S.D.N.B. VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)

CHENNAI 600 044

M.Sc., APPLICABLE MATHEMATICS

SYLLABUS FRAME WORK (FOR THE STUDENTS ADMITTED FROM 2014)
M.Sc APPLICABLE MATHEMATICS
Semester-I

S.No	Paper	Title of the paper	CIA	ESE	Max Marks	Credits	Instructional Hours/Week	
							Theory	Practicals
1.	Major 1	Modern Algebra	25	75	100	4	6	-
2.	Major 2	Real Analysis	25	75	100	4	6	-
3.	Major 3	Programming in C++	25	75	100	4	6	-
4.	Elective 1	Probability and Distributions	25	75	100	3	6	-
5.	Practical	Computational Laboratory-I	40	60	100	4	-	4
6.	Soft Skill	Essentials of Spoken and Presentation Skills				2	2	-

Total Credits   21

Semester-II

S.No	Paper	Title of the paper	CIA	ESE	Max Marks	Credits	Instructional Hours/Week	
							Theory	Practicals
1.	Major 4	Linear Algebra	25	75	100	4	6	-
2.	Major 5	Topology	25	75	100	4	6	-
3.	Major 6	Programming in Java	25	75	100	4	4	-
4.	Elective 2	Mathematical Statistics	25	75	100	3	4	-
5.	Practical	Computational Laboratory-II	40	60	100	4	-	4
6.	Non major Elective	Quantitative Aptitude	25	75	100	3	4	-
7.	Soft skill	Essentials of Spoken and Presentation Skills Advanced Level				2	2	-
8.		Internship				2		

Total Credits   26

CIA-Continuous Internal Assessment

ESE-End Semester Examination

Semester - III

S.No	Paper	Title of the paper	CIA	ESE	Max Marks	Credits	Instructional Hours/Week	
							Theory	Practicals
1.	Major 7	Complex Analysis	25	75	100	4	6	-
2.	Major 8	Differential Equations	25	75	100	4	5	-
3.	Major 9	Classical Mechanics	25	75	100	4	5	-
4.	Elective 3	Operations Research	25	75	100	3	4	-
5.	Practical	Computational Laboratory-III (Visual Programming and SQL)	40	60	100	4	-	4
6.	Non major Elective	Discrete Mathematics	25	75	100	3	4	-
7.	Soft Skill	Personality Enrichment				2	2	-

Total Credits 24

Semester – IV

S.No	Paper	Title of the paper	CIA	ESE	Max Marks	Credits	Instructional Hours/Week	
							Theory	Practicals
1.	Major 10	Functional Analysis	25	75	100	4	6	-
2.	Major 11	Differential Geometry and Tensor Calculus	25	75	100	4	6	-
3.	Elective 4	Calculus of variations and Integral Equations	25	75	100	3	6	-
4.	Elective 5	Data Base Management Systems	25	75	100	3	6	-
5.	Project	Project	20	80	100	4	4	-
6.	Soft Skill	Life and Managerial Skills				2	2	-

Total Credits 20

Grand Total 91

M.Sc., Applicable Mathematics

Pattern of Question Paper

External :75 Marks & Internal 25 Marks

External :75 Marks

Section-A

Answer any 10 out of 12 questions   (10x2=20)

Section-B

Answer any 5 out of 7 questions   (5x5=25)

Section-C

Answer any 3 out of 5 questions   (3x10=30)

Total   :75

Internal :25 Marks

1. Test Marks:

    a.   **CAT-I**   : 5 Marks

    b.   **CAT-II**   : 5 Marks

    c.   **Model**   : 5 Marks

2. Aptitude   : 5 Marks

3. Seminar/Group Discussion : 5 Marks

Total   :25 Marks

Semester I

Title of the Course/ Paper	PAPER :Major:1- Modern Algebra	
Core	I Year I Semester	Credits: 4 Sub. Code:
Course outline	Unit-1: Another counting principle – class equation for finite groups and its applications – Sylow's Theorems (for theorem 2.12.1, first proof only) Chapter 2: section 2.11 and 2.12 (Omit Lemma 2.12.5).	
	Unit-2: Solvable groups – Direct Products – Finite abelian groups – Modules Chapter 5: section 5.7(Lemma 5.7.1, Lemma 5.7.2, Theorem 5.7.1) Chapter 2: section 2.13 and 2.14 (Theorem 2.14.1 only) Chapter 4: section 4.5.	
	Unit-3: Trace and Transpose – Hermitian, Unitary, Normal Transformations. Chapter 6: section 6.8 and 6.10	
	Unit-4: Finite Fields – Wedderburn's theorem on finite division rings. Chapter 7: Section 7.1 and 7.2 (theorem 7.2.1 only).	
	Unit-5: Solvability by Radicals – A theorem on Frobenius – integral quaternions and the four square theorem. Chapter 5: Section 5.7(omit Lemma 5.7.1 Lemma 5.7.2 and Theorem 5.7.1). Chapter 7: Section 7.3 and 7.4	
Books for Study	Herstein. Topics in Algebra (II Edition), Wiley Eastern Limited, New Delhi, 1975.	

Books for Reference		1. M. Artin, Algebra, Prentice Hall of India, 1991. 2. P.B. Bhattacharya, S.K. Jain, and S.R. Nagpaul, Basic Abstract Algebra (II Edition) Cambridge University Press, 1997. (Indian Editon) 3. I.S. Luther and I.B.S. Passi, Algebra, Vol. I- Groups(1996);Vol. II Rings, Narosa Publishing House, New Delhi,1999 4. D.S. Malik, J.N. Mordeson and M.K. Sen, Fundamentals of Abstract Algebra, McGraw Hill (International Edition), New York. 1997. 5. N. Jacobson, Basic Algebra, Vol. I & II W.H. Freeman (1980); also published by Hindustan Publishing Company, New Delhi.

