

MATHEMATICS FOR PHYSICS

YEAR & SEMESTER	: I Yr/ I SEM	CREDIT	: 4
CATEGORY	: AR	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 1100	OFFERING TO PHYSICS DEPT	

Objectives:

To familiarize the learner with applications of mathematics to physics.

Unit 1: The n th derivative-Leibnitz theorem and applications-subtangent and subnormal in cartesian and polar coordinates-slope of a curve and angle of intersection of curves in polar coordinates-maxima and minima.

Unit 2: Binomial, exponential and logarithmic series (no proof)-application to summation-matrices-Cayley-Hamilton theorem-rank-eigenvalues and eigenvectors.

Unit 3: Laplace transform of standard functions and periodic functions-inverse transform-application to differential equations.

Unit 4: Expansions of $\sin n\theta$, $\cos n\theta$ and $\tan n\theta$ - conversion of $\sin^n\theta$ and $\cos^n\theta$ in terms of sines/cosines of multiples of θ -power series for $\sin\theta$, $\cos\theta$ and $\tan\theta$ -hyperbolic functions.

Unit 5: Probability-mean-standard deviation-Binomial, Poisson and Normal distributions-expectation.

Text Books:

1. Narayanan, S. and Manickavachagam Pillai, T.K., *Calculus*, Vol. I & Vol. II, S.Viswanathan Printers & Publishers, 1996.
2. Manickavachagam Pillai, T.K, Natarajan,T. and Ganapathy,K.S. *Algebra*, Vol. I & Vol II, S.Viswanathan Printers & Publishers,1994.
3. Narayanan, S. *Trigonometry*,S.Viswanathan Printers & Publishers,1995.
4. S. P. Gupta, *Statistical Methods*, Sultan Chand and sons Publishers.

Reference Books:

1. Shanthi Narayanan, *Differential Calculus*, S.Chand & Co., 1964.
2. Vittal,P.R. *Trigonometry*, Margham Publications,1988.
3. Duraipandian, P., *Vector Analysis*, Emerald Publishers, 1984.

MATHEMATICS FOR STATISTICS

YEAR & SEMESTER	: I Yr/ I SEM	CREDIT	: 4
CATEGORY	: AR	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 1101	OFFERING TO STATISTICS DEPT	

Objectives:

To introduce the basic concepts in Calculus for the purpose of learning Mathematical Statistics.

Unit 1: Function-Classification of functions-Limit of a function-Simple examples-Continuous function-Differentiation of x^n , e^x , $\log x$, $\sin x$, $\cos x$, $\tan x$ -Product rule-Quotient rule-Function of function (Exclude Hyperbolic Functions) Logarithmic Differentiation (omit Transformation, Implicit Functions) Differentiation of one function with respect to another function.

Unit 2: Meaning of sign of the derivative (Exclude rate of change, Acceleration, Velocity) Maxima-minima problems (exclude exercise 20, 21) concavity-convexity-points of inflexion-Rolle's theorem-mean value theorem-statement and simple problem only.

Unit 3: Expression of functions-Taylor's and Maclaurin's series (statement only) Expansion of e^x , $\sin x$, $\log(1+x)$, $(1+x)^n$. Partial differentiation.

Unit 4: Integration- method of substitution-simple problems in exercises-1, 2, 3, 4, 5, 6. Rational algebraic functions, irrational functions.

Unit 5: Properties of definite integral-integration by parts-reduction formula- simple problems in multiple integrals- polar coordinates.

Text Books:

1. S. Narayanan, T.K. Manicavachagam pillai, 2007, *Calculus Volume I*, S. Viswanathan Printers and Publishers.
2. S. Narayanan, T.K. Manicavachagam pillai, 2007, *Calculus Volume II*, S. Viswanathan Printers and Publishers.

Reference Books:

1. Shanthi Narayanan, *Differential Calculus*, S.Chand & Co., 1964.
2. Shanthi Narayanan, *Integral Calculus*, S.Chand & Co., 1964

ALGEBRA AND CALCULUS-I

YEAR & SEMESTER	: I Yr/ I SEM	CREDIT	: 5
CATEGORY	: MC	NO. OF HOURS /WEEK	: 5
COURSE CODE	: MT 1502		

Objectives:

1. To emphasize basic concepts in Calculus.
2. To improve skills in solving problems in Algebra.

Unit 1: Leibnitz theorem and its applications-sub tangents and subnormal in cartesian and polar coordinates – slope of a curve and angle of intersection of curves in polar coordinates.

Unit 2: Maxima and Minima of functions of two and three independent variables-Lagrange's method of undetermined multipliers (without Proof).

Unit 3: Curvature-Radius of curvature in Cartesian and polar coordinates, centre of curvature, p-r equations-evolute-finding asymptotes of rational algebraic curves.

Unit 4: Theory of equations- irrational roots and imaginary roots - relation between roots and coefficients - sum of the r^{th} powers of roots - reciprocal equations.

Unit 5: Transformations- Descarte rule of signs- approximate solutions of polynomial by Newton's method and Horner's method- Cardon's method of solution of a cubic polynomial.

Text Books:

1. Narayanan, S. and Manickavachagam Pillai, T. K., *Calculus- Vol I*, S. Viswanathan Printers and Publishers, 1996. Unit 1- Chapter 3:1.1-1.5, 2.1 & 2.2, Chapter 9: 2, 4.1-4.5, Unit 2- Chapter 8: 4, 4.1 & 5. Unit 3- Chapter 10: 2.1-2.8, Chapter 11: 1-4.
2. Manickavachagam Pillai, T. K., Natarajan, T. and Ganapathy, K. S., *Algebra- Vol I*, S. Viswanathan Printers and Publishers, 1994. Unit 4- Chapter 6: 1-11, 13, 14 & 16, Unit 5 –Chapter 6: 21-24, 29.4-30 &34.1(i).

Reference Books:

1. Shanthi Narayanan, *Differential Calculus*, S.Chand & Co., 1964.
2. P. R. Vittal, *Allied Mathematics*, Margham Publications, 2000.

ANALYTICAL GEOMETRY OF 2D, TRIGONOMETRY AND MATRICES

YEAR & SEMESTER	: I Yr / I SEM	CREDIT	: 4
CATEGORY	: MC	NO. OF HOURS /WEEK	: 4
COURSE CODE	: MT 1503		

Objectives:

1. To introduce the expansions and hyperbolic functions in trigonometry.
2. To improve analytical skills.

Unit 1: Expansions of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ - Powers of sines and cosines of θ in terms of functions of multiples of θ - expansion of $\sin\theta$ and $\cos\theta$ in a series of ascending powers of θ .

Unit 2: Hyperbolic functions-relation between hyperbolic and circular functions-Inverse hyperbolic functions-Logarithms of a complex number.

Unit 3: Matrices – Cayley Hamilton theorem – Eigen values and Eigen vectors – Diagonalization of a matrix.

Unit 4: Conics – pole and polar – chord in terms of midpoint – pair of tangents – conjugate diameters for ellipse.

Unit 5: Asymptotes of hyperbola – rectangular hyperbola – polar equations of a line, circle and conic.

