential equations of higher order when dependent and independent variables are absent. Solution of differential equations by the method based on factorization of operators.

Level-2, Term-1

MATH 221 (Vector Analysis, Matrices and Laplace Transform)

4.00 Credit Hours

Vector Analysis: Scalars and vectors, equality of vectors. Addition and subtraction of vectors. Multiplication of vectors by scalars. Position vector of a point. Resolution of vectors. Scalar and vector product of two vectors and their geometrical interpretation. Triple product and multiple product. Application to geometry and mechanics. Linear dependence and independence of vectors. Differentiation and integration of vectors together with elementary applications. Definition of line, surface and volume integrals. Gradient, divergence and curl of point functions. Various formulae. Gauss's theorem, Stokes' theorem, Green's theorem and their applications.

Matrices: Definition of matrix. Different types of matrices. Algebra of matrices. Adjoint and inverse of a matrix. Elementary transformations of matrices and rank. Normal and canonical forms. Solution of linear equations. Quadratic forms. Matrix polynomials. Cayley-Hamilton theorem. Eigenvalues and eigenvectors.

Laplace Transform: Definition. Laplace transforms of some elementary functions. Sufficient conditions for existence of Laplace transforms. Inverse Laplace transforms. Laplace transforms of derivatives. The unit step function. Periodic function. Some special theorem on Laplace transforms. Partial fraction. Solution of differential equations by Laplace Trnaforms. Solution of integral and difference equations by Laplace transforms. Evaluation of improper integrals.

Level-2, Term-2

MATH 223 (Numerical Analysis and Statistics)

3.00 Credit Hours

Numerical Analysis: Interpolation. Simple difference. Newton's formulae for forward and backward interpolation. Divided differences. Tables of divided differences. Relation between divided differences and simple differences. Newton's general interpolation formula. Lagrange's interpolation formula. Inverse interpolation by Lagrange's formula and by successive approximations. Numerical differentiation using Newton's forward and backward formulae. Numerical integration. General quadrature formula for equidistant ordinates. Trapezoidal rule. Simpson's rule. Weddle's rule. Calculation of errors. Relative study of three rules. Gauss's quadrature formula. Legendre polynomials. Newton-Cotes formula. Principles of least squares.

Curve fitting. Solution of algebraic and transcendental equations by graphical method. Regula-Falsi method. Newton-Raphson method. Geometrical significance. Convergence of iteration and Newton-Raphson methods. Newton-Raphson method and iteration method for the solution of simultaneous equations. Solution of ordinary first order differential equations by Picard's and Euler's method. Runge-Kutta method for solving differential equations.

Statistics: Frequency distribution. Mean, median, mode and other measures of central tendency. Standard deviation and other measures of dispersion. Moments, skewness and kurtosis. Elementary probability theory and discontinuous probability distribution, e.g. Binomial, Poisson and Negative binomial distribution. Continuous probability distributions, e.g. Normal and Exponential distribution. Characteristics of distributions. Hypothesis testing and regression analysis. Time series analysis. Markov chain.

Level-3, Term-1

MATH 321 (Complex Variable, Bessel's Function and Legendre polynomials)

3.00 Credit Hours

Complex Variable: Complex number system. General functions of complex variables. Limits and continuity of functions of complex variables and related theorems. Complex differentiation and the Cauchy-Riemann equations. Mapping of elementary functions. Line integral of complex functions. Cauchy's integral theorem. Cauchy's integral formula. Liouville's theorem. Taylor's and Laurent's theorem. Singular points. Residues and Cauchy's residue theorem. Evaluation of residues. Contour integration. Conformal mapping.

Bessel's Function and Legendre Polynomials: Solution of differential equations in series by the method of Frobenius. Bessel's functions, Legendre polynomials and their properties.

Level-3, Term-2

MATH 323 (Fourier Analysis, Harmonic Functions and Partial Differential Equation)

3.00 Credit Hours

Fourier Analysis: Real and complex form of Fourier series. Finite Fourier transform. Fourier Integral. Fourier transforms and their uses in solving boundary value problems.

Harmonic Functions: Definition of harmonics. Laplace equation in Cartesian, polar, cylindrical and spherical coordinates. Solution of these equations together with applications. Gravitational potential due to a ring. Steady-state temperature. Potential inside or outside of a sphere. Properties of harmonic functions.

Partial Differential Equations: Introduction. Solution of the linear and nonlinear first order partial differential equations. Standard forms. Linear equations of higher order. Equations of the second order with variable coefficients.

For The Department of Civil Engineering

Level-1, Term-1

MATH 137 (Differential & Integral Calculus, Matrices)

3.00 Credit Hours

Differential Calculus: Limits, continuity and differentiability. Successive differentiation and Leibnitz's theorem. Expansion of functions. Indeterminate forms. Partial differentiation. Euler's theorem. Tangent and Normal. Maxima and minima of functions of single variable.

Integral Calculus: Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals. Beta function. Gamma function. Multiple integrals.

Matrices: Definition of different kinds of matrices. Algebra of matrices. Inverse of a matrix. Rank and elementary transformation of matrices. Solution of systems of linear equations. Eigenvalues and eigenvectors. Cayley-Hamilton theorem.

Level-1, Term-2

MATH 139 (Differential Equations and Statistics)

3.00 Credit Hours

Ordinary Differential Equations: Formation of differential equations. Solution of first order differential equations by various methods. Solution of differential equations of first order but higher degree. Solution of general linear differential equations of second and higher order with constant coefficients. Solution of Euler's homogeneous linear differential equations.

