BHARATHIAR UNIVERSITY, COIMBATORE.
M. Sc. MATHEMATICS DEGREE COURSE (AFFILIATED COLLEGES)
(Effective from the academic Year 2015-2016)
SCHEME OF EXAMINATIONS – CBCS PATTERN

Sem.	Study Components	Course title	Ins. hrs/ week	Examinations				Credit
				Dur.Hrs	CIA	Marks	Total Marks	
I	Paper 1	Algebra	7	3	25	75	100	4
	Paper 2	Real Analysis	7	3	25	75	100	4
	Paper 3	Ordinary Differential Equations	6	3	25	75	100	4
	Paper 4	Numerical Methods	6	3	25	75	100	4
	Elect. Paper I		4	3	25	75	100	4
II	Paper 5	Complex Analysis	6	3	25	75	100	4
	Paper 6	Partial Differential Equations	7	3	25	75	100	4
	Paper 7	Mechanics	7	3	25	75	100	4
	Paper 8	Operations Research	6	3	25	75	100	4
	Elect. Paper II		4	3	25	75	100	4
III	Paper 9	Topology	7	3	25	75	100	4
	Paper 10	Fluid Dynamics	7	3	25	75	100	4
	Paper 11	Mathematical Statistics	6	3	25	75	100	4
	Paper 12	Graph Theory	6	3	25	75	100	4
	Elect. Paper III		4	3	25	75	100	4
IV	Paper 13	Functional Analysis	7	3	25	75	100	4
	Paper 14	Mathematical Methods	7	3	25	75	100	4
	Paper 15	Computer Programming (C++ Theory)	4	3	25	75	100	4
	Practical	Computer Programming (C++ Practical)	2	3	40	60	100	4
	Paper 16	Number Theory	6	3	25	75	100	4
	Elect. Paper IV		4	3	25	75	100	4
	Project						150*	6
		Total					2250	90

*** For Project report – 120 marks, Viva-voce – 30 marks.**

LIST OF ELECTIVES

1.Mathematical Softwares**
(*LaTex, MATLAB and Mathematica*)
2.Magnetohydro Dynamics
3.Control Theory
4.Differential Geometry
5.Fuzzy Logic and Fuzzy Sets
6.Cryptography
7. Neural Networks
8.Stochastic Differential Equations

Note : The syllabus for all the above papers (except Paper XIV – Mathematical Methods & Elective paper Mathematical Softwares) be the same as prescribed for the academic year 2014-15. The syllabus for the Paper XIV – Mathematical Methods, Elective paper Mathematical Softwares are furnished below. For Paper IV – Numerical Methods one more reference book is added.

** Theory – 2 hrs – 75 Marks (20 CIA +55 External)
Practical – 2 hrs – 25 Marks (10 CIA +15 External)

PAPER IV: NUMERICAL METHODS

Unit I:

SOLUTION OF NONLINEAR EQUATIONS:

Newton's method – Convergence of Newton's method – Bairstow"s Method for quadratic factors NUMERICAL DIFFERENTIATION AND INTEGRATION: Derivatives from Differences tables – Higher order derivatives – Divided difference, Central-Difference formulas – Composite formula of Trapezoidal rule – Romberg integration – Simpson's rules.

Unit II:

SOLUTION OF SYSTEM OF EQUATIONS:

The Elimination method – Gauss and Gauss Jordan methods – LU Decomposition method – Matrix inversion by Gauss-Jordan method – Methods of Iteration – Jacobi and Gauss Seidal Iteration – Relaxation method – Systems of Nonlinear equations.

Unit III:

SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:

Taylor series method – Euler and Modified Euler methods – Rungekutta methods – Multistep methods – Milne's method – Adams Moulton method.

Unit IV:

BOUNDARY VALUE PROBLEMS AND CHARACTERISTIC VALUE PROBLEMS: The shooting method – solution through a set of equations – Derivative boundary conditions – Characteristic value problems – Eigen values of a matrix by Iteration – The power method.

Unit V:

NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS:

(Solutions of Elliptic, Parabolic and Hyperbolic partial differential equations) Representation as a difference equation – Laplace's equation on a rectangular region – Iterative methods for Laplace equation – The Poisson equation – Derivative boundary conditions – Solving the equation for time-dependent heat flow (i) The Explicit method (ii) The Crank Nicolson method – solving the wave equation by Finite Differences.