Text Books:

1. Narayanan, S. and Manickavachagam Pillai, T. K., *Trigonometry*, S. Viswanathan Printers and Publishers, 2007. Unit 1 – Chapter 3: 1, 2,4, 4.1, 5, & 5.1, Unit 2- Chapter 4: 1, 2, 2.1-2.3, Chapter 5: 5, 5.1 & 5.2.
2. Manickavachagam Pillai, T. K., Natarajan, T. and Ganapathy, K. S., *Algebra- Vol II*, S. Viswanathan Printers and Publishers, 1994. Unit 3- Chapter 2: 16, 16.1-16.4.
3. Manickavachagam Pillai and T. K., Natarajan., *Analytical Geometry (part I)*, S. Viswanathan Printers and Publishers, 1996. Unit 4- Chapter 6: 6-7, 13, Chapter 7: 15 & 16, Unit 5- Chapter 8: 8, 10, & 10.1, Chapter 9: 1-9.

Reference Books:

1. Vittal,P.R. *Trigonometry*, Margham Publications,1988.
2. P. R. Vittal, *Allied Mathematics*, Margham Publications , 2000.
3. Duraipandian, P., *Coordinate Geometry*, Emerald Publishers, 1984

MATHEMATICS FOR CHEMISTRY

YEAR & SEMESTER	: I Yr/ II SEM	CREDIT	: 4
CATEGORY	: AR	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 2102	OFFERING TO CHEMISTRY DEPT	

Objectives:

To familiarize the learner with applications of mathematics to chemistry.

Unit 1: Differentiation of standard functions-hyperbolic and inverse hyperbolic functions-differentiation of one function with respect to another-slope-tangent and normal-maxima and minima-angle of intersection of curves in cartesian and polar coordinates

Unit 2: Methods of integration-integration by parts-Bernoulli's formula-properties of definite integrals-differential equations-second order differential equations with constant coefficients.

Unit 3: Application of binomial, exponential and logarithmic series to summation-eigenvalues and eigenvectors (differential calculus approach)-partial differential equations-all types.

Unit 4: Complex numbers- DeMoivre's theorem and applications-expansions of $\sin n\theta, \cos n\theta, \sin^n\theta, \cos^n\theta, \sin\theta, \cos\theta$ -hyperbolic functions-Fourier series.

Unit 5: Probability-mean-standard deviation-Binomial, Poisson and normal distributions.

Text Books:

1. Narayanan, S. and Manickavachagam Pillai, T.K., *Calculus, Vol.I and Vol. II*, S.Viswanathan Printers & Publishers,1996.
2. Manickavachagam Pillai, T.K, Natarajan,T. and Ganapathy,K.S. *Algebra, Vol I*, S.Viswanathan Printers & Publishers,1994.
3. Narayanan, S. *Trigonometry*, S.Viswanathan Printers & Publishers,1995.
4. Gupta,S.P.,*Elements of Statistics*, S.Chand & Co,1986.
5. Venkataraman, M.K. *Engineering Mathematics, III-A*, The National Publishing Co.,1995.

Reference Books:

1. Shanthi Narayanan, *Differential Calculus*, S.Chand & Co., 1964.
2. Vittal,P.R. *Trigonometry*, Margham Publications,1988.
3. Duraipandian, P., *Vector Analysis*, Emerald Publishers, 1984.

ALGEBRA AND CALCULUS-II

YEAR & SEMESTER	: I Yr / II SEM	CREDIT	: 5
CATEGORY	: MC	NO. OF HOURS /WEEK	: 5
COURSE CODE	: MT 2502		

Objectives:

1. To familiarize the application of integral calculus.
2. To emphasize algebraic concepts.

Unit 1: Definite integrals - properties of definite integrals - reduction formulae - area, volume, arc length and surface area in polar coordinates.

Unit 2: Multiple integrals – Change of order of integration – Change of variables – Jacobian.

Unit 3: Beta & Gamma integrals and their properties.

Unit 4: Convergence and divergence of series - comparison test - ratio test - Cauchy's root test - Raabe's test.

Unit 5: Binomial, Exponential and Logarithmic series (without proofs) - application to summation.

Text Books:

1. Narayanan, S. and Manickavachagam Pillai, T.K., *Calculus*, Vol.II, S.Viswanathan Printers & Publishers, 1996. Unit 1- Chapter 1: Pages 1-6, 66-74, 79-97, 123-126, 132-140, 144-151, Unit 2- Chapter 5 & 6: Pages 203-219, 251-269, Unit 3-Chapter 7: Pages 270-293.
2. Manickavachagam Pillai, T.K., Natarajan, T. and Ganapathy, K.S. *Algebra*, Vol I, S.Viswanathan Printers & Publishers, 1994. Unit 4- Chapter 2: Pages 14-83, Unit 5 - Chapter 3 & 4: Pages 99-120, 143-152, 188-230.

Reference Books:

1. Shanthi Narayanan, *Integral Calculus*, S.Chand & Co., 1964.
2. Vittal, P.R. *Trigonometry*, Margham Publications, 1988.

ANALYTICAL GEOMETRY OF 3D, FOURIER SERIES AND NUMBER THEORY

YEAR & SEMESTER	: I Yr/ II SEM	CREDIT	: 4
CATEGORY	: MC	NO. OF HOURS /WEEK	: 4
COURSE CODE	: MT 2503		

Objectives:

To introduce and solve problems in 3D, Fourier series and Number Theory.

Unit 1: 3D Geometry: Planes – Straight lines – the plane and the straight lines – Coplanar lines.

Unit 2: Spheres: Definition – Equation of sphere – Equation of circle on a sphere – Equation of the tangent plane to the sphere.

Unit 3: Periodic function – Even and odd function – Dirichlet's conditions – Convergence of Fourier series – Half range Fourier series.

Unit 4: Theory of numbers - Euler's function $\phi(N)$ - highest power of a prime contained in $n!$ - Congruence's - Fermat's theorem - Wilson's theorem (Lagrange's theorem excluded). (Chapter 6: Pages 202-228)

Unit 5: Inequalities - geometric and arithmetic means - Weirstrass inequality - Cauchy's inequality.

Text books:

1. Manickavachagam Pillai, T.K, Natarajan,T. and Ganapathy,K.S. *Analytical geometry* , S.Viswanathan Printers & Publishers,1996. Units 1 - Chapters 1, 2 & 3: Pages 1-75) Unit 2 - Chapter 4: Pages 92-114.
2. Narayanan, S. and Manickavachagam Pillai, T.K., Calculus, Vol.III, S.Viswanathan Printers & Publishers, 2007. Unit 3- Chapter 6: Pages 202-228.
3. Manickavachagam Pillai, T.K, Natarajan,T. and Ganapathy,K.S. *Algebra*,Vol II , S.Viswanathan Printers & Publishers,1994. Units 4 - Chapter 5: Pages 218-259. .Unit 5- Chapter 4: Pages 179-208)

Reference Books:

1. Venkatraman M.K., *Numerical Methods in Science and Computer Science*, The National Publishing Company, Madras.
2. Arumugam S, Issac A, *Engineering Mathematics Vol I*, Scitech Publications, 1999.
3. Singaravelu A., *Numerical Methods*, Meenakshi Publications.
4. Duraipandian, P., *Coordinate Geometry*, Emerald Publishers, 1984.

BUSINESS MATHEMATICS

YEAR & SEMESTER	: II Yr/ III SEM	CREDIT	: 4
CATEGORY	: AO	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 3205	OFFERING TO COMMERCE DEPT	

Objectives:

To enable the student to realize the role of mathematics in business.