Partial Differential Equations: Introduction. Linear and nonlinear first order differential equations. Standard forms. Linear equations of higher order. Equations of the second order with variable coefficients.

Statistics: Measures of central tendency and standard deviation. Moments, skewness and kurtosis. Elementary probability theory and discontinuous probability distribution. Continuous probability distributions, e.g. normal and exponential. Hypothesis testing and regression analysis.

Level-2, Term-1

MATH 237 (Laplace Transform and Vector Analysis)

3.00 Credit Hours

Laplace Transforms: Definition of Laplace transforms. Sufficient conditions for existence of Laplace transforms. Inverse Laplace transforms. Laplace transforms of derivatives. The unit step function. Periodic function. Some special theorems on Laplace transforms. Partial fraction. Solution of differential equations by Laplace transforms.

Vector Analysis: Scalars and vectors, equality of vectors. Addition and subtraction of vectors. Multiplication of vectors by scalars. Position vector of a point. Scalar and vector product of two vectors and their geometrical interpretation. Triple and multiple product of vectors. Linear dependence and independence of vectors. Definition of line, surface and volume integrals. Gradient, divergence and curl of point functions. Gauss's theorem, Stokes' theorem, Green's theorem and their applications.

For The Department of Water Resources Engineering

Level-1, Term-1

MATH 131 (Differential Calculus and Integral Calculus)

3.00 Credit Hours

Differential Calculus: Limits, continuity and differentiability. Derivatives of standard functions. Leibnitz's theorem. Rolle's theorem and Meanvalue theorem. Expansion in finite and infinite forms. Indeterminate forms. Partial differentiation. Euler's theorem. Tangent and Normal. Subtangent and subnormal in Cartesian and polar coordinates. Maximum and minimum of functions of single variable. Curvature.

Integral Calculus: Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals. Improper integrals. Beta function. Gamma function. Jacobian. Multiple integrals. Area and volume of solids of revolution.

Level-1, Term-2

MATH 133 (Matrices and Three dimensional Coordinate Geometry)

3.00 Credit Hours

Matrices: Definition of matrix. Algebra of matrices. Multiplication of matrices. Transpose of a matrix and inverse of a matrix. Rank and elementary transformations of matrices. Solution of linear equations. Linear dependence and independence of vectors. Quadratic forms. Matrix polynomials. Determination of characteristic roots and vectors. Null space and nullity of a matrix. Characteristic subspace of a matrix.

Three Dimensional Coordinate Geometry: System of coordinates. Projection. Direction cosines. Equations of planes and lines. Angle between lines and planes. Distance from a point to a plane. Coplanar lines. Shortest distance between two straight lines. Standard equation of conicoids: Sphere, ellipsoid, hyperboloid of one sheet, hyperboloid of two sheets. Tangent planes. Normal lines. Condition of tangency.

Level-2, Term-1

MATH 231 (Differential Equations)

3.00 Credit Hours

Differential Equations: Definition. Formation of differential equations. Solution of first order differential equations by various methods. Solution of differential equations of first order and higher degree. Solution of general linear equations of second and higher order with constant coefficients. Solution of Euler's homogeneous linear equations. Solution of differential equations in series by the method of Frobenius. Bessel's functions, Legendre polynomials and their properties.

Partial Differential Equations: Introduction. Solutions of linear and nonlinear differential equations of first order. Standard forms. Linear equations of higher order. Equations of the second order with variable coefficients.

Level-2, Term-2

MATH 233 (Fourier Analysis, Harmonic Functions and Laplace Transform)

3.00 Credit Hours

Fourier Analysis: Real and complex form of Fourier series. Finite Fourier transform. Fourier integrals. Fourier transforms and their uses in solving boundary value problems.

Harmonic functions: Definition of harmonics. Laplace's equation in Cartesian, polar, cylindrical and spherical coordinates. Solution of these equations together with applications. Gravitational potential due to a ring. Steady-state temperature. Potential inside or outside of a sphere. Properties of harmonic functions.

Laplace Transforms: Definition. Laplace transforms of some elementary functions. Sufficient conditions for existence of Laplace transforms. Inverse Laplace transforms. Laplace transforms of derivatives. The unit step function. Periodic functions. Some special theorems on Laplace transforms. Partial fraction. Solution of differential equations by Laplace transforms. Evaluation of improper integrals.

Level-2, Term-2

MATH 235 (Vector Analysis and Statistics)

3.00 Credit Hours

Vector Analysis: Scalars and vectors, equality of vectors. Addition and subtraction of vectors. Multiplication of vectors by scalars. Position vector of a point. Resolution of vectors. Scalar and vector product of two vectors and their geometrical interpretation. Triple product and multiple product. Application to geometry and mechanics. Linear dependence and independence of vectors. Differentiation and integration of vectors together with elementary applications. Definition of line, surface and volume integrals. Gradient, divergence and curl of point functions. Various formulae: Gauss's theorem, Stokes' theorem, Green's theorem and their applications.

Statistics: Frequency distribution. Mean, median, mode and other measures of central tendency. Standard deviation and other measures of dispersion. Moments, skewness and kurtosis. Elementary probability theory and discontinuous probability distribution, e.g. binomial, Poisson and negative binomial. Continuous probability distributions, e.g. normal and exponential. Characteristics of distributions. Elementary sampling theory. Estimation. Hypothesis testing and regression analysis.