Title of the Course/ Paper	PAPER : Major:2- Real Analysis	
Core	I Year I Semester	Credits: 4 Sub. Code:
Course outline	Unit-1:	**Measure on the Real line :** Lebesgue Outer Measure – Measurable sets – Regularity – Measurable Function – Borel and Lebesgue Measurability. Chapter : 2 Sections : 2.1 to 2.5.
	Unit-2:	**Integration of Functions of a Real variable:** Integration of Non-negative Functions – The General Integral – Riemann and Lebesgue Integrals. Chapter : 3 Sections : 3.1 to 3.4.(Omit Section 3.3)
	Unit-3:	**Sequences and Series of Functions:** Discussion of Main Problem – Uniform Convergence - Uniform Convergence and Continuity - Uniform Convergence and Integration - Uniform Convergence and Differentiation – Equicontinuous families of Functions – The Stone -Weierstrass Theorem. Chapter 7: Sections:7.1 to 7. 27
	Unit-4:	**Functions of Several Variables:** Differentiation – The Contraction Principle – The Inverse Function Theorem – The Implicit Function Theorem. Chapter 9: Sections:9.10 to 9.28
	Unit-5:	**Special Functions:** Power Series-Exponential and Logarithmic Functions- Trigonometric Functions Fourier series-Gamma function. Chapter 8:Sections: 8.1 to 8.7,8.9 to 8.22 (omit 8.8)
Books for Study		1. G. de Barra Measure Theory And Integration, New age International, 2003. 2. W.Rudin , Principles of Mathematical analysis,(3rd edition) , McGraw Hill Book Company, Newyork 1976.

Books for Reference		1.Royden .H.L. – Real Analysis, Macmillan Publishing Company, New York, 1988. 2.Tom. M. Apostol, Mathematics Analysis, II Edition Narosa Publishing House, 1989. 3.Burkill, J.C. The Lebesgue Integral , Cambridge University Press,1951 4. Real Analysis – Gupta and others

Title of the Course/ Paper	PAPER : Major:3-Programming in C++	
Core	I Year I Semester	Credits: 4 Sub. Code:
Course outline	**Unit-1:** **Principles of Object Oriented Programming(OOP)-Software evaluation- OOP Paradigm-Basic Concepts of OOP-benefits of OOP-Application of OOP.**	
	Unit-2: **Introduction to c++-Tokens-Keywords-Identifiers-Variables-operators-Manipulators-Expresssions-Control Structures-Pointers-Functions-Functionprototyping parameters Passing in Functions-Values return by Functions-Inline functions-Friend and Virtual functions**	
	Unit-3: **Classes and objects-Constructors-Operator overloading-Type Conversions-Type of Constructors-Function Overloading**	
	Unit-4: **Inheritance- Types of Inheritance- Virtual Functions and Polymorphism Constructors in inheritance- Mapping Console I/O operations.**	
	Unit-5: **Files-File Operations-File pointer-Error Handling during file operations-Command line arguments.**	
Books for Study	**E.Balaguruswamy-Object Oriented Programming With C++-TMH.**	
Books for Reference	**1. Robert Lafore-Object Oriented Programming in Microsoft C++ Galgotia** **2. Venugopal – Programming with C++**	

Title of the Course/ Paper	PAPER :Elective:1-Probability and Distributions(Revised)		
Core	I Year	I Semester	Credits: 3 Sub. Code:

Course outline	Unit-1:	**Probability:**
		      Sample space – Probability axioms – Addition theorem – Bon-Ferroni's inequality – Boole's inequality – conditional probability – multiplication theorem – Baye's rule – Independence of events.
		
		Random variables:
		      Probability distribution of a random variable – Discrete and continuous Random variables –Functions of a Random Variable.	

	Unit-2:	**Moments and Generating functions:**
		      Mathematical expectation – addition & multiplication theorems – PGF – MGF – characteristic function – inversion formula & uniqueness theorem of characteristic function.
		
		 Moment inequalities:
		      Liapounoff's inequality – Chebychev's inequality.	

	Unit-3:	**Multiple random variables:** Definition – joint distribution function – marginal & conditional distributions – Independent random variables – conditional expectation & conditional variance.	

	Unit-4:	**Discrete Distributions:**
		Uniform, Binomial, Negative Binomial, Poisson, Hyper-Geometric, multinomial (mgf, mean & variance of the above distributions).
		Continuous Distributions:
		Uniform, Gamma, Beta (mgf, mean & variance of the above distributions), Cauchy distribution.
	Unit-5:	**Modes of convergence:**
		Convergence in probability & distribution, convergence almost surely, convergence in rth mean – WLLN – SLLN.
		Limit theorems:
		Liapounoff's CLT, Lindberg-Levy CLT – applications of CLT.
Books for Study		V.K. Rohatgi, An Introduction to Probability Theory & Mathematical Statistics, Wiley Eastern Ltd, New Delhi(1988).
Books for Reference		1. G.G Roussas, A first Course in Mathematical Statistics. 2. S.C.Gupta & V.K.Kapoor, Fundamentals of Mathematical Statistics. 3. E.J. Dudewicz and S.N. Mishra, Modern Mathematical statistics. 4. M.Fisz,Probability Theory & Mathematical Statistics. 5. H.Cramer, Mathematical Methods of Statistics. 6. S.S. Wilks,Mathematical Statistics.