Unit 1: Functions and their applications-revenue function-cost function-profit function- break-even analysis-polynomial function-exponential function-logarithmic function-function of several variables-implicit function-explicit function-demand function-average cost function-marginal functions-average revenue functions-production function-utility function-capital formation.

Unit 2: Differentiation-application of standard formulae(no derivation)-function of a function rule-logarithmic differentiation-implicit differentiation-differentiation of one function with respect to another function-parametric differentiation-successive differentiation(2nd and 3rd order derivatives only)-maximum and minimum of functions of one variable-partial differentiation-maximum and minimum of functions of several variables-elasticity of demand.

Unit 3: Standard forms of integration-definite and indefinite integrals by i. Substitution ii. Partial fractions-integration of functions of the form $(lx+m)/(ax^2 +bx +c)$, $(lx+m)/\sqrt{(ax^2 + bx +c)}$ -integration by parts-(no trigonometric functions)-properties of definite integrals-capital formation-consumer surplus-producer surplus.

Unit 4: Determinants and matrices-elementary properties of determinants and applications-elementary operations on matrices-product and inverse-solutions of linear equations in 3 variables using matrices-Gaussian elimination method-elementary transformations-rank of a matrix-input and out analysis.

Unit 5: Partial fractions-the following 3 types only-(i). $(x+1)/(x-1)(2x+1)$, (ii). $(x^2+1)/(x-1)^2(2x+1)$, (iii). $(x+1)/(x-1)(x^2 + x+ 1)$ -formulation of linear programming problems-solution of L.P.P by graphical method and simplex method.

Text Books:

Sancheti, D.C. and Kapoor,V.K., *Business Mathematics*, Sultan Chand and Sons, New Delhi, 1984.

Reference Books:

1. Taro Yamane, *Mathematics for Economists*, 1970.
2. Navaneetham, P., *Business Mathematics*, Master Books Publication, 1992.
3. Metha and Madhani, *Mathematics for Economists*, Sultan Chand & Sons, New Delhi, 1996.

ADVANCED MATHEMATICS FOR PHYSICS

YEAR & SEMESTER	: II Yr/ III SEM	CREDIT	: 4
CATEGORY	: AO	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 3206	OFFERING TO PHYSICS DEPT	

Objectives:

1. To familiarize the students with applications of mathematics to Physics
2. To develop analytical skills

Unit 1: Methods of integration-integration by parts-Bernoulli's formula-properties of definite integrals-Fourier series in a range of length 2π and half range expansions.

Unit 2: Ordinary differential equations-solutions of first order and first degree equations-exact equations $Mdx + Ndy = 0$ -second order differential equations with constant coefficients.

Unit 3: Multiple integrals-change of order of integration-change of variables-Jacobian- Beta and Gamma integrals and their properties.

Unit 4: Differentiation of vectors-gradient-divergence and curl-line integrals-verification of Gauss theorem, Green's theorem and Stokes theorem.

Unit 5: Group-subgroup-cyclic group-permutation group-Cayley's table-definition and simple problems only-coordinate transformation-summation convention-contravariant and covariant vectors and tensors.

Text Books:

1. Narayanan, S. and Manickavachagam Pillai, T.K., *Calculus*, Vol.II, S.Viswanathan Printers & Publishers, 1996.
2. Narayanan, S. *Vector Analysis*, S.Viswanathan Printers & Publishers,1995.
3. Santiago,M.L., *Modern Algebra*, Arul Publications,1988.
4. Murray R.Spiegel,*Vector Analysis & An Introduction to Tensor Analysis*,Schaum outline series,McGraw Hill Book Co.,1981.

Reference Books:

1. Shanthi Narayanan, *Integral Calculus*, S.Chand & Co., 1964.
2. Duraipandian, P., *Vector Analysis*, Emerald Publishers, 1984.
3. Viswanathan,K. and Selvaraj,S., *Vector Analysis*, Emerald Publishers, 1988.
4. John B.Fraleigh, *A First Course in Abstract Algebra*, Addison Wesley Publishing Co., 1975.
5. Joshi,A.W., *Matrices and Tensors in Physics*, Wiley Eastern Ltd.,1995.

REAL ANALYSIS FOR STATISTICS

YEAR & SEMESTER	: II Yr/ III SEM	CREDIT	: 4
CATEGORY	: AO	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 3207	OFFERING TO STATISTICS	
DEPT			

Objectives:

To introduce the basic concepts in Real Analysis for the purpose of learning Mathematical Statistics.

Unit 1: Bounded sets- functions-(supremum-infimum-sequences-null sequence-limit of a function-sum and product increasing sequence-sequence $\{a^n\}$).

Unit 2: Infinite series-convergence-divergence-geometric series- the series $\sum \frac{1}{n^k}$ - properties - series of positive terms. Cauchy's test-d'alembert's test- series of positive and negative terms- absolute convergence-conditional convergence-power series.

Unit 3: Continuous functions - examples of continuous and discontinuous functions- properties of e^x , $\log x$.

Unit 4: Derivative-sign of $f'(x)$ -Rolle's theorem-mean value theorem-applications-maxima and minima-Taylor's theorem.

Unit 5: Dissection-norms-lower and upper sum lower and upper integrals- integral as a limit properties-fundamental theorem -infinite integrals- series and Cauchy integral theorem.

Text Books:

J.C. Burkill, 1979, A first course in mathematical analysis, Vikas Publishing House Pvt. Ltd.

Reference books:

1. *A first course in Mathematical Analysis* by D.Somasundaram – B.Choudhary, Narosha publishing House, New Delhi.
2. *Mathematical Analysis* by Tom M.Apostol, Addison Wesley publishing company, California

Methods of Real Analysis by Richard R.Goldberg, Oxford and IBH publishing Co.Pvt.,Ltd., New Delhi.

POPULAR ASTRONOMY

YEAR & SEMESTER	: II Yr/ III SEM	CREDIT	: 1
CATEGORY	: EG	NO. OF HOURS /WEEK	: 3
COURSE CODE	: MT 3300		

Objectives:

1. To introduce the student to space science.
2. To familiarize the learner with the important features of the planets, sun, moon and stellar universe.
3. To give a brief history of Astronomy.

Unit 1: Coordinate systems used in astronomy-definitions-sun's annual motion-rising and setting-circumpolar stars-morning stars-evening stars-sidereal day-sidereal time –zones of earth-variations in length of a day using diagrams-meaning of dip-twilight-geographical and geocentric latitudes.

Unit 2: Refraction-parallax-aberrations-seasons-calendars-Captain Sumner's method of finding the position of a ship at sea.

Unit 3: Instruments-general description of sextant-telescopes-transit circle-equatorial-sundial-radio telescope-radio astronomy.

Unit 4: The moon-synodic, sidereal months-phases of moon-moon's surface-Metonic cycle-lunar day-harvest moon-tides-landing on moon-lunar and solar eclipses-occurrence using diagrams only.

Unit 5: Solar system-Heliocentric motion-geocentric motion (direct and retrograde)-descriptive astronomy-sun-planets-comets-stellar universe-history of astronomy.

Text Book:

Kumaravelu,S., *Astronomy*, 7th edition, Madras Book House,1984.

Reference Books:

1. Mathew,K.C.& Thiruvengkatacharya, *A Text Book of Astronomy for degree classes*, S.Chand & Co., 1974.
2. Ramachandran,G.V. *A Text Book of Astronomy for post graduate classes*, 7th edition, Rukmani Publishers, 1970.