For The Department of Computer Science & Engineering

Level-1, Term-1

MATH 145 (Differential Calculus, Integral Calculus and Co-ordinate Geometry)

3.00 Credit Hours

Differential Calculus. Continuity and differentiability. Leibnitz's Theorem. Rolle's Theorem. Mean value Theorem in finite and infinite forms. Lagrange's form of remainders. Cauchy's form of remainder. Expansion of functions. Evaluation of indeterminate forms by L'Hospitals rule. Partial differentiation. Euler's Theorem. Tangent and Normal. Subtangent and subnormal in Cartesian and polar coordinates. Maximum and minimum values of functions of single variable. (1.0 credit)

Integral Calculus: Definite integrals and its properties. Walli's formula. Improper integrals. Beta function and Gamma function. Area under a plane curve in cartesian and polar coordinates. Area of the region enclosed by two curves in Cartesian and polar coordinates. Arc lengths of curves in Cartesian and polar coordinates. Volume of solids of revolution. Area of' surface of revolution. Multiple integrals. (1.0 credit)

Coordinate Geometry: Transformation of coordinates axes and its uses. General equations of second degree and their reduction to standard forms. Pair of straight lines. System of circles. Coaxial

circles and limiting points. Equations of parabola, ellipse and hyperbola in Cartesian coordinates. Tangents and normals. Pair of tangents. Chord of contact. Chord in terms of its middle point. Parametric coordinates. Conjugate diameters. Asymptotes. (1.0 Credit)

Level-1, Term-2

MATH 147 (Ordinary Differential Equation (ODE), Partial Differential Equations (PDE) & Vector Calculus)

4.00 Credit Hours

Ordinary Differential Equation (ODE): Degree and order of ordinary differential equation. Formation of differential equations. Solution of first order differential equations by various methods. Solution of first order but higher degree ordinary differential equations. Solution of general linear equations of second and higher orders with constant coefficients; Solution of homogeneous linear equations and its applications. Solution of differential equations of higher order when dependent and independent variables are absent. (1.5 credit)

Partial Differential Equations (PDE): Introduction; Solution of linear and non-linear PDE of order one. Second order linear PDE: its nomenclature and classifications to standard forms: Parabolic Elliptic and Hyperbolic. Solution of second order linear PDE by separation of variables. Higher order linear PDE with constant coefficients. (1.0 credit)

Vector Calculus: Multiple products of vectors. Differentiation and integration of vectors together with elementary applications. Gradient, divergence and curl of point functions. Various formulae. Definition of line, surface and volume integrals. Green's theorem. Gauss's theorem. Stoke's theorem. (1.5 credit)

Level-2, Term-1

MATH 245 (Complex Variable and Statistics)

3.00 Credit Hours

Complex Variable: Functions of a complex variable. Limits and continuity of functions of complex variable. Complex differentiation and Cauchy-Riemann Equations. Mapping by elementary functions. Line integral of a complex function. Cauchy's Integral Theorem. Cauchy's Integral Formula. Liouville's Theorem. Taylor's Theorem and Laurent's theorem. Singular points. Residue. Cauchy's Residue Theorem. Contour integration. Mapping. (1.5 Credit)

Statistics: Frequency distribution; Measures of central tendency. Standard deviation and other measures of dispersion. Moments, Skewness and kurtosis. Elementary probability theory. Random variable, Mathematical expection. Discontinuous probability distribution: Binomial, Poisson and Negative binomial. Continuous probability distribution: Normal and Exponential. Hypothesis testing and regression analysis. (1.5 Credit)

Level-2, Term-2

MATH 247 (Linear Algebra, Laplace Transform & Fourier Analysis)

4.00 Credit Hours

Linear Algebra: Introduction to systems of linear equations. Gaussian elimination. Inverse of matrix. Eigen values and eigen vectors. Cayley-Hamilton theorem. Euclidean n-space. Linear transformations from IR^n to IR^m. Properties of linear transformations from IR^n to IR^m. Real vector spaces and subspaces. Basis and Dimension, Change of basis, Rank and Nullity. Inner product spaces. Diagonalization. Linear transformations: Kernel and Range.

(1.5 credit)

Laplace Transform & Fourier Analysis: Laplace transforms of some elementary functions including unit step function; Periodic function etc. Inverse Laplace transforms. Solutions of differential equations by Laplace transforms.

Fourier series: Fourier Integrals. Fourier transforms and their uses in solving boundary value problems of wave equations. (1.5 credit)

For The Department of Electrical & Electronic Engineering

Level-1, Term-1

MATH 157 (Calculus-I)

3.00 Credit Hours

Differential Calculus: Limits, continuity and differentiability. Successive differentiation of various types of functions. Leibnitz's theorem. Rolle's theorem, Meanvalue theorem, Taylor's and Maclaurin's theorems in finite and infinite forms. Lagrange's form of remainder. Cauchy's form of remainder. Expansion of functions. Evaluation of indeterminate forms by L'Hospital's rule. Partial differentiation, Euler's theorem. Tangent and Normal. Subtangent and subnormal in Cartesian and polar coordinates. Determination of maximum and minimum values of functions. Curvature. Asymptotes and curve tracing.

Integral Calculus: Integration by the method of substitution. Standard integrals. Integration by successive reduction. Definite integrals, its properties and use in summing series. Walli's formulae. Improper integrals. Beta function and Gamma function. Area under plane curves and area of a region enclosed by two curves in Cartesian and polar coordinates. Volume and surface area of solids of revolution.