Title of the Course/ Paper	PAPER : Practical-Computational Laboratory-I C++ Lab	
Core	I Year I Semester	Credits: 4 Sub. Code:

Course outline		**Simple Programs** 1. Generate the pyramid of digits 2. Generate Armstrong numbers upto a specific limit. 3.Generate Fibonacci series upto n (n<50) number **Functions** 4.Construct a class for storage of dimensions circle, triangle and rectangle and calculate their areas. **Recursion** 5. Print String backwards 6. Factorial of a numbers. **Polymorphism** 7. Overload Unary operator 8. Overload Binary operator **Inheritance** 9. Illustrate multilevel inheritance **Virtual and Friend Functions** 10. Illustrate runtime polymorphism 11. Illustrate working of a friend function **File Handling in C++** 12. Copy a text file to another **Templates** 13. Illustrate a class template

Semester II

Title of the Course/ Paper	PAPER :Major:4-Linear Algebra		
Core	I Year	II Semester	Credits: 4 Sub. Code:
Course outline	Unit-1:	**Extension Fields – Transcendence of e** Chapter 5: Section 5.1 and 5.2.	
	Unit-2:	**Roots of Polynomials – More about roots.** Chapter 5: Section 5.3 and 5.5.	
	Unit-3:	**Elements of Galois theory.** Chapter 5: Section 5.6.	
	Unit-4:	**Linear Transformations: Canonical forms – nilpotent Transformations** Chapter 6: section 6.4 and 6.5.	
	Unit-5:	**Jordan forms – Rational Canonical forms.** Chapter 6: section 6.6 and 6.7.	
Books for Study		Herstein. Topics in Algebra (II Edition), Wiley Eastern Limited, New Delhi, 1975.	

Books for Reference		1 . M. Artin, Algebra, Prentice Hall of India, 1991
		2. P.B. Bhattacharya S.k. Jain and S.R. Nagpaul, Basic Abstract Algebra (II Edition) Cambridge University Press, 1997 (Indian Edition)
		3. I.S. Luther and I.B.S. Passi, Algebra, Vol. 1 – Groups (1996); Vol. II Rings, Narosa Publishing House, New Delhi, 1999
		4. D.S. Malik, J.N. Mordeson and M.K. Sen, Fundamentals of Abstract Algebra, McGraw Hill (International Edition), New York, 1997
		5. N. Jacobson, Basic Algebra, Vol. I & II W.H. Freeman (1980); also published by Hindustan Publishing company, New Delhi.

Title of the Course/ Paper	PAPER : Major:5-Topology	
Core	I Year II Semester	Credits: 4 Sub. Code:

Course outline	**Unit-1:**	**Metric Spaces:**
		          Convergence, completeness and Baire's theorem-Continuous mappings-Spaces of Continuous functions-Euclidean and Unitary spaces.
		
		Topological Spaces:
		          The definition and some examples-elementary concepts.
		Chapter Two : (Sections: 12 – 15)
		Chapter Three: (Sections: 16 & 17

	Unit-2:	**Topological spaces (contd…)**
		          Open bases and sub bases.
		
		Compactness
		          Compact spaces, Product of spaces.
		Chapter Three (Sections: 18)
		Chapter Four (Sections: 21 & 22)

	Unit-3:	Tychonoff's theorem and locally compact spaces-compactness for metric spaces- Ascoli's theorem. Chapter Four (Sections: 23 – 25)
	Unit-4:	T_1 – spaces and Hausdorff spaces- completely regular spaces and normal spaces- Urysohn's lemma and Tietze extension theorem. Chapter Five (Sections: 26 – 28)
	Unit-5:	Connected spaces- The components of a space-Totally disconnected spaces - Locally connected spaces. Chapter Six (Sections: 31 – 34)
Books for Study		George F.Simmons, Introduction to Topology and Modern Analysis, McGraw Hill Book Co., 1963.

Books for Reference		1.James R. Munkres, Topology (2nd edition) Pearson Education Pvt Ltd., Delhi – 2002(Third Indian Reprint) 2. J. Dugundji , topology, Prentice Hall of India, New Delhi, 1975, 3.J.L. Kelly, General Topology , Van Nosttand, Reinhold Co., New york. 4.S.Willard, General Topology, Addison – Wesley , Mass., 1970.

Title of the Course/ Paper	PAPER : Major:6-Programming in Java		
Core	I Year	II Semester	Credits: 4 Sub. Code:
Course outline	Unit-1:	Introduction to Java-Features of Java-Object Oriented Concepts- Lexical Issues-data Types-Variables-Arrays-Operators-control Statements.	
	Unit-2:	Classes –Objects-Constructors-Overloading method-Access Control- Static and fixed methods-Inner Classes-String Class-Inheritance- Overriding	
	Unit-3:	Packages-Access Protection-ImportingPackages-Interfaces-Exception Handling-Throw and Throws.	
	Unit-4:	Thread-Synchronization – Messaging – RunnableInterface - Interthread Communication-Deadlock- Suspending, Resuming and stopping threads-Multithreading.	
	Unit-5:	I/O Streams-File Streams-Applets-String Objects-String Buffer- Char Array-Java Utilities-Code Documentation.	
Books for Study		1.Cay S.Horstmann, Gary Cornell-core Java 2 Volume I-Fundamentals, 5th Edition. PHI, 2000. 2.P.Naughton and H.Schildt-Java 2(The Complete Reference)-Third Edition TMH 1999.	
Books for Reference		1. Programming with Java, - A Primer – E.Baluguruswamy 2. Programming with Java 2 – Xavier, C 3. K.Arnold and J.Gosling- The Java Programming Language-Second Edition Addison Wesley, 1996	