VECTOR ANALYSIS AND ORDINARY DIFFERENTIAL EQUATIONS

YEAR & SEMESTER	: II Yr/ III SEM	CREDIT	: 5
CATEGORY	: MC	NO. OF HOURS /WEEK	: 5
COURSE CODE	: MT 3503		

Objectives:

To enable students to

1. Understand the fundamental concepts of vector calculus and apply the various techniques of vector integration in solving volume and surface integrals.
2. Gain logical skills in the formulation of differential equations.
3. Expose students to different techniques of finding solution to these equations.

Unit 1: Vector Differentiation: Directional Derivative, Unit normal to the surface, equation of tangent plane to a surface, equation of normal to a surface, Divergence, Curl, Laplace operators.

Unit 2: Evaluation of line integral, Surface integral and volume integral.

Unit 3: Application of Green's theorem, Gauss – Divergence theorem, Stokes theorem (proofs of theorems not included), simple problems.

Unit 4: Ordinary Differential Equations: Solutions of first order and first degree equations, Bernoulli's equation, Equations of first order but of higher degree, Clairaut's equation.

Unit 5: Linear Differential equations with constant coefficients, Variation of parameters, Linear equations with variable coefficients (Cauchy – Euler equation), Equations reducible to the linear homogeneous equation (Legendre linear equations).

Text Books:

1. Duraipandian, P., Laxmi Duraipandian, *Vector Calculus*, Emerald Publishers, 2003.
2. Narayan, S. and Manickavachagam Pillai, T.K., *Calculus, Vol.II*, S.Viawanathan Printers & Publishers, 1996. Unit 1: Book 1 – Chapter 2 – Sections 2.1 – 2.8, Unit 2: Book 1 – Chapter 3 – Sections 3.1 – 3.8, Unit 3: Book 1 – Chapter 4 – Sections 4.1 – 4.8, Unit 4: Book 2 – Chapter 2 – Sections 2.1 – 2.5, Book 2 – Chapter 3 – Sections 3.1 – 3.4 & 4.1, Unit 5: Book 2 – Chapter 9 – Sections 9.1 – 9.4 & 9.8 – 9.10.

References:

1. P. R. Vittal, *Vector Analysis, Analytical solid geometry and Sequences and series*.
2. M. L. Khanna, *Co-ordinate Geometry*, Jai Prakash Nath & co.
3. P. R. Vittal, *Differential Equations and Laplace transformations*.

4. Singaravalu, *Differential Equations, Fourier Series and Laplace transforms*.

Zafar Ahsan, *Differential Equations and their applications*.

INTEGRAL TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

YEAR & SEMESTER	: II Yr/ III SEM	CREDIT	: 4
CATEGORY	: MC	NO. OF HOURS /WEEK	: 4
COURSE CODE	: MT 3504		

Objectives:

1. To develop of the skill of solving partial differential equations
2. To enable the students the applications of Laplace and Fourier transforms in differential equations.

Unit-1: Formation of PDE, Complete integrals, Particular integrals, Singular integrals, equations solving by direct integration – the four standard types – Lagrange’s equation – Charpit’s method.

Unit-2: Laplace transform: Laplace Transform of standard functions and periodic functions.

Unit-3: Inverse transform – Properties - Applications of Laplace transform to solution of the first and second order linear differential equations (with constant coefficients).

Unit-4: Fourier transforms: Complex form of Fourier integral formula – Properties.

Unit-5: Fourier cosine and sine transforms – Parseval’s identity – Convolution theorem.

Text Book:

Narayanan, S. and Manicavachagom Pillay, T.K., *Calculus, Vol.III*, S. Viswanathan Printers and Publishers, 2009. Unit-1- Chapter 4: Sections 2.1, 2.2, 3, 4, 5.1, 5.2, 5.3, 5.4, 6, 7, Unit-2 -Chapter 5: Sections 1, 2, 3, 4, 5. Unit-3 -Chapter 5: Sections 6, 7, 8, 9, 10, 11, 12. Unit-4- Chapter 6: Sections 9, 10. Unit- 5- 11.1, 11.2, 12, 13, 14, 15.

References:

1. Shanthi Narayanan, *Integral Calculus*, S.Chand & Co., 1964.
2. P. R. Vittal, *Allied Mathematics*, Margham Publications, 2000.
3. P. R. Vittal, *Differential Equations and Laplace transformations*.
4. Singaravalu, *Differential Equations, Fourier Series and Laplace transforms*.

ADVANCED MATHEMATICS FOR CHEMSITRY

YEAR & SEMESTER	: II Yr/ IV SEM	CREDIT	: 4
CATEGORY	: AO	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 4204	OFFERING TO CHEMISTRY DEPT	

Objectives:

1. To prepare the students to apply mathematical skills to carry out research in chemistry
2. To solve chemical problems using mathematical techniques.

Unit 1: Change of order of integration-change of variables-Jacobian-double and triple integrals in polar, spherical polar and cylindrical polar coordinates-Beta and Gamma integrals and their properties.

Unit 2: Differentiation of vectors-gradient-divergence and curl- Laplace transform of standard functions and periodic functions-inverse transform-application to solutions of second order differential equations .

Unit 3: Theory of equations-relation between roots and coefficients-sum of the rth powers of roots-reciprocal equations-transformations.

Unit 4: Tests of significance-correlation and regression-curve fitting.

Unit 5: Solutions to simultaneous linear equations-Cramer's rule-Gaussian elimination-Gauss-Seidal iterative method-successive bisection-Newton-Raphson method-interpolation-Newton's interpolation formulae.

Text Books:

1. Narayanan, S. and Manickavachagam Pillai, T.K., *Calculus*, Vol.II, S.Viswanathan Printers & Publishers, 1996.
2. Manickavachagam Pillai, T.K, Natarajan,T. and Ganapathy,K.S. *Algebra*,Vol I, S.Viswanathan Printers & Publishers,1994.
3. Narayanan, S. *Vector Analysis*, S.Viswanathan Printers & Publishers,1995.
4. Gupta, S.P. *Elements of Statistics*,S.Chand & Co.,1986.
5. Venkataraman, M.K. *Engineering Mathematics, III-A*, The National Publishing Co.,1995.
6. Venkataraman, M.K. *Numerical Methods in Science and Engineering*, 3rd edition, The National Publishing Co. 1995.

Reference Books:

1. Donald A. McQuaire and John D. Simon, *Physical Chemistry A Molecular Approach*, 1998.
2. Harry G. Hecht, *Mathematics in Chemistry An Introduction to Modern Methods*, 1990.

NUMERICAL METHODS USING C

YEAR & SEMESTER	: II Yr/ IV SEM	CREDIT	: 4
CATEGORY	: AO	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 4206	OFFERING TO STATISTICS DEPT	

Objectives:

To introduce concepts in Numerical methods and develop the skill of writing program in C language in it.

Unit 1: C- Character set-constants-variables and arithmetic expressions. Basic structure of a C program. Operators-pre processor directives-library functions. Mathematical library functions, string-handling functions-input and output functions.

Unit 2: Control statements-decision making statements-if, if ... elseif, go to, switch case, break and continue statements-loop statements-while, do..while and for statements. Arrays one-dimensional and two dimensional arrays-user defined functions-recursion basic file handling concepts.