Level-1, Term-1

MATH 159 (Calculus-II)

3.00 Credit Hours

Complex Variable: Complex number system. General functions of a complex variable. Limits and continuity of functions of complex variables and related theorems. Complex differentiation and the Cauchy-Riemann equations. Infinite series. Convergence and uniform convergence. Line integral of complex functions. Cauchy's integral formula. Liouville's theorem. Taylor's and Laurent's theorem. Singular points. Residue, Cauchy's residue theorem.

Vector Analysis: Multiple product of vectors. Linear dependence and independence of vectors. Differentiation and integration of vectors together with elementary applications. Line, surface and volume integrals. Gradient of a scalar function. divergence and curl of a vector function. Various formulae. Integral forms of gradient, divergence and curl. Gauss's divergence theorem, Stokes' theorem and Green's theorem.

Level-1, Term-2

MATH 257 (Ordinary and Partial Differential Equations)

3.00 Credit Hours

Ordinary Differential Equations: Degree and order of ordinary differential equations. Formation of differential equations. Solution of first order differential equations by various methods. Solution of general linear equations of second and higher order with constant coefficients. Solution of homogeneous linear equations. Solution of differential equations of the higher order when dependent and independent variables are absent. Solution of differential equations by the method based on factorization of operators. Frobenius method.

Partial Differential Equations: Introduction. Solutions of linear and nonlinear partial differential equations of first order. Linear equations of higher order. Equations of the second order with variable coefficients. Wave equations. Particular solutions with boundary and initial conditions.

Level-2, Term-1

MATH 259 (Linear Algebra)

3.00 Credit Hours

Introduction to systems of linear equations. Gaussian elimination. Definition of matrices. Algebra of matrices. Transpose of a matrix and inverse of a matrix. Factorization. Determinants. Quadratic forms. Matrix polynomials. Euclidean n-space. Linear transformations from IR^n to IR^m. Properties of' linear transformations from IR^n to IR^m. Real vector spaces and subspaces. Basis and Dimension. Rank and Nullity. Inner product spaces: Gram-Schmidt process and QR-Decomposition. Eigenvalues and eigenvectors. Diagonalization. Linear transformations: Kernel and Range. Application of linear algebra to electric networks.

Level-2, Term-2

MATH 357 (Probability and Statistics)

3.00 Credit Hours

Introduction. Sets and probability. Random variables. Properties describing distributions. Treatment of grouped sample data. Some discrete probability distributions. Normal distribution.

Sampling theory. Estimation theory. Tests of hypotheses. Regression and correlation. Analysis of variance.

For The Department of Mechanical Engineering

Level-1, Term-1

MATH 161(Differential Calculus, Three Dimensional Co-ordinate Geometry and Vectors)

4.00 Credit Hours

Differential Calculus: Differentiation of explicit and implicit functions and parametric equations. Successive differentiation of various types of functions. Leibnitz's theorem. Rolle's theorem, Meanvalue theorem. Taylor's theorem in finite and infinite forms. Maclaurin's theorem in finite and infinite forms. Lagrange's form of remainder. Cauchy's form of remainder. Expansion of functions. Partial differentiation, Euler's theorem. Tangent and Normal. Subtangent and subnormal in Cartesian and polar coordinates. Determination of maximum and minimum values of functions. Points of inflexion. Applications. Evaluation of indeterminate forms by L' Hospital's rule. Curvature, radius of curvature, center of curvature and chord of curvature. Evolute and involute. Asymptotes. Envelopes, curve tracing.

Three Dimensional Coordinate Geometry: System of coordinates. Distance between two points. Section formula. Projections. Direction Cosines. Equations of planes and lines.

Vectors: Definition of vectors, equality of vectors. Addition and multiplication of vectors. Triple product and multiple product. Application to geometry and mechanics. Linear dependence and independence of vectors.

Level-1, Term-2

MATH 163 (Integral Calculus and Differential Equations)

4.00 Credit Hours

Integral Calculus: Definition. Integration by the method of substitution. Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals, its properties and use in summing series. Walli's formula. Improper integrals. Beta function and gamma function. Area under plane curves in Cartesian and polar coordinates. Area of the region enclosed by two curves in Cartesian and polar coordinates. Trapezoid rule, Simpson's rule. Arc lengths of curves in Cartesian and polar coordinates. Parametric and pedal equations. Intrinsic equation. Volume of solids of revolution. Volume of hollow solids of revolution by shell method. Area of surface of revolution. Convergence and divergence of infinite series.

Ordinary Differential Equations: Formation of differential equations. Solution of first order differential equations by various methods. Solution of general linear equations of second and higher order with constant coefficients. Solution of homogeneous linear equations with applications. Solution of differential equations of higher order when dependent and independent variables are absent. Solution of differential equations by the method based on factorization of operators.

Level-2, Term-1

MATH 261 (Matrices, Vector Calculus, Series Solution, Laplace Transforms)

4.00 Credit Hours

Matrices: Types of matrices and algebraic properties. Rank and elementary transformations of matrices. Solution of linear equations using matrix. Linear dependence and independence of vectors. Quadratic forms. Matrix polynomials. Determination of characteristic roots and vectors.

Vector Calculus: Differentiation and integration of vectors together with elementary applications. Line, surface and volume integrals. Gradient of scalar functions. Divergence and curl of vector functions. Physical significance of gradient, divergence and

curl. Stokes' theorem, Green's theorem, Gauss's theorem and their applications.

Series Solution: Solution of differential equations in series by the method of Frobenius. Besesl's functions, Legendre's polynomials and their properties.