Title of the Course/ Paper	PAPER :Elective:2-Mathematical Statistics(Revised)		
Core	I Year	II Semester	Credits: 3 Sub. Code:
Course outline	Unit-1:	**Exact Sampling Distributions:** Chi-square – definition, derivation of the pdf, mgf, additive property – independence of $\overline{X}$ & S^2 – t & F statistic – definition, derivation of the pdf, mean and variance – interrelationship between χ^2, t and F.	
	Unit-2:	**Theory of Estimation:** Consistency, unbiasedness, sufficiency and completeness, Neyman-Fisher factorization theorem, MVUE, LMVUE, UMVUE – Rao-Blackwell theorem – Cramer-Rao inequality – Chapman-Robin's inequality – Lehman-Scheffe theorem **Methods of Estimation:** MLE, method of moments	
	Unit-3:	**Testing of Hypothesis:** Errors in hypothesis testing – the Neyman-Pearson lemma – Most powerful tests – Families with MLR– unbiased and invariant tests – Generalized NP lemma.	
	Unit-4:	Generalized Likelihood ratio test – definition, LRT for Binomial, LRT for Normal (one and two populations only) – χ^2, t and F tests.	

	Unit-5:	Confidence Estimation:
		Methods of finding confidence interval – shortest length confidence interval – confidence intervals for the parameters of normal distribution – confidence intervals based on large samples. Analysis of variance: One way ANOVA- Two way ANOVA- Two way ANOVA with one observation per cell.
Books for Study		V.K. Rohatgi, An Introduction to Probability Theory & Mathem Statistics, Wiley Eastern Ltd, New Delhi(1988).
Books for Reference		1. G.G Roussas, A first Course in Mathematical Statistics. 2.S.C.Gupta & V.K.Kapoor, Fundamentals of MathematicalStatistics. 3.E.J. Dudewicz and S.N. Mishra, Modern Mathematical Statistics. 4.M.Fisz,Probability Theory & Mathematical Statistics. 5.H.Cramer, Mathematical Methods of Statistic 6.S.S. Wilks,Mathematical Statistics.

Title of the Course/ Paper	PAPER :Practical- Computational Laboratory-II Java Programming Lab	
Core	I Year II Semester	Credits: 4 Sub. Code:
Course outline		**Applications:** 1.Substring Removal from a String. Use String Buffer class. 2.Finding area and Perimeter of a circle. Use Buffered Reader class 3.Determining the order of numbers generated randomly using Random class 4.Implementation of Point Class for Image manipulation. 5.String Manipulation using Char Array. 6.Usage of Vector Class 7.Implementing Thread based applications & Exception Handling. 8.Application using synchronization such as Thread based, Class based and synchronized statements. **Applets:** 9. Working with Frames and various controls. 10. Working with Dialogs and Menus. 11. Working with Panel and Layout. 12. Working with Colors and Fonts.

Title of the Course/ Paper	PAPER : Non – Major Elective :Quantitative Aptitude	
Core	I Year II Semester	Credits: 3 Sub. Code:
Course outline	Unit-1: Numbers – H.C.F and L.C.M of numbers- Decimal fractions .(Only simple problems)	
	Unit-2: Percentage -Profit and Loss (Only simple Problems)	
	Unit-3: Time and work (Only simple problems)	
	Unit-4: Time and distance (Only simple problems)	
	Unit-5: Data interpretation-Tabulation (Only simple problems)	
Books for Study	R.S.Priya Quantitative Aptitude,Scitech Publications (India) Pvt.Ltd.,	
Books for Reference	1. Agarwal R.S Quantitative Aptitude, S. Chand and company Ltd, (1989). 2.Guha Abhijit, Quantitative Aptitude for competitive examinations standard book Distributing House Third Edition 2005.	

Semester III

Title of the Course/ Paper	**PAPER :Major:7-Complex Analysis**

Core	Ⅱ **Year** Ⅲ **Semester**	**Credits: 4** **Sub. Code:**

Course outline	**Unit-1:**	**Complex integration:**
		      Zeros of an analytic function- the index of a closed curve – Cauchy's theorem and integral formula – the homotopic version of Cauchy's Theorem and simple connectivity – Counting zeros & open mapping theorem – Goursat's theorem.
		  Chapter 4 : Section 3 to 8

	Unit-2:	**Singularities:**
		      Classification of Singularities –residues-the Argument principle.
		
		 The Maximum Modulus theorem :
		      The Maximum Principle – Schwarz 's lemma
		 Chapter 5: Section 1 to 3
		 Chapter 6 : Section 1 and 2

	Unit-3:	**Compactness and convergence in the space of analytic functions:** **The Riemann mapping theorem – Weierstrass Factorization theorem – Factorization of the sine function - The gamma function -The Riemann – zeta function.** **Chapter 7: Section 4 to 8**
	Unit-4:	**Harmonic functions :** **Basic properties of Harmonic function – Harmonic functions on a disk- Subharmonic and superharmonic function – The Dirichlet problem – Green's functions.** **Chapter 10 : Section 1 to 5**

	Unit-5:	**Entire Functions:**
		      Jensens formula – The genus and order of an entire function –Hadamard Factorization theorem.
		 The Range of an Analytic function:
		 Bloch's theorem –The Little Picard theorem –Schottky's theorem .
		 Chapter 11 : Section 1 to 3
		  Chapter 12 : Section 1 to 3

Books for Study		John B. Conway , Functions of one complex variable, springer – Verlag,international student edition,Narosa publishing co.
Books for Reference		1. Lars V. Ahlfors, Complex Analysis, (3rd edition) McGraw Hill Co., New York, 1979 2.H.A.Prestly, Introduction to complex Analysis, clarendon Press Oxford 1990. 3.E.Hille, Analytic function Theory (2 vols), Gonm & co, 1959 4.M.Heins, Complex function Theory, Academic press, New York 1968