Unit 3: Numerical solutions-pivotal condensation method of finding determinant of a matrix-solving system of linear equations by Gauss elimination method-Gauss-Jordan and matrix inversion methods-eigen values and vectors.

Unit 4: Interpolation-Newton's formulae and Lagrange's formula-Inverse interpolation-numerical differentiation-numerical integration-Trapezoidal rule-Simpson's 1/3 rule and 3/8 rule.

Unit 5: Differential equations-solutions of differential equations by Euler's method-Taylor's series method and Runge-Kutta method. Algebraic equations-Newton-Raphson method-Regula-falsi method and bisection method.

Note:

1. Programs to be develop for the problems in units 3, 4 and 5 using C.
2. No derivations are required for the formula.

Text Books:

1. Balagurusamy. E. (1997), *ANSI C programming*, Tata Mgraw Hill Publishers Ltd.
2. Balasubramanian P. (1995), *Numerical methods*, Rochouseand sons.

References:

1. Kandasamy P. and others (1997), *Numerical methods*, Sultan and sons (P) Ltd.
2. Sarbrough (1996), *Numerical mathematical analysis*, Oxford and IBII (P) Ltd.
3. Pillai R.S.N and Bagavathi (1984), *Practical statistics*, Sultan Chang and sons.

MATHEMATICS FOR COMPETITIVE EXAMINATIONS

YEAR & SEMESTER	: II Yr/ IV SEM	CREDIT	: 1
CATEGORY	: EG	NO. OF HOURS /WEEK	: 3
COURSE CODE	: MT 4301		

Objectives:

To concentrate on basic concepts of arithmetic and to equip the students with the skills required to succeed in any competitive examination.

Unit 1: Numbers – H.C.F. & L.C.M. – Decimal fractions – Square roots and Cube roots – Problems on numbers – Surds and Indices.

Unit 2: Problems on Ages – Averages – Percentage – Profit & loss – Ratio & Proportion – Alligation & Mixtures.

Unit 3: Partnership – Time & Work – Pipes & Cisterns – Time & Distance – Problems on Trains, Boats & Streams.

Unit 4: Simple Interest – Compound Interest – Races – Clocks – Calendars.

Unit 5: Data Interpretation – Tabulation – Bar graphs & Pie diagrams – Circle graphs.

Text book:

Aggarwal R.S., *Quantitative Aptitude*, S.Chand & Company Ltd., 1989.

Reference books:

1. Guha Abhijit, *Quantitative Aptitude For Competitive Examinations*, Standard Book Distributing House, Third Edition, 2005
2. Serre J.P., *Course in Arithmetic*.
3. Dinesh Khattar, *The Peareson Guide to Quantitative Aptitude*, Pearson Education (Singapore), 2005.

ALGEBRAIC STRUCTURE I

YEAR & SEMESTER	: II Yr/ IV SEM	CREDIT	: 6
CATEGORY	: MC	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 4503		

Objectives:

1. To introduce and develop abstract concepts.
2. To understand the subject as tool applicable to almost all other branches of Science, Engineering and Technology.

Unit 1: Equivalence Relations - Binary Operations – Groups – Definition and Examples – Simple Properties – Subgroups.

Unit 2: Cyclic Groups – Cosets and Lagrange’s Theorem - Normal Subgroups and Quotient Groups.

Unit 3: Homomorphisms - Isomorphism Theorems – Automorphisms - Permutation Groups.

Unit 4: Rings – Definition and Examples – Properties – Special Classes of Rings – Subrings and Subfields – Ideals and quotient Rings – Homomorphisms.

Unit 5: Maximal and Prime Ideals - Euclidean Rings – Definition and Properties - Gaussian Integers.

Text book:

M. L. Santiago, *Modern Algebra*, Tata McGraw-Hill, 2001.

[Chapter 1: Sections 1. 3, 1. 5, Chapter 2: Sections 2. 1, 2. 2, 2. 4 to 2. 11, Chapter 3: Sections 3.1 to 3. 7, Chapter 4: Sections 4. 1, 4. 3].

Reference books:

1. I. N. Herstein, *Topics in Algebra*, Wiley Eastern Ltd., 1989.
2. S. Arumugam and A. T. Issac, *Modern Algebra*, Scitech Publications (India) Pvt. Ltd., 2006.
3. John B Fraleigh, *A First Course in Abstract Algebra*, Addison Wesley Publishing Co., 1975.
4. Joseph A Gallian, *Contemporary Abstract Algebra*, Narosa Publishing House, 1999.

5. Venkatachalapathy S G., *Modern Algebra*, Margham Publications, 2003.

COMPUTER PROGRAMMING IN “C”

YEAR & SEMESTER	: II Yr/ III SEM	CREDIT	: 3
CATEGORY	: MC	NO. OF HOURS /WEEK	: 3
COURSE CODE	: MT 4504		

Objectives:

1. To improve logical thinking and better understanding of programming techniques
2. To learn a language that is well suited for both systems software and business packages.

Unit 1: Overview of C - Character set- keywords and identifiers - constants-variables-data types- declaration of variables- assigning values to variables - arithmetic, relational and logical operators-assignment operators-increment and decrement operators-conditional operators-arithmetic expressions.

Unit 2: Input and output operators-decision making-branching and looping.

Unit 3: Arrays-handling of character strings.

Unit 4: User defined functions-structures.

Unit 5: Pointers-file management in C.

Programs:

Area of a circle, rectangle, square, etc., Volume of a sphere, cuboids, etc., Basic operations on matrix. Fibonacci series, Factorial of a given number, addition of n natural numbers, square of n natural numbers, Roots of a quadratic equation. Some basic programs from the text book.- some practical programs like library stack.

Text Book:

Balagurusamy, E., *Programming in ANSI C*, 2nd edition, Tata McGraw Hill Publishing Co., 1997.

Reference Books:

1. Kernington & Richia, *C Programming Language*, second edition, Prentice Hall, 1988.
2. Rajaraman, V., *Computer Programming in C*, Prentice Hall of India, New Delhi, 1996.

3. Byron S. Gottfried, *Programming with C*, Schaum outline series, Tata McGraw Hill Publishing Co., 1993.

COMBINATORICS

YEAR & SEMESTER	: III Yr/ V SEM	CREDIT	: 2
CATEGORY	: ES	NO. OF HOURS /WEEK	: 3
COURSE CODE	: MT 5406		

Objectives:

1. To introduce a branch of Discrete Mathematics that deals with enumeration and existence problems.
2. To enable the students to attempt questions related to enumeration in various competitive examinations.

Unit 1: Basic Combinatorial numbers - Stirling numbers of the second kind.

Unit 2: Generating functions and Recurrence relations - Symmetric functions.

Unit 3: Multinomials - multinomial theorem - Inclusion and Exclusion principle.

Unit 4: Euler Function - Permutations with forbidden positions - The 'Menage' problem - Problem of Fibonacci.

Unit 5: Polya Theory - Necklace problem and Burnside's lemma - Cycle index of a permutation group - Polya's theorems and their immediate applications.

Text Book:

Krishnamurthy.V , *Combinatorics Theory and Applications*, East-West Press.

Reference Books:

1. V.K.Balakrishnan – *Theory and problems of combinatorics* – Schaums outline series – McGraw Hill.
2. Inn Anderson – *Combinatorics of finite sets* – Oxford Science Publication.
3. Kenneth P. Boggart - *Introductory Combinatorics*- Pitman Books Ltd.