Laplace Transforms: Definition of Laplace transforms. Elementary transformation and properties. Convolution theorem. Solution of differential equations by Laplace transforms. Evaluation of integrals by Laplace transforms.

Level-2, Term-2

MATH 263 (Complex Variable, Fourier series, Harmonic Functions and Partial Differential Equations)

4.00 Credit Hours

Complex Variable: Complex number system. General functions of complex variables. Limits and continuity of functions of complex variables and related theorems. Complex differentiation and the Cauchy-Riemann equations. Mapping by elementary functions. Line integral of complex functions. Cauchy's integral theorem. Cauchy's integral formula. Liouville's theorem. Taylor's and Laurent's theorem. Singular points. Residues and Cauchy's

residue theorem. Evaluation of residues. Contour integration. Conformal mapping.

Fourier Series: Real and complex form of Fourier series. Finite Fourier transform. Fourier integrals. Fourier transforms and their uses in solving boundary value problems.

Harmonic Functions: Definition of harmonics. Laplace's equation in Cartesian, polar, cylindrical and spherical coordinates. Solution of these equations together with applications. Gravitational potential due to a ring. Steady-state temperature. Potential inside or outside of a sphere. Properties of harmonic functions.

Partial Differential Equations: Introduction. Solutions of linear and nonlinear differential equations of first order. Linear equations of higher order. Equations of the second order with variable coefficients.

For The Department of Materials & Metallurgical Engineering

Level-1, Term-1

MATH 171 (Calculus and Differential Equation)

3.00 Credit Hours

Differential Calculus: Limits, continuity and differentiability of functions. Successive differentiation, Leibnitz's theorem. Partial differentiation, Euler's theorem. Tangent and normal. Maximum and minimum.

Integral Calculus: Integration by the method of substitution. Standard integrals. Integration by parts. Definite integrals and their properties. Area under plane curves in Cartesian and polar coordinates. Surface area and volumes of solids of revolution.

Ordinary Differential Equations: Definition. Formation of differential equations. Solution of first order differential equations by various methods. Solution of differential equations of first order and higher degree. Solution of general linear equations of second and higher order with constant coefficients. Solution of Eluler's homogeneous linear equations.

Level-1, Term-2

MATH 173 (Vector Analysis and Matrices)

3.00 Credit Hours

Vector Analysis: Scalars and vectors, equality of vectors. Addition and subtraction of vectors. Multiplication of vectors by scalars. Position vector of a point. Resolution of vectors. Scalar and vector product of two vectors and their geometrical interpretation. Triple product and multiple product. Application to geometry and mechanics. Linear dependence and independence of vectors. Differentiation and integration of vectors together with elementary applications. Definition of line, surface and volume integrals. Gradient, divergence and curl of point functions. Various formulae. Gauss's theorem, Stokes' theorem, Green's theorem and their applications.

Matrices: Definition of matrix. Different types of matrices. Algebra of matrices. Adjoint and inverse of a matrix. Rank and elementary transformations of matrices. Normal and canonical forms. Solution of linear equations. Quadratic forms. Matrix polynomials. Cayley-Hamilton theorem. Different types of eigenvalues and corresponding eigenvectors.

Level-2, Term-1

MATH 271 (Numerical Analysis, Statistics and Partial Differential Equations)

4.00 Credit Hours

Numerical Analysis: Interpolation: Simple difference. Newton's formulae for forward and backward interpolations. Divided differences. Relation between divided differences and simple differences. Newton's general interpolation formula. Legrange's interpolation formula. Inverse interpolation by Lagrange's formula and by successive approximations. Numerical differentiation of Newton's forward and backward formulae. Numerical integration. General quadrature formula for equidistant ordinates. Trapezoidal rule. Simpson's rule. Weddle's rule. Calculation of errors. Relative study of three rules. Gauss's quadrature formula. Legendre polynomials. Newton-Cotes formula. Principles of least squares. Curve fitting. Solution of algebraic and transcendental equations by graphical method. Regula-Falsi method. Newton-Raphson method, geometrical significance. Iteration method. Convergence of iteration and Newton-Raphson methods. Newton-Raphson method and iteration method for the solution of simultaneous equations. Solution of ordinary first order differential equations by Picard's and Euler's method. Runge-Kutta method for solving differential equations.

Statistics: Frequency distribution. Mean, median, mode and other measures of central tendency. Standard deviation and other measures of dispersion. Moments, skewness and kurtosis. Elementary probability theory and discontinuous probability distribution, e.g. binomial, Poisson and negative binomial distribution. Continuous probability distributions, e.g. normal and exponential distribution. Characteristics of distributions. Elementary sampling theory. Estimation. Hypothesis testing and regression analysis.

Partial Differential Equations: Introduction. Solutions of linear and nonlinear partial differential equations of first order. Linear equations of higher order. Equations of the second order with variable coefficients.

For The Department of Naval Architecture & Marine Engineering

Level-1, Term-1

MATH 181 (Differential Calculus and Integral Calculus)

3.00 Credit Hours

Differential Calculus: Limits, continuity and differentiability. Differentiation of explicit and implicit functions and parametric equations. Differentials. Successive differentiation of various types of functions, Leibnitz's theorem. Rolle's theorem, Meanvalue theorem, Taylor's theorem, Maclaurin's theorem, Lagrange's form of remainder, Cauchy's form of remainder. Expansion of functions by differentiation and integration. Evaluation of indeterminate forms by L'Hospital's rule. Equations of tangent and normal. Partial differentiation. Euler's theorem. Maximum and minimum values of functions of single variable. Curvature, circle of curvature. Asymptotes.