Title of the Course/ Paper	PAPER :Major:8-Differential Equations		
Core	II Year	III Semester	Credits: 4 Sub. Code:
Course outline	Unit-1:	**Solutions in Power Series:** Introduction – Second order Linear equations with ordinary points, Legendre equation and Legendre polynomials- Second order equation with Regular singular point – Properties of Bessel functions. **Chapter 3: Section 3.1 to 3.5**	
	Unit-2:	**Systems of Linear Differential Equations:** Introduction – Systems of first order equations – Model for arms competition between two nations- Existence and uniqueness theorem Fundamental matrix – Non-homogeneous linear systems – Linear systems with constant coefficients **Chapter 4 :Section 4.1 to 4.7**	
	Unit-3:	**Existence and uniqueness of solutions:** Introduction – Preliminaries – Successive approximations – Picard's theorem – Some examples **Chapter 5 :Section 5.1 to 5.5**	
	Unit-4:	**First order Partial Differential Equations:** Introduction – Partial differential equations of first order in two independent variables – Formulation of first order partial differential equations – Solution of linear first order partial differential equations (Lagrange's method) – Integral surfaces passing through a given curve surfaces orthogonal to a given system of surfaces – Compatibility of first order partial differential equations – Classification of the solution of first order partial differential equations – solution to Non-linear partial differential equations of first order – Charpit's method – Jacobi's method . **Chapter 1 Section: 1.1 to 1.9**	

	Unit-5:	**Second order Partial Differential Equations:** Origin of second order partial differential equations - Linear partial differential equations with constant coefficients – Method of solving linear partial differential equations – Solution of reducible equations – Solution of irreducible equations with constant coefficients – Rules for finding complimentary functions – Rules for finding particular integrals –classification of second order partial differential equations – Canonical forms – Adjoint operators – Riemann's method . **Chapter 2: Sections 2.1 to 2.5**

Books for Study		For Units I , II and III
		    S.G. Deo, S.D. Lakshmikanthan and V. Raghavendra, Ordinary Differential Equations , Tata McGraw Hill Publishing Company, New Delhi, 1991.
		
		For units IV and V
		    J.N .Sharma and Kehar singh , Partial Differential Equations for Engineers and Scientists ,Narosa Publishing, NewDelhi ,2000.

Books for Reference		1. M.D.Raisinghania, Ordinary and partial Differential Equations, S.Chand & Company Ltd. New Delhi 2001. 2. I.N. Smirnov, Second order partial differential equations, Leningrad , 1964. 3. lan Sneddon, Elements of partial differential equations, McGraw Hill,New Delhi, 1983. 4.R. Dennemeyer, Introduction to partial Differential Equations and Boundary Value problem Mcgraw Hill,New York. 5. W.E. Willams, Partial Differential Equation, Oxford, Clarendon, 1980. 6.W.E.Boyce and Diprima, Elementary Differential Equation and Boundary value Problems, (7th Edition)John Wilsey &Sons , NewYork, 1967.

Title of the Course/ Paper	PAPER :Major:9-Classical Mechanics		
Core	II Year	III Semester	Credits: 4 Sub. Code:
Course outline	**Unit-1:** Mechanics of a particle-Mechanics of a system of particles-Constraints-D'Alembert's principle and Lagrange's equation-simple applications of the Lagrangian formulation. Chapter 1: section 1.1-1.4,1.6		
	Unit-2: Hamilton's principle-Some techniques of the calculus of variations-Derivation of Lagrange's equation from Hamilton's principle-Extension of Hamilton's principle to nonholonomic systems-Conservation theorems and symmetry properties. Chapter2:Section 2.1-2.4,2.6		
	Unit-3: The independent coordinates of a rigid body-The Euler angles-Euler's theorem on the motion of a rigid body-Rate of change of a vector-The Coriolis force. Chapter 4:Section 4.1,4.4,4.6,4.9.4.10		
	Unit-4: Angular momentum and Kinetic energy of motion about a point-Tensor and dyadics-The inertia tensor and the moment of inertia-The eigen values of the inertia tensor and the principal axis transformation-Methods of solving rigid body problems and the Euler equations of motion- Legendre transformations and the Hamilton equations of motion-Routh's procedure and oscillations about steady motion. Chapter 5:Section 5.1-5.5 Chapter 8:Section 8.1,8.3		

	Unit-5:	The principle of least action-The equations of canonical transformation-Examples of canonical transformations-The symplectic approach to canonical transformations-Poission brackets and other canonical invariants. Chapter8:Section 8.6 Chapter 9:Section 9.1-9.4
Books for Study		Classical Mechanics-Herbert Goldstein II Edition Narosa Publishing House New Delhi. 1986
Books for Reference		1.Principles of Mechanics-J.L.Synhe and B.A.Griffith-III Edition McGraw Hill Book House, New York, 1970. 2.Classical Mechanics-D.E.Rutherford,Olover Boyd. 3.Text Book of Dynamics-P.Chorlton-Van Nostrand. 4.Principles of Dynamics-Donald T.Greenwood II Edition Prentice Hall of India Private Limited, New Delhi, 1988.