FORMAL LANGUAGES AND AUTOMATA

YEAR & SEMESTER	: III Yr/ V SEM	CREDIT	: 2
CATEGORY	: ES	NO. OF HOURS /WEEK	: 3
COURSE CODE	: MT 5407		

Objectives:

1. To study Formal Languages and Automata and establish some of the properties of such systems.
2. To familiarize the students with some theories of mathematics in computer science.

Unit 1: Finite automaton – Definition of finite automaton – Representation of finite automaton – Acceptability of a string by a finite automaton – Languages accepted by a finite automaton.

Unit 2: Non – Deterministic finite automaton – Acceptability of a string by NFA – Equivalence of FA and NFA - Procedure for finding an FA equivalent to a given NFA – Properties of regular sets – Decision Algorithm for regular sets.

Unit 3: Phrase – Structure Grammar derivations – Phrase structure languages – Context-sensitive language (CSL) – Context-free languages – Chomskian hierarchy.

Unit 4: Closure operation – Kleene closure – Substitutions – Homomorphisms – Inverse homomorphism – Context-free languages – Derivation trees – Ambiguity leftmost and rightmost derivations.

Unit 5: Normal forms – Chomsky’s normal form – Problems based on Chomsky’s normal form – uvwxy theorem – Problems based on uvwxy theorem.

Text books:

1. Dr. M. K. Venkatraman, Dr. N. Sridharan, N. Chandrasekaran, *Discrete Mathematics*, Unit XII, Sections 1 to 12. (Units 1 & 2)
Chapter: 12 Sections: 1 – 12.
2. Rani Sironmoney, *Formal Languages and Automata*, The Christian Literature Society, Chennai. (Units 3, 4 & 5)
Chapter 2: Sections: 2.1 – 2.4, Chapter 3: sections 3.1 – 3.2 & Chapter 4: Sections 4.1 – 4.5

Reference Books:

1. John E, Hopcroft, Jeffrey D, Ullman, *Introduction to Automata Theory and Computations*, Narosa Publishing House.
2. Ragade B.R., *Automata and Theoretical Computer Science*, Peareson Education.
3. Bernard M, Moret, *The Theory of Computation*, Peareson Education.

GRAPH THEORY

YEAR & SEMESTER	: III Yr/ V SEM	CREDIT	: 2
CATEGORY	: ES	NO. OF HOURS /WEEK	: 3
COURSE CODE	: MT 5408		

Objectives:

1. To translate real life situations to diagrammatic representations.
2. To develop problem solving skills and thereby solve real life problems.

Unit 1: Definition of graph and examples – incidence and degree – subgraphs – isomorphism – complement of a graph – operation on graphs.

Unit 2: Walks, trails and paths – connectedness and components – cut points and bridges – blocks.

Unit 3: Eulerian graphs – Konigsburg bridge problem – Hamiltonian graphs.

Unit 4: Trees – characteristics of trees – center of a tree.

Unit 5: planarity – colourability – chromatic number – five-colour theorem – four-colour problem.

Text Book:

Invitation to graph theory by S.Arumugam and S.Ramachandran, New gamma publishing house, Palayamkottai, 1994.

Reference books:

1. *Introduction to Graph Theory*, by Wilson R.J., Oliver and Boyd, Edinburg (1972).
2. *Graph Theory*, by Harary, F., Addison Wesley (1969).
3. *Graph Theory with Applications*, by J.A.Bondy and U.S.R.Murty, The MacMillan Press (1976).

NUMERICAL METHODS

YEAR & SEMESTER	: III Yr/ V SEM	CREDIT	: 2
CATEGORY	: ES	NO. OF HOURS /WEEK	: 3
COURSE CODE	: MT 5409		

Objectives:

To find numerical solutions to problems where the exact relationship between the variables are not known.

Unit 1: Solutions to simultaneous linear equations - Cramer's rule – Gaussian elimination – Gauss-Seidel iterative method.

Unit 2: Successive bisection method – Newton-Raphson method – Successive approximation method – Regula Falsi method.

Unit 3: Interpolation – Newton's interpolation formulae – Forward difference interpolation formula – Backward difference interpolation formula – Divided difference formula - Lagrange's interpolation formula.

Unit 4: Central difference – Central difference formula – Gauss interpolation formula – Stirlings formula – Bessel's formula – Everett's formula (Only application of these formulae. No proof required). Numerical differentiation.

Unit 5: Numerical integration – Trapezoidal rule – Simpson's $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ rule for numerical integration. Numerical solutions of ordinary differential equations- Euler's methods with its modifications – Taylor's series method – Runge- Kutta method.

Text books:

2. *Numerical Algorithms computations in Science & Engineering* by E.V. Krishnamurthy & S.K.Sen. Affiliated East- West Press pvt. Ltd., New Delhi.

3. *Numerical Methods* by Dr. V.N. Vedamurthy, Dr.N.Ch.S.N.Iyengar; Vikas Publishing house pvt. Ltd., 576, Masjid Road, Jangpura, New Delhi – 110014.

References:

1. Kandasamy P. and others (1997), *Numerical methods*, Sultan and sons (P) Ltd.
2. Sarborought (1996), *Numerical mathematical analysis*, Oxford and IBII (P) Ltd.

REAL ANALYSIS

YEAR & SEMESTER	: III Yr/ V SEM	CREDIT	: 6
CATEGORY	: MC	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 5505		

Objectives:

2. The primary objective of teaching Real Analysis is to make the students think logically and objectively.
3. The secondary objective is to impart rigorous mathematical training.

Unit 1: The real number system - ordered field – upper bounds – lower bounds – maximum element – minimum element – supremum - infimum – order completeness of the real line – integers – rational and irrational number - Cauchy-Schwarz inequality – Minkowski’s inequality – similar sets – finite and infinite sets – countable and uncountable sets.

Unit 2: Metric spaces – Euclidean space R^n – Open balls and open sets in R^n – Closed sets – adherent points – accumulation points Convergent sequences in a Metric space – Cauchy sequences – complete Metric spaces- limit of a function.

Unit 3: continuous function – examples of continuous functions – continuity and inverse images of open or closed sets – functions continuous on compact sets – intermediate value theorem for continuous functions – uniform continuity – discontinuities of real valued functions.

Unit 4: Definition of derivative – differentiability and continuity – algebra of derivatives and the chain rule – one sided derivatives – Roll’s theorem – Mean value theorem for derivatives – intermediate value theorem for derivatives – Taylor’s formula.

Unit 5: Properties of monotonic functions – functions of bounded variation – total variations on $[a,x]$ as a function of x – functions of bounded variation expressed as a difference of increasing

functions – definition of the Riemann Stieltjes integral – linear properties – integration by parts – reduction to a Riemann integral.

Text Book:

Real Analysis by K.Viswanatha Naik, Emerald Publishers. Unit 1- Chapter 1: 1.5-1.8, 1.10-1.15, Unit 2- Chapter 2: 2.1-2.4, Chapter 3: 3.1-3.4, Unit 3- Chapter 3: 3.5-3.9, Unit 4- Chapter 4: 4.1-4.7, Unit 5- Chapter 5: 5.1-5.3, Chapter 6: 6.1-6.4, 6.6.

Reference books:

2. *A first course in Mathematical Analysis* by D.Somasundaram – B.Choudhary, Narosha publishing House, New Delhi.
3. *Mathematical Analysis* by Tom M.Apostol, Addison Wesley publishing company, California.