Integral Calculus: Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals with properties. Improper integrals. Beta function and Gamma function. Area, arc lengths of curves in Cartesian and polar coordinates. Volumes of solids of revolution. Area of surface of revolution.

Level-1, Term-2

MATH 183 (Coordinate Geometry, Ordinary Differential Equations)

3.00 Credit Hours

Coordinate Geometry: Change of axes, transformation of coordinates. Pair of straight lines. System of circles. Coaxial circles and limiting points. Equations of parabola, ellipse and hyperbola in Cartesian and polar coordinates. Tangents and normals. Pair of tangents. Chord of contact. Chord in terms of its middle points. Parametric coordinates. Diameters, conjugate diameters and their properties.

Ordinary Differential Equations: Degree and order of ordinary differential equations. Formation of differential equations. Solution of first order differential equations by various methods. Solution of general linear equations of second and higher order with constant coefficients. Solution of homogeneous linear equations with applications. Solution of differential equations of higher order when dependent and independent variables are absent.

Level-2, Term-1

MATH 281 (Differential Equation (special types) and Vector Analysis)

3.00 Credit Hours

Differential Equations: Solution of homogeneous differential equations. Solution of differential equations by the method based on factorization of operators. Solution of differential equations in series by the method of Frobenius. Bessel's functions. Legendre's polynomials and their properties.

Vector Analysis: Scalars and vectors, equality of vectors. Addition and subtraction of vectors. Multiplication of vectors by scalars. Position vector of a point. Resolution of vectors. Scalar and vector product of two vectors and their geometrical interpretation. Triple product and multiple product of vectors. Application to geometry and mechanics. Linear dependence and independence of vectors. Differentiation and integration of vectors together with elementary applications. Definition of line, surface and volume integrals. Gradient, divergence and curl of point functions. Various formulae. Gauss's theorem. Stokes' theorem, Green's theorem and their applications.

Level-2, Term-2

MATH 283 (Partial Differential Equations, Matrices and Statistics)

3.00 Credit Hours

Partial Differential Equations: Introduction. Solutions of linear and nonlinear partial differential equations of first order. Linear equations of higher order. Equations of the second order with variable coefficients.

Matrices: Definition of matrix. Different types of matrices. Algebra of matrices. Adjoint and inverse of a matrix. Rank and elementary transformations of matrices. Normal and canonical forms. Solution of linear equations. Quadratic forms. Matrix polynomials. Cayley-Hamilton theorem. Eigenvalues and eigenvectors.

Statistics: Frequency distribution. Mean, median, mode and other measures of central tendency. Standard deviation and other measures of dispersion. Moments, skewness and kurtosis. Elementary probability theory and discontinuous probability distribution, e.g. binomial, Poisson and negative binomial distribution. Continuous probability distributions, e.g. normal and exponential distribution. Characteristics of distributions. Elementary sampling theory. Estimation. Hypothesis testing and regression analysis.

Level - 3, Term - 2

MATH 381 (Fourier Analysis, Harmonic Function, Complex Variable and Laplace Transform)

4.00 Credit Hours

Complex Variable: Complex number system. General functions of a complex variable. Limits and continuity of a function of complex variable and related theorems. Complex differentiation and the Cauchy-Riemann equations. Mapping by elementary functions. Line integral of a complex function. Cauchy integral theorem. Cauchy's integral formula. Liouville's theorem. Taylor's and Laurent's theorem. Singular points. Residues and Cauchy's residue theorem. Evaluation of residues. Contour integration. Conformal mapping.

Fourier Analysis: Real and complex form of Fourier series. Finite Fourier transform. Fourier Integrals, Fourier transforms and their uses in solving boundary value problems.

Harmonic Functions: Definition of harmonics. Laplace's equation in Cartesian, polar, cylindrical and spherical coordinates. Solution of these equations together with applications. Gravitational potential due to a ring. Steady-state temperature. Potential inside or outside of a sphere. Properties of harmonic functions.

Laplace Transforms: Definition of Laplace transforms. Elementary transformation and properties. Convolution theorem. Solution of differential equation by Laplace transforms. Evaluation of integrals by Laplace transforms.

For The Department of Industrial And Production Engineering

Level - 1, Term - 1

MATH 191 (Differential Calculus and Integral Calculus)

4.00 Credit Hours

Differential Calculus: Limits, continuity and differentiability. Differentiation of explicit and implicit functions and parametric equations. Differentials. Successive differentiation of various types of functions, Leibnitz's theorem. Rolle's theorem and Meanvalue theorem, Taylor's theorem in finite and infinite forms. Maclaurin's theorem in finite and infinite forms. Lagrange's form of remainder, Cauchy's form of remainder. Expansion of functions by differentiation and integration. Evaluation of indeterminate forms by L' Hospital's rule. Tangent and normal, subtangent and subnormal in Cartesian and polar coordinates. Partial differentiation, Euler's theorem. Maximum and minimum for

functions, points of inflection, applications. Curvature, circle of curvature and involute. Asymptotes. Envelopes. Curve tracing.

Integral Calculus: Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals with properties. Improper integrals. Beta function and Gamma function. Area, arc lengths of curves in Cartesian and polar coordinates. Volumes of solids of revolution. Area of surface of revolution.