Title of the Course/ Paper	PAPER :Elective:3-Operations Research		
Core	II Year	III Semester	Credits: 3 Sub. Code:
Course outline	Unit-1:	**Dynamic Programming Problems(DPP):** Dynamic programming terminology –Developing optimal decision policy -Dynamic programming under certainity- Dynamic programming approach for solving LPP. **Chapter22: Sections: 22.1-22.5**	
	Unit-2:	**Decision Theory:** Steps in decision theory approach – types of decision making environments - decision making under uncertainity- decision making under risk . posterior probabilities and Bayesian analysis. Decision tree analysis. **Chapter 11: Sections: 11.1 – 11.7**	
	Unit-3:	**Inventory Models:** Introduction-Basic concepts- Inventory control models without shortages(model I(a) EOQ model with constant rate of demand) , (model I (c) :EOQ model with Economic production model when supply is gradual) – Inventory control models with shortages (model II (a): EOQ model with constant rate of demand and variable order cycle time ,(model II (b): EOQ model with constant rate of demand and fixed reorder cycle time,) (model II (c):EOQ model with gradual supply) **Chapter 14: Sections: 14.1 – 14. 8**	
	Unit-4:	**Queueing Theory:** Introduction-Basic concepts -Classification of queuing models and their solutions. **Probability Distribution of Arrivals and Departures-Erlangian Service Time Distribution with K-Phases.** **Chapter 16:Sections: 16.1- 16.5 Appendix : 16. A,16. B**	

	Unit-5:	Classical Optimization Theory:
		
		    Unconstrained optimization –constrained multi variable optimization with equality constrained multi variable optimization with inequality constrained.
		 Chapter 23 : Sec 23.1–23.4
		Non-Linear Programming:
		
		    The general non linear programming problem – Quadratic programming .
		Chapter 24: Sections: 24.1, 24.2, 24.4(omit 24.3 & 24.4.3)

Books for Study		J.K. SHARMA Operations Research Theory and Application (II Edition), Macmillan India Limited (1997-2003)
Books for Reference		1.F.S.Hiller and G.J .Liebermen , Introduction to operations Research (IV Edition)Mc Graw Hill Book Company, New York,1989. 2.Philips D.T.Ravindra A. and Solberg J, Operations Research, Principles and Practice,John wileyand sons New York. 3.S.D.Sharma Operations Research Kedar Nath Ram Nath & Co Publishers, Meerut.

Title of the Course/ Paper	PAPER : Pactical: Computational Laboratory III (Visual Programming & SQL)	
Core	II Year III Semester	Credits: 4 Sub. Code:
Course outline	SQL Lab: 1. Simple Queries 2. Set Operations & Aggregate functions 3. DML commands. 4.DDL Commands. Visual Basic: 1. Write a program to design a calculator with arithmetic, sqrt and trigonometric functions. 2.Write a program to perform temperature conversion and inches to feet conversion.The program should include facility to change font size, to display with precision (decimalplaces). The program should use MDI forms. 3.Write a program to select items from one list and move them to another list. 4. Write a program to implement the timer and shape controls. 5. Write a program to drag the controls within the form 6. Write a program to create a sketchpad using picture box. For the following programs use Oracle, create a database and perform the operations given below Menu Driven program. a.Insertion, b.Deletion, c.Modification, d.Generate simple reports using queries. 7. Payroll 8. Electricity bill preparation system	

Title of the Course/ Paper	**PAPER : Non-Major Elective:Discrete Mathematics**	
Core	II Year III Semester	**Credits: 3** **Sub. Code:**
Course outline	**Unit-1:**	**Mathematical Logic:** **Logical Statement or proposition-Type of proposition-The propositional calculus- The Negation of proposition-Disjunction-Conjunction-Tautologies and contradictions (Only simple problems)**
	Unit-2:	**Mathematical logic (conti.,)** **Logical equivalence – The algebra of propositions – Conditional propositions – Converse Inverse and contra positive propositions – The Negation of a conditional proposition – Byconditional propositions – Argument (Only simple problems)**
	Unit-3:	**Boolean Algebra – Basic properties (Only simple problems)**
	Unit-4:	**Relation – Equivalence relation (Only simple problems)**
	Unit-5:	**Function(mapping) – Inverse mappings – Composition of mappings (Only simple problems)**
Books for Study		**Vatssa B.S : Discrete Mathematics , Third Edition, Wishwa Prakashan , New Delhi 1986.**
Books for Reference		**Venkataraman M.K : Engineering Mathematics,Vol 1&2,The National Pub.co,Madras (1993 & 1992)**

Semester IV

Title of the Course/ Paper	PAPER :Major:10-Functional Analysis	
Core	II Year IV Semester	Credits: 4 Sub. Code:
Course outline	Unit-1:	Banach Spaces : Definition - Some examples - Continuous Linear Transformations - The Hahn-Banach Theorem – The natural embedding of N in N**. Chapter 9 : Sections 46 to 49.
	Unit-2:	Banach Spaces and Hilbert Spaces : Open mapping theorem - Conjugate of an operator - Definition and some simple properties.Orthogonal complements - Orthonormal sets. Chapter 9 : Sections 50 and 51 Chapter 10 : Sections 52, 53 and 54
	Unit-3:	Hilbert Space : Conjugate space H* - Adjoint of an operator - Self-adjoint operator - Normal and Unitary operators. Chapter 10 : Sections 55, 56 57 and 58.
	Unit-4:	General Preliminaries on Banach Algebras: Definition and some examples - Regular and singular elements - Topological divisors of zero spectrum - the formula for the spectral radius - the radical and semi-simplicity. Chapter 12 : Sections 64 to 69.
	Unit-5:	Structure of Commutative Banach Algebras: The Gelfand mapping - Applications of the formula $r(x) = \lim \|x^n\|^{1/n}$ - Involutions in Banach Algebras - The Gelfand-Neumark Theorem. Chapter 13 : Sections 70 to 73.
Books for Study		G.F. Simmons, Introduction to Topology and Modern Analysis, McGraw Hill international Book Company, New York, 1963