Treatment as in:

1. APPLIED NUMERICAL ANALYSIS' by C.F.Gerald and P.O.Wheatley, Fifth Edition, Addison Wesley, (1998).

Reference Book:

1. S.C. Chapra and P.C. Raymond: Numerical Methods for Engineers, tata McGraw Hill, New Delhi, (2000)
2. R.L. Burden and J. Douglas Faires: Numerical Analysis, P.W.S.Kent Publishing Company, Boston (1989), Fourth Edition.
3. S.S. Sastry: Introductory methods of Numerical Analysis, Prentice Hall of India, New Delhi, (1998).
4. P.Kandasamy et al.,Numerical Methods, S.Chand & Co.Ltd., New Delhi(2003)

PAPER XIV: MATHEMATICAL METHODS

Unit I:

FOURIER TRANSFORMS: Fourier sine and cosine transforms – Fourier transforms of derivatives - Fourier transforms of simple functions - convolution integral – Parseval's Theorem - Solution of PDE by Fourier transform – Laplace equation in half plane in infinite strips; in semi infinite strip. The Linear diffusion equation on a semi infinite line – the two dimensional diffusion equation.

Unit II:

HANKEL TRANSFORMS: Properties of Hankel Transforms – Hankel transformation of derivatives of functions – Hankel Inversion Theorm (Statement only)- The Parseval's relation – relation between Fourier and Hankel transforms - Axisymmetric Dirichlet problem for a half space - Axisymmetric Dirichlet problem for a thick plate.

Unit III:

INTEGRAL EQUATIONS: Types of Integral equations – Integral Fredholm Alternative - Approximate method – Equation with separable Kernel - Volterra integral equations – Fredholm's theory – Fredholm's first, second, third theorems.

Unit IV:

Application of Integral equation to ordinary differential equation – initial value problems – Boundary value problems – singular integral equations – Abel Integral equation

Unit V:

CALCULUS OF VARIATIONS: Variation and its properties – Euler's equation – Functionals of the integral forms - Functional dependent on higher order derivatives – functionals dependent on the functions of several independent variables – variational problems in parametric form –applications.

Treatment as in: For Units I and II:

The Use of Integral Transforms by I.N.Sneddon, Tata Mc Graw Hill, New Delhi, 1974.

For Units III and IV:

Linear Integral Equations Theory and Technique by R.P.Kanwal, Academic Press, New York, 1971.

For Unit V:

Differential Equations and Calculus of Variations by L.Elsgolts, Mir Publishers, Moscow, 1970.

Unit I	:	Chapter 2:	2.4 - 2.7, 2.9 – 2.10, 2.16 – 2-(a).(b).(c) 2.16.		
Unit II	:	Chapter 5:	5.2 – 5.4, 5.6 – 5.7, 5.10 – 5.12.		
Unit III	:	Chapter 2:	2.3 - 2.5,	Chapter 3:	3.3 - 3.4.
Unit IV	:	Chapter 5:	5.1 – 5.2,	Chapter 8:	8.1 – 8.2.
Unit V	:	Chapter 6:	6.1 – 6.7.		

Elective Paper –I
Mathematical Softwares *(LaTex, MATLAB and Mathematica)*

Unit I: Basis of a LaTex file – Special Characters, Document layout and organization – Document Class, Page Style, Parts of the Document, Centering and Indenting, List, Theorem-Like Declarations, Boxes, Tables.

Unit II: Foot notes and Marginal notes, Mathematical formulas – Mathematical Environments, Main elements of math mode, Mathematical Symbols, Additional Elements, Fine Tuning Mathematics, Drawing Pictures with LaTex.

Unit III: MATLAB Windows – Online help – Matrices and Vectors – Matrix and Array Operations – Inline functions – Function files.

Unit IV: Loops – Linear Algebra – Data Analysis and Statistics – Ordinary Differential Equations – Nonlinear Algebraic Equations – Basic 2D and 3D Plot (Syntax only).

Unit V: Mathematica Commands (General form, Example, Uses only): Differential Calculus: **Limit[f[x], x→a] - D[f[x], x] - D[f[x],{x, n}]** . Integral Calculus: **Integrate** [f[x], x] **- Integrate**[f[x],{x, a, b}] **- NIntegrate**[f[x],{x, a, b}] . Partial Derivatives: **D**[f,x] **– D**[f,{x,n}] **. -** Total Differential: **Dt**[f[x, y]] **- Dt**[f[x, y],x] **.** Multiple Integrals:**Integrate[f[x,y],{x,a,b},{y,c,d}]**. Differential Equations: **DSolve**[eqn,y[x],x] **– NDSolve**[eqn,y,{x,xmin,xmax}] . Algebra: **Expand [ ] - Factor [ ] - Roots [ ]- Solve**[eqn,var]. Matrices: **Determinant**[mx] - **Invers**e[mx] - **Eigenvalues**[mx]- **Eigenvectors**[mx] . Graphics: **Plot**[f[x],{x,a,b}] – **Plot**[f[x],g[x],{x,a,b}] – **ParametricPlot**[{x[t],y[t],{t,a,b}] - **Plot3D**[{f[x,y],{x,a,b},{y,c,d}].