OPERATIONS RESEARCH

YEAR & SEMESTER	: III Yr/ V SEM	CREDIT	: 6
CATEGORY	: MC	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 5507		

Objectives:

To provide a scientific basis to the decision makers for obtaining optimal solution.

Unit 1: Linear programming – Graphical solution – Simplex algorithm – Dual and primal techniques – Dual simplex method.

Unit 2: Transportation and assignment problem.

Unit 3: Theory of Games – Optimal solutions of two persons zero-sum games – Mixed strategies – Solutions by graphical method – Solutions of $m \times n$ games by graphical method – Dominance principle.

Unit 4: Network Analysis – Network definitions – Shortest - route problem – Minimal spanning tree problem –Maximal flow problem – Project scheduling by PERT-CPM .

Unit 5: Inventory models: Introduction – Deterministic models- single item static models with and without shortages- Single item static model with single price break- Quantity discounts.

Text books:

1. *Operations Research Theory & Applications*. Third edition by J K Sharma – Macmillan India Ltd, New Delhi. (Units 1, 2,3 & 5) Unit 4 (Sec: 13.1-13.6).
2. *Operations Research. An Introduction*. Fifth edition by Hamdy A. Taha Prentice – hall of India private Ltd., New Delhi – 110001. Unit 4 (Sec: 8.2- 8.4)

Reference Books:

1. *An Introduction to Operational Research*; Third revised and enlarged edition by C.R.Kothari Vikas Publishing house pvt. Ltd
2. *Introduction to Operational Research* by Frederick S.Hillier and Gerald J.Lieberman, Holden-Day, Inc., 500 Sansome street, San Francisco, California.

ALGEBRAIC STRUCTURE II

YEAR & SEMESTER	: III Yr/ V SEM	CREDIT	: 6
CATEGORY	: MC	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 5509		

Objectives:

1. To study vector spaces as an abstract algebraic system and establish some of the properties of such systems.
2. To appreciate that part of Mathematics, that is, linear algebra, which finds the widest application – in physics, chemistry, economics, in fact in almost every science and pseudo science.

Unit 1: Vector spaces – Definition and Simple Properties – Subspaces and Quotient Spaces - Sums and Direct Sums - Linear Independence.

Unit 2: Basis and Dimension - Homomorphisms.

Unit 3: Inner Product Spaces - Algebra of Linear Transformations – Eigen values and Eigen vectors.

Unit 4: Matrix Algebra – Trace and Transpose.

Unit 5: Rank of a Matrix - Linear Equations - Hermitian and Unitary Transformations.

Text books:

M. L. Santiago, *Modern Algebra*, Tata McGraw-Hill, 2001.
[Chapter 6: Sections 6. 1 to 6. 6, 6. 8, Chapter 7: Sections 7. 1 to 7. 3, 7. 5 to 7. 7, 7.9]

Reference books:

1. I. N. Herstein, *Topics in Algebra*, Wiley Eastern Ltd., 1989.
2. S. Arumugam and A. T. Issac, *Modern Algebra*, Scitech Publications(India) Pvt. Ltd., 2006.
3. Gopalakrishnan N S., *University Algebra*, New Age International(P) Ltd., 2nd Edition, 2002.
4. Aloknath Chakrabarti, *A First Course in Linear Algebra*, Vijay Nicole Imprints Pvt., Ltd., 2006.
5. Kumaresan S., *Linear Algebra*, Prentice-Hall of India, Pvt., Ltd., 2001.
6. Venkatachalapathy S G., *Modern Algebra*, Margham Publications, 2003.

STATICS

YEAR & SEMESTER	: III Yr/ V SEM	CREDIT	: 6
CATEGORY	: MC	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 5510		

Objectives:

To give the students a practical knowledge of statics; its uses and application in day to day life.

Unit 1: Concurrent system of forces

Forces acting on a particle-concurrent forces-equilibrium of forces acting at a point-parallelgram law of forces-triangle law of forces-Lami's theorem-polygon of forces-conditions of equilibrium in three dimensional cases with problems related to the plane.

Unit 2: Parallel forces, moments and couples

Moments-parallel forces-couples-moments of a force about a point and a line-theorems on moments-resultant of like and unlike parallel forces-couples-reduction of a force and couple in a plane to a single force-conditions of equilibrium of a body under the influence of a set of non-concurrent forces (general 3-D treatment)-three forces in equilibrium, concurrent or parallel-work done by a force in a given interval as the dot product of force and displacement –function-laws of friction- cone of friction-equilibrium of a particle resting on a rough plane.

Unit 3: Centre of gravity

Centre of gravity of curves, areas, surfaces and volumes of solids of revolution-location of the centre of gravity of standard configurations.

Unit 4: Principle of virtual work and stability

Conditions of equilibrium- virtual work- simple problems- equilibrium of bodies- stability of a body with one point fixed- stability of a body rolling over a fixed body.

Unit 5: Catenary

Equilibrium of strings and chains- common catenary- suspension bridge-flexible cable resting on a plane curve.

Text Books:

Statics by K.V. Naik and M.S. Kasi. Unit 1- Chapter-I, Unit 2: Chapter-II, Unit 3: Chapter-V, Unit 4: Chapter –VI and VII, Unit 5: Chapter VIII.

References:

1. *Statics* by M.K. Venkataraman.
2. *Statics* by S. Duraipandian.

COMPLEX ANALYSIS

YEAR & SEMESTER	: III Yr/ VI SEM	CREDIT	: 8
CATEGORY	: MS	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT6606		

Objectives:

To prepare the students on the basic concepts in complex analysis.

Unit 1: Introduction – Functions of a Complex Variable – Limits – Continuous Functions – Differentiability – Cauchy-Riemann Equations – Analytic Functions – Harmonic Functions.

Unit 2: Conformal Mapping – Elementary Transformations – Bilinear Transformations – Cross Ratio.

Unit 3: Complex Integration – Definite Integral - Cauchy's theorem – Cauchy's integral formula – Higher Derivatives.

Unit 4: Series Expansions – Taylor's Series – Laurent's Series – Zeros of an Analytic Function - Singularities – Meromorphic Function.

Unit 5: Calculus of Residues – Residues – Cauchy's Residue Theorem – Evaluation of Definite Integrals.

Text book:

Arumugam S., Thangapandi Issaac A., Somasundaram A., *Complex Analysis*; Scitech Publications (India), 2010.

[Chapter 2: Sections 2.0 to 2.9, Chapter 3: Sections 3.0 to 3.3, Chapter 6: Sections 6.0 to 6.4, Chapter 7: Sections 7.0 to 7.4, Chapter 8: Sections 8.0 to 8.3]

Reference books:

1. James Ward Brown, Ruel V Churchill, *Complex Variables and Application*, McGraw-Hill, Inc., 1996.
2. Ponnusamy S., *Foundations of Complex Analysis*, Narosa Publishing House, 2000.
3. Sharma J. N., *Functions of a Complex Variable*, Krishna Prakashan Mandir, 2011.

DYNAMICS

YEAR & SEMESTER	: III Yr/ VI SEM	CREDIT	: 7
CATEGORY	: MS	NO. OF HOURS /WEEK	: 5
COURSE CODE	: MT6607		

Objectives:

To enable the learner to apply the principles of Dynamics in daily life.