Books for Reference		1.W .Rudin , Functional Analysis Tata Mc graw-Hill Publising Company New Delhi, 1973. 2. G. Bachman & L. Narici, Functional Analysis Academic Press, New York, 1966. 3. H.C. Goffman and G. Pedrick, First course in Functional Analysis, Academic Press New York (1963)

Title of the Course/ Paper	PAPER :Major :11-Differential Geometry and Tensor Calculus		
Core	II Year	IV Semester	Credits: 4 Sub. Code:
Course outline	Unit-1:	**Space Curves:** Definition of a space curve – Arc length – Tangent, normal and binormal – Curvature and torsion - Contact between curves and surfaces - Tangent surfaces, involutes and evolutes - Intrinsic equations - Fundamental Existence Theorem for space curves-Helices. Chapter I :Section 1 to 9.	
	Unit-2:	**Intrinsic properties of a surface:** Definition of a surface – Curves on a surface - Surface of revolution –Helicoids – Metric - Direction Coefficients - Families of curves – Isometric correspondence - Intrinsic properties. Chapter II :Section 1 to 9	
	Unit-3:	**Geodesics:** Geodesics - Canonical geodesic equations – Normal property of geodesics –Existence Theorems – Geodesic parallels –Geodesics curvature – Gauss Bonnet Theorem. Chapter II : Section 10 to 16	
	Unit-4:	Invariance –Transformation of coordinates and its properties – Transformation by Invariance- Transformation by covariance and contra variance – The Tensor concept: Contravariant and Covariant Tensors- Tensor Character of Covariant and Contravariant Laws - Algebra of tensors – Quotient Laws - Symmetric and Skew- Symmetric Tensors. Chapter II : section 18 to 27 (omit sec.28) I.S.Sokolnikoff	

	Unit-5:	The Metric tensor – The Fundamental and Associated Tensors – Christoffel's symbols – Transformation of Christoffel's symbols - Covariant Differentiation of Tensors – Formulas for Covariant Differentiation – Ricci's theorem. Chapter II : section 29 to 35 (I.S.Sokolnikoff)
Books for Study		For Units I, II and III T.J Willmore, An Introduction to Differential Geometry , Oxford University press, (17th impression) New Delhi 2002. (Indian print). For Units IV and V I.S Sokolnikoff, Tensor Analysis, John Wiley and Sons New york, 1964.
Books for Reference		1.Struik, D.T ,Lecturers on classical differential geometry ,addison – Wesley mass 1950. 2.Kobayashi. S.and Nomizu K. Foundations of Differential Geometry Interscience publishers, 1963. 3.Wilhelm Klingenberg ,A course in Differential Geometry Graduate texts in Mathematics springer-verlag 1978. 4.J.A Thorpe Elementary topics in differential geometry springer International Edition 2004.

Title of the Course/ Paper	PAPER :Elective:4-Calculus of Variations and Integral Equations		
Core	II Year	IV Semester	Credits: 3 Sub. Code:
Course outline	Unit-1:	The method of Variations in problems with fixed boundaries : Variation and its properties – Euler's equation – Functionals of the form $\int F(x,y_1,y_2,\ldots y_n,y_1{}',y_2,{}'\ldots y_n{}')dx.$ – functionals dependent on higher-order derivatives - functionals dependent on the functions of several independent variables – variational problems in parametric form – some applications. Chapter 6 : Sections 1 to 7 (Elsgolts)	

	Unit-2:	Variational problems with moving boundaries and certain other problems andsufficient conditions for an extremum:
		   An elementary problem with moving boundaries - the moving – boundary problem for a functional of the form $\int f(x,y,z,y',z')dx$ – extremals with corners – one-sided variations.
		   Field of extremals – the function $E(x,y,p,y')$ – transforming the Euler's equations to the canonical form.
		 Chapter 7 : Sections 1 to 4 (Elsgolts)
		 Chapter 8 : Sections 1 to 3 (Elsgolts	

	Unit-3:	Integral Equations:
		   Definition-regularity conditions-special kinds of kernels-eigen values and eigen functions-convolution integral-the inner or scalar product of two functions.
		
		 Integral Equations with separable kernels:
		   Reduction to a system of algebraic equations-examples-Fredholm alternative-examples-an approximate method.
		 Chapter 1 : Sections 1.1 to 1.7 (Kanwal)
		 Chapter 2 : Sections 2.1 to 2.5 (Kanwal	

	Unit-4:	Method of successive approximations:
		    Iterative scheme-examples-Volterra integral equation-examples-Some results about the resolvent kernel.
		
		Classical Fredholm Theory:
		    The method of solution of Fredholm-Fredholm's first theorem-examples-Fredholm's second theorem-Fredholms third theorem.
		Chapter 3 : Sections 3.1 to 3.5 (Kanwal)
		Chapter 4 : Sections 4.1 to 4.5 (Kanwal)

	Unit-5:	Symmetric Kernels:
		
		    Introduction-fundamental properties of eigen values and eigen functions for symmetric kernels-expansion in eigen functions and bilinear form-Hilbert-Schmidt theorem and some immediate consequences-solution of a symmetric integral equation-examples.
		
		Singular Integral Equations:
		
		    The Abel integral equation-examples-Cauchy principle value for integrals-the Cauchy-type integrals-solution of the Cauchy-type singular integral equation.
		Chapter 7 : Sections 7.1 to 7.6 (Kanwal)
		Chapter 8 : Sections 8.1 to 8.5 (Kanwal)

Books for Study		For Units I and II : L. Elsgolts, Differential Equations and the Calculus of Variations, Mir Publishers, Moscow,1973 (2nd Edition) For Units III, IV and V : Ram P. Kanwal, Linear Integral Equations, Academic Press, New York, 1971.