Level - 1, Term - 2

MATH 193 (Vector, Matrix and Coordinate Geometry)

4.00 Credit Hours

Vectors: Definition of vectors, equality of vectors. Addition, subtraction and multiplication of vectors. Scalar and vector product of two vectors and their geometrical interpretation. Triple product, multiple product and their application to geometry and mechanics. Linear dependence and independence of vectors.

Matrices: Definition of matrix. Different types of matrices. Algebra of matrices. Adjoint and inverse of a matrix. Rank and elementary transformations of matrices. Normal and canonical forms. Solution of linear equations. Quadratic forms. Matrix polynomials. Eigenvalues and eigenvectors.

Coordinate Geometry: Transformation of coordinates and identification of conics. Three dimensional coordinate system. Projection. Direction cosines. Equations of planes and lines. Angle between lines and planes. Distance from a point to a plane. Coplanar lines. Shortest distance between two straight lines. Standard equations of sphere, ellipsoid, hyperboloid of one sheet, hyperboloid of two sheets. Tangent planes, normal lines. Condition of tangency.

Level - 2, Term - 1

MATH 291 (Differential Equations, Vector Calculus and Laplace transform)

3.00 Credit Hours

Ordinary Differential Equations: Formation of differential equations. Solution of first order differential equations by various methods. Solution of general linear equations of second and higher order with constant coefficients. Solution of homogeneous linear equations with applications. Solution of differential equations of higher order when dependent and independent variables are absent. Solution in series by Frobenius method. Bessel's function. Legendre's polynomials and their properties.

Vector Calculus: Differentiation and integration of vectors together with elementary applications. Line, surface and volume

integrals. Gradient of a scalar function. Divergence and curl of vector functions. Physical significance of gradient, divergence and curl. Gauss's theorem, Stokes' theorem, Green's theorem and their applications.

Laplace Transforms: Definition of Laplace transforms. Elementary transformation and properties. Convolution theorem. Solution of differential equations by Laplace transforms. Evaluation of improper integrals by Laplace transforms.

8. APPENDICES

Reference Books

Calculus

1. Calculus *by* Howard Anton, Irl Bivens and Stephen Davis.
2. Calculus with Analytic Geometry by Earl William Swokowski.
3. Integral Calculus with Applications by A. K. Hazra.
4. Schaum's Outline of Calculus by Frank Ayres and Elliott Mendelson.
5. Differential and Integral Calculus by B. C. Das and B. N. Mukherjee.
6. Differential Calculus by P. N. Chatterjee.
7. A Text Book on Differential Calculus by Khosh Mohammad and P. K. Bhattacharjee.
8. Precalculus by Michael Sullivan.

Coordinate Geometry

1. The elements of coordinate geometry by S. L. Loney.
2. Two Dimensional Coordinate Geometry by Mohammad Isa.
3. Elements of Coordinate Geometry by Kazi Md. Zahiruddin.
4. Solid Geometry: Analytical Geometry of Three Dimensions by Qazi Zameeruddin and Vijay K. Khanna.
5. A Text Book on Coordinate Geometry by Rahman & Bhattacharjee.
6. An Elementary Treatise on Coordinate Geometry of Three Dimensions *by* Robert J. T. Bell.
7. Coordinate Geometry by Zameeruddin.
8. Solid Geometry by M.L. Khanna.
9. Simplified Course in Coordinate Geometry by Raisinghania M.D., Saxena H.C., Dass H.K.
10. Coordinate Geometry (2-D and 3-D) by G. C. Sharma.

Differential Equations

1. Differential Equations with Applications by M. M. K. Chowdhury.
2. Differential Equations by Shepley L. Ross.
3. Schaum's Outline of Differential Equations by Richard Bronson and Gabriel Costa.
4. A First Course in Differential Equations with Modeling Applications by Dennis G. Zill.
5. Introduction to Partial Differential Equations and Boundary Value Problems by Rene Dennemeyer.
6. Elements of Partial Differential Equations by Ian Naismith Sneddon.
7. Advanced Engineering Mathematics by Peter V. O'Neil.

8. Advanced Engineering Mathematics by Dean G. Duffy.
9. Ordinary and Partial Differential Equations by M. D. Raisinghania.

Linear Algebra

1. Linear Algebra and Its Applications *by* Gilbert Strang.
2. Elementary Linear Algebra: Applications Version *by* Howard Anton and Chris Rorres.
3. Schaum's Outline of Theory and Problems of Linear Algebra by Seymour Lipschutz and Marc Lars Lipson.
4. Matrices and Linear Transformations by Mohammad Iman Ali.
5. Elementary Linear Algebra with Applications by Bernard Kolman.
6. Schaum's Outline of Theory and Problems of Matrices by Frank Ayres, Jr.

Vector Analysis

1. Advanced Engineering Mathematics by Peter V. O'Neil.
2. Vector Analysis with Applications *by* Md. Ali Ashraf and Md. Abdul Khaleq Hazra.
3. Elementary Linear Algebra: Applications Version *by* Howard Anton and Chris Rorres.
4. Advanced Engineering Mathematics by Erwin Kreyszig, Herbert Kreyszig and Edward J. Norminton.
5. Advanced Engineering Mathematics by Dean G. Duffy.
6. Schaum's Outline of Theory and Problems of Vector Analysis *by* Murray R. Spiegel.

7. Vector Analysis by M. D. Raisinghania.

Special Functions and Series Solution

1. Differential Equations with Applications by M. M. K. Chowdhury.
2. Advanced Engineering Mathematics by Peter V. O'Neil.
3. Advanced Engineering Mathematics by Erwin Kreyszig, Herbert Kreyszig and Edward J. Norminton.
4. Schaum's Outline of Theory and Problems of Advanced Calculus by Robert C. Wrede and Murray R. Spiegel.
5. Differential Equations by Shepley L. Ross.
6. Ordinary and Partial Differential Equations by M. D. Raisinghania.