Unit 1: Laws of motion

Momentum-Newton's laws of motion-illustration of Newton's laws of motion-conservation of linear momentum-motion of a particle on a rough horizontal plane under the action of a constant force- motion of a particle up a rough inclined plane under the action of a constant force-pressure of body resting on a moving horizontal plane- motion of connected particles- Atwood's machine.

Unit 2: Projectile

Trajectory-ranges on horizontal and inclined planes-enveloping parabola.

Unit 3: Simple harmonic motion

Simple harmonic motion and its application to the case of a particle attached to the end of an elastic string-composition of two simple harmonic motions-simple harmonic motion on a curve-simple pendulum.

Unit 4: Central forces

Central orbits-velocity and acceleration in polar coordinates-circular, elliptic, parabolic and hyperbolic orbits-problems to find out the orbit when the law is given and conversely-inverse square law-Kepler's laws.

Unit 5: Moment of inertia

Theorems on parallel axes and perpendicular axes-product of inertia-moment of inertia of regular bodies.

Text Book

Dynamics by K.V. Naik and M.S. Kasi. Unit 1: Chapter-II, Unit 2: Chapter –V, Unit 3: Chapter-VII, Unit 4: Chapter-X, Unit 5: Chapter XI.

References:

1. *Dynamics* by S. Narayanan
2. *Dynamics* by A.V. Dharmapadam
3. *Dynamics* by S. Duraipandian

DISCRETE MATHEMATICS

YEAR & SEMESTER	: III Yr/ VI SEM	CREDIT	: 5
CATEGORY	: MS	NO. OF HOURS /WEEK	: 4
COURSE CODE	: MT 6608		

Objectives:

1. To equip the students with mathematical tools that has applications in various fields.
2. To enable students to develop construction and verification of mathematical logic.
3. To gain fundamental knowledge about lattices and Boolean algebra.

Unit 1: Mathematical logic

Statements and Notations, Connectives, Negation, Conjunction, Disjunction, Statement Formulae and Truth Tables, Conditional and Bi-conditional, Well-formed Formulae, Tautologies, Equivalence of Formulae, Duality Law Tautological Implications.

Unit 2: Mathematical logic (contn..)

Normal Forms, Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Disjunctive Normal Forms, Principal Conjunctive Normal Forms, Rules of Inference, The Predicate Calculus, .Predicates, Variables and Quantifiers, Predicate Formula, Free and Bound Variables.

Unit 3: Semigroups and Monoids

Semigroups, Monoids, Homomorphism of Semigroups and Monoids, Subsemigroups and Submonoids.

Unit 4: Lattices

Lattices as Partially Ordered Set, Properties of Lattices, Lattices as Algebraic Systems, Sublattices, Direct Product, and Homomorphism.

Unit 5: Boolean Algebra

Boolean Algebra, Basic properties, Subalgebra, Direct Product, and Homomorphism, Boolean Functions.

Text books:

Discrete Mathematical Structures with applications to Computer science by J.P. Trembley, R.Manohar – McGraw Hill Book Co., second edition 1984. Unit 1- Chapter 1: 1.1, 1.2.1-1.2.4, 1.2.6-1.2.11, Unit 2- Chapter 1: 1.3.1-1.3.4, 1.4.1-1.4.3, 1.5.1-1.5.4, Unit 3- Chapter 3: 3.2.1-3.2.3, Unit 4- Chapter 4: 4.1.1-4.1.4, Unit 5- Chapter 4: 4.2-4.3.

Reference Books:

1. *Discrete and combinatorial Mathematics: An Applied Introduction* by Ralph P.Grimaldi, 4th edition, Pearson Education Asia, Delhi 2002.
2. *Applied Abstract Algebra* by R. Lidl and G. Pilz, Springer Verla, 1984.

ASTRONOMY

YEAR & SEMESTER	: III Yr/ VI SEM	CREDIT	: 15
CATEGORY	: SK	NO. OF HOURS /WEEK	: 6
COURSE CODE	: MT 6653		

Objectives:

1. To introduce the students to space science.
2. To familiarize the student with the important features of the planets, sun , moon and stellar universe.

Unit 1: Spherical trigonometric formulae (without proof) – systems of coordinates – diurnal motion of the sun and stars – sidereal day – sidereal time – circumpolar stars – morning and evening stars – celestial diagram.

Zones of earth – variations in the durations of day and night – dip – twilight.

Unit 2: Refraction – parallaxes – aberration of light – effect of parallax on celestial latitude and longitude.

Instruments – sextant – telescope – meridian circle – equatorial – sundial.

Unit 3: Kepler’s laws – verifications of first law – Newton’s deductions – conversion of time – equation of time – seasons – calendar.

Unit 4: Moon – synodic and sidereal periods – Moon’s phases – description of Moon’s surface. Eclipses – lunar and solar eclipses – different kinds of eclipses – ecliptic limits – maximum and minimum number of eclipses in a year.

Unit 5: Universe: Origin of universe – Solar system – Birth and Death of stars – Black holes.

Practical Astronomy: Constellation of stars- Planets- Galaxies.

Text Book:

1. Astronomy for degree classes by S.Kumaravelu, Mission Press, Palayamkottai.
2. The rough guide to universe by John Scalzi, Rough guides’ ltd, London.

Reference books:

1. Astronomy for graduate & post graduate classes by Rukmani Ramachandran, Trichirapally, 1968.
2. Astronomy by G.V.Ramachandran, Mission Press, PalayamKottai.

DATA STRUCTURES AND ALGORITHMS

YEAR & SEMESTER	: III Yr/ VI SEM	CREDIT	: 15
CATEGORY	: SK	NO. OF HOURS /WEEK	: 5
COURSE CODE	: MT 6653		

Objectives:

1. This language independent data structures enable students to design algorithms using pseudocode and then build them into programs.
2. Learn the basic techniques to collect and analyze the data in respective project.

Unit 1: Pseudocode - Algorithm analysis - pseudocode examples - Abstract Data Type(ADT) - Data structure - ADT operations.

Unit 2: Searching - sequential search - sentinel search, probability search, ordered list search - Binary search.

Unit 3: Linear lists - linked lists - linked list algorithms(Create node, insert node, delete node algorithms only) –Stacks - Applications - Reversing data, Backtracking.

Unit 4: Queues - operations - Array implementation- Recursion - Examples(Factorial, Fibonacci numbers algorithms only) - Tree - Basic tree concepts - Binary tree.

Unit 5: Sorting concepts - Insertion sort - Selection sort - Heap sort - Bubble sort.

Text Books:

Richard F.Gilberg and Behrouz A.Forouzan - Data Structures A Pseudocode approach with C - Brooks/Cole Publishing Company, 2002.
(Sections 1.1 - 1.3, 2.1, 3.1 - 3.3, 4.1, 4.3, 5.1, 5.7, 6.1, 6.4, 7.1, 7.2, 11.1 - 11.4)

Reference Books:

1. Trembley and Sorenson – Data structures with applications – TMH- 3rd Edition, 1991.
2. Ellis Horowitz and Sartaj Sahani – Fundamentals of Data Structure in PASCAL – Galgotia Publ, 1996.

PROJECT

YEAR & SEMESTER	: III Yr/ VI SEM	CREDIT	: 15
CATEGORY	: SK	NO. OF HOURS /WEEK	: 4
COURSE CODE	: MT 6653		