Books for Reference		1. I.M. Gelfand and S.V. Fomin, Calculus of Variations, Prentice-Hall Inc. New Jersey, 1963. 2. A.S. Gupta, Calculus of Variaticns with Applications, Prentice-Hall of India,New Delhi, 1997. 3. M. Krasnov, A. Kiselev and G. Makarenko, Problems and Exercises in Integral Equations,Mir Publishers, Moscow, 1979. 4. S.G. Mikhlin, Linear Integral Equations, Hindustan Publishing Corp. Delhi,1960. 5. L.A.Pars, An Introduction to the Calculus of Variations,Heinemann,London1965. 6. R.Weinstock, Calculus of Variations with Applications to Physics and Engineering, McGraw-Hill Book Company Inc. New York, 1952.

Title of the Course/ Paper	PAPER :Elective:5-Database Management Systems	
Core	II Year IV Semester	Credits: 3 Sub. Code:
Course outline	Unit-1:	Advantages and Components of a Database Management Systems - Feasibility Study – Class Diagrams – DataTypes – Events – Normal Forms - Integrity – Converting Class Diagrams to Normalized Tables – Data Dictionary.
	Unit-2:	Query Basics – Computation Using Queries – Subtotals and GROUP BY Command – Queries with Multiple Tables – Subqueries – Joins –DDL & DML – Testing Queries.
	Unit-3:	Effective Design of Forms and Reports – Form Layout – Creating Forms – Graphical Objects – Reports – Procedural Languages – Data on Forms – Programs to Retrieve and Save Data – Error Handling.
	Unit-4:	Power of Application Structure – User Interface Features – Transaction – Forms Events – Custom Reports –Distributing Application – Table Operations – Data Storage Methods – Storing Data Columns – Data Clustering and Partitioning.
	Unit-5:	Database Administration – Development Stages – Application Types – Backup and Recovery – Security and Privacy – Distributed Databases – Client/Server Database – Web as a Client/server System – Objects – Object Oriented Databases –Integrated Applications.
Books for Study		G.V. Post – Database Management Systems Designing and Building Business Application- McGraw Hill International edition – 1999.

Books for Reference		1. **Raghu Ramakrishnan – Database Management Systems – WCB/McGraw Hill – 1998.** 2. **C.J. An Introduction to Database Systems – 7th Edition – Addison Wesley- 2000**.

PROJECT

Using Visual Basic and Oracle

Title of the Course/ Paper	PAPER : ALLIED MATHEMATICS – I For B.C.A Students	
Core	I Year I Semester	Credits: 5 Sub. Code:
Course outline	**Unit-1:** **Mathematical logic- Introduction-Prepositional calculus-Basic logic operations-Tautologies-Contradiction-Argument-Simple problems.**	
	Unit-2: **Expansion of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$, $\sin^n \theta$, $\cos^n \theta$, $\sin \theta$, $\cos \theta$, $\tan \theta$ in powers of θ.**	
	Unit-3: **Circular functions, Hyperbolic functions, Relation between Circular and Hyperbolic functions, Inverse Hyberbolic functions.**	
	Unit-4: **Laplace Transforms of Standard functions and properties**	
	Unit-5: **Inverse Laplace Transforms of Standard functions and properties.**	
Books for Study		**1.Allied Mathematics Volume 1&2 by Prof. P.Duraipandian and Dr. S. Udayabaskaran, Muhil publishers,Chennai.** **Unit 2,3 – Vol I** **Unit 4,5 - Vol II** **2.Discrete Mathematics" by B.S .Vatsa.suchi vatsa New age International Publishers(Unit I)**
Books for Reference		**1.Mathematical Foundation on P.R.Vittal,Margham Publications.** **2.Discrete Mathematics-J.K.Sharma Second Edition-2005 Macmillian India Ltd.**

Title of the Course/ Paper	PAPER : ALLIED MATHEMATICS-II **For B.C.A Students**		
Core	I **Year**	II **Semester**	**Credits: 5** **Sub. Code:**
Course outline	**Unit-1:**	Solving algebraic and transcendental equation by Newton-Raphson method,Solution to system of linear Equations: Gauss elimination,Gauss seidel method.	
	Unit-2:	Interpolation with unequal intervals:Divided differences and their properties,Newton's divided difference formula,Lagrange's formula for interpolation. **Inverse interpolation:** Lagrange's method.	
	Unit-3:	Numerical Differentiation:Numerical differentiation upto second order solution using Newton's forward and backward formula. **Numerical integration:** Trapezoidal rule,Simpson's one-third rule,Simpson's three-eighth rule.	
	Unit-4:	Concept of random variable, Probability distribution of a random variable, Mathematical Expectation, Moments and moment generating functions, simple problems, standard distributions, binomial, poission, normal distributions(mean and variance)-Simple problems.	

	Unit-5:	Correlation and regression analysis: Correlation coefficient-rank correlation coefficient, Simple regression-method of least squares for estimation of regression coefficient-Simple problems.
Books for Study		**1.Numerical methods(II edition),S.Arumugam,A.Thangapandi Issac,A.Somasundaram.(for UNIT-1,2,3)** **2.Statistical methods.S.P Gupta.(for UNIT-4,5).**
Books for Reference		**1.Statistical and Numerical Methods-P.R.Vittal** **2.Pillai R.S.N And Bagavathi.V (2003) Statistics S.Chand and Company Limited .** **3.V.K. Kapoor-Practical Statistics**