Complex Variables

1. Complex Variables and Applications by James Ward Brown and Ruel V. Churchill.
2. Schaum's Outline of Theory and Problems of Complex Variables by Murray R. Spiegel.
3. Complex Variables: Harmonic and Analytic Functions by Francis J. Flangian.
4. Advanced Engineering Mathematics by Peter V. O'Neil.
5. Advanced Engineering Mathematics by Dean G. Duffy.

Harmonic Functions

1. Applied Mathematics for Engineers and Physicists by Louis Albert Pipes and Laurence R. Harvill.
2. Advanced Engineering Mathematics by Peter V. O'Neil.
3. Advanced Engineering Mathematics by Erwin Kreyszig, Herbert Kreyszig and Edward J. Norminton.

4. Harmonic Function Theory by Sheldon Axler, Paul Bourdon and Ramey Wade.
5. Advanced Engineering Mathematics by Dean G. Duffy.
6. Advanced Engineering Mathematics by H. K. Dass.

Laplace Transforms

1. Schaum's Outline of Laplace Transforms by Murray R. Spiegel.
2. Operational Mathematics by Ruel Vance Churchill.
3. Advanced Engineering Mathematics by Peter V. O'Neil.
4. Advanced Engineering Mathematics by Erwin Kreyszig, Herbert Kreyszig and Edward J. Norminton.
5. Advanced Engineering Mathematics by Alan Jeffrey.
6. Advanced Engineering Mathematics by H. K. Dass.

Fourier Series

1. Fourier Series and Boundary Value Problems by Ruel V. Churchill and James Ward Brown.
2. Schaum's Outline of Fourier Analysis with Applications to Boundary Value Problems by Murray R. Spiegel.
3. Advanced Engineering Mathematics by Peter V. O'Neil.
4. Fourier Series by Ian Naismith Sneddon.
5. Advanced Engineering Mathematics by Alan Jeffrey.
6. Advanced Engineering Mathematics by Dean G. Duffy.

Numerical Analysis

1. Numerical Methods for Mathematics, Science and Engineering by John H. Mathews.
2. An Introduction to Numerical Analysis by Kendall E. Atkinson.
3. Numerical Analysis by Richard L. Burden and J. Douglas Faires.
4. Numerical Methods for Engineers by Steven C. Chapra and Raymond P. Canale.
5. Introductory Methods of Numerical Analysis by S. S. Sastry.
6. Advanced Engineering Mathematics by Alan Jeffrey.

Statistics

1. An Introduction to Statistics and Probability by M. Nurul Islam.
2. Probability and Statistics for Engineers and Scientists by Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers and Keying Ye.
3. Probability and Statistics for Engineers by Irwin Miller and John E. Freund.
4. Probability and Statistics with Applications by Y. Leon Maksoudian.
5. Elements of Probability and Statistics by Frank Louis Wolf.

9. Basis for awarding marks for class participation and attendance will be as follows:

Attendance		Marks
90% and above		10
85% to less than	90%	9
80% to less than	85%	8
75% to less than	80%	7
70% to less than	75%	6
65% to less than	70%	5
60% to less than	65%	4
Less than	60%	0

For 2 credit courses 3 best out of 5, for 3 credit courses 4 best out of 6, and for 4 credit courses 5 best out of 7 quizzes may by considered for awarding grade. These may be considered as the

minimum recommended number of quizzes for any course. If the number of quizzes administered in a course exceeds these minimum numbers, than two-thirds best of all quizzes may be considered. The scheme of continuous assessment that a teacher proposes to follow for a course will be announced on the first day of classes.

10. Course system (Under Graduate)

Numerical grade	Letter grade	Grade point
80% or above	A^+ (A plus)	4
75% to less than 80%	A (A regular)	3.75
70% to less than 75%	A^- (A minus)	3.50
65% to less than 70%	B^+ (B plus)	3.25
60% to less than 65%	B (B regular)	3.00
55% to less than 60%	B^- (B minus)	2.75
50% to less than 55%	C^+ (C plus)	2.50

45% to less than 50%	C (C regular)	2.25
40% to less than 45%	D	2.00
Less than 40	F	0.00
Continuation	X	
(for project & thesis		
design courses)		

18/03/93Bs Zvwi‡L †Kvm© c×wZ gwbUwis KwgwUi mfvq †Kvm© c×wZi wbgœwjwLZ wm×všÍwU M„nxZ nq|

***** Total Marks nB‡Z Percentage Marks-G convert Kivi mgq Round of Kivi Rb¨ 0.5 and above †Kvm© msL¨v next higher whole number-G cwieZ©b n‡e and less than 0.5 previous whole number _vK‡e| (†hgb 8.5% nB‡Z 59%, 58.49% n‡e 58%)

Rules & Regulations for Course System (Vide A/C Resolution dated 14/3/96)

Article : 12 (Earned Credit)

* When a student will repeat a course in which he/she previously obtained a "**F**" grade, he/she will not be eligible to get a grade better than "**C**" in such a course.

* If a students obtains "**D**" grade in a course, he/she will be allowed to repeat the course for the purpose of grade improvement by forgoing his/her earlier grade, but he/she will not be eligible to get a grade better then "**C**" in such a course.