Text Books:

1) **H. Kopka** and **P.W. Daly**, "**A Guide to LATEX**", Third Edition, Addison – Wesley, London,1999.
Unit I: Chapter 2: Sections: 2.5,Chapter 3: Sections: 3.1 – 3.3, Chapter 4: Sections: 4.2, 4.3, 4.5, 4.7, 4.8
Unit II: Chapter 4: Sections: 4.10, Chapter 5: Sections: 5.1 – 5.5,Chapter 6: Sections: 6.1.

2) **Rudra Pratap**, "**Getting Started with MATLAB**" Indian Edition, Oxford University Press.
Unit III: Chapter1: Sections: 1.6.1, 1.6.2, Chapter3: Sections: 3.1, 3.2, 3.5.1, Chapter4: Sections: 4.2, 4.2.1.
Unit IV: Chapter4: Sections: 4.3.4,Chapter5: Sections: 5.1, 5.3, 5.5, 5.6,Chapter6: Sections: 6.1, 6.3.

3) **Eugene Don,Ph.D.** Mathetica(schaum's outlines**) ,**Mc.Graw.Hill.
Unit V

Mathematical Softwares *(LaTex, MATLAB and Mathematica)*

Practical List of Programs

1. (a) Using LaTex, type the following paragraph, to including the 9.5in text height, 6.30in text width, 0.10in left margin, 0.120in right margin, -0.6in top margin, 1.5in line space and foot notes.

(b) Write the MATLAB program to generate Fibonacci series.

(c) Using MATHEMATICA to compute the area bounded by the curves $f(x) = 1-x^2$ and $g(x) = x^4-3x^2$. [Q: 9.8]

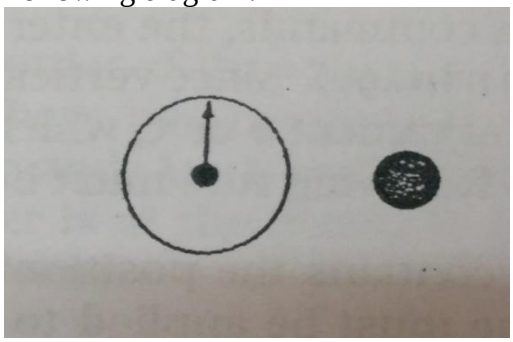
2. (a) Using LaTex, type the following formula

$$a_0+\cfrac{1}{a_1+\cfrac{1}{a_2+\cfrac{1}{a_3+\cfrac{1}{a_4}}}}+\begin{pmatrix} a & b \\ c & d \end{pmatrix}+\sum_{\alpha=0}^{\infty}(\beta^{\alpha}+\Gamma^{\alpha})$$

(b) Using MATLAB, Solve the following system of equations by matrix method $2x+y = 13$, $x-3y = -18$.

(c) Using MATHEMATICA, sketch the Sphere $x^2+y^2+z^2=14$ and its tangent plane at the point (1,2,3). [Q: 10.7]

3. (a) Using LaTex, draw the following diagram:



(b) Using MATLAB, solve the following first order linear differential equation using Euler method: $\frac{dy}{dx} = -y$, $y(0)=1$. Draw the graph and compare the exact solution.

(c) Using MATHEMATICA, plot the (five) solutions for : $d^2y/dx^2+0.3\ dy/dx+siny=0$ with $0\leq x\leq 30$ and using initial conditions $y'(0)=0, y(0)= -2,-1,0,1$and 2**.** [Q: 11.17]

4. (a) Create the following table using LaTex:

S.No.	Register Number	Name of the Student	Percentage of Marks	Rank
1	xxxxxx	xxxxxx	xxxxx	xxxx
2	xxxxxx	xxxxxxx	xxxx	xxxx
3	xxxxxx	xxxxxx	xxxx	xxxxx

(b) Calculate mean, median, standard deviation, variance, maximum value, minimum value, range, skewness and kurtosis for the following data:
40 41 45 49 50 51 55 59 60 60

(c) Using MATHEMATICA, solve the differential equation $\frac{dy}{dx}=1+\frac{1}{2}y^2$, $y(0)=1$, $0\leq x\leq 1$, with **DSolve** and **NDSolve** and compare the results. [Q: 11.15]