

LOGANATHA NARAYANASAMY GOVERNMENT COLLEGE
(AUTONOMOUS)
PONNERI, TIRUVALLUR (DT.)-601204



Post Graduate
Department of Mathematics

B. Sc. Mathematics Syllabus
(For candidates admitted from 2020 -21 onwards)

B.SC. MATHEMATICS

CHOICE BASED CREDIT SYSTEM

REGULATIONS

(w.e.f. 2020-2021)

1. DURATION OF THE PROGRAMME

Three years (six semesters)

Each academic year shall be divided into two semesters. The odd semesters shall consist of the period from June to November of each year and the even semesters from December to April of each year.

There shall be not less than 90 working days for each semester.

2. ELIGIBILITY FOR ADMISSION

Candidates for admission to the first year of the Degree of Bachelor of Science courses shall be required to have passed the Higher Secondary Examination accepted as equivalent thereof by the Syndicate of the University of Madras.

3. COURSE OF STUDY:

The main Subject of Study for Bachelor Degree Courses shall consist of the following components:

- **PART - I** Tamil / Other Languages
- **PART - II** English
- **PART - III**
 - Core Courses
 - Allied Courses
 - Elective Courses (Three Courses)

➤ **PART - IV**

i. Non-Major Elective

- a) Those who have not studied Tamil up to XII Std. and taken a Non-Tamil Language under Part-I shall take Tamil comprising of two course (level will be at 6thstandard).
- b) Those who have studies Tamil up to XII Std. and taken a Non-Tamil Language under Part-I shall take Advanced Tamil comprising of two courses.
- c) Others who do not come under (a) or (b) can choose Non-Major Elective comprising of two courses.

ii. Skill Based Subjects (Elective) - (Soft Skills)

iii. Environmental Studies

iv. Value Education

v. Extension Activities

- *A candidate shall be awarded a maximum of 1 Credit for Compulsory Extension Service.*
- *All the Students shall have to enroll for NSS /NCC/ NSO (Sports & Games) Rotract / Youth Red cross or any other service organizations in the college and shall have to put in Compulsory minimum attendance of 40 hours which shall be duly certified by the Principal of the college before 31st March in a year. If a student LACKS 40 HOURS ATTENDANCE in the First year, he/she shall have to compensate the same during the subsequent years.*
- *Students those who complete minimum attendance of 40 hours in One year will get HALF A CREDIT and those who complete the attendance of 80 or more hours in Two Years will wget ONE CREDIT.*
- *Literacy and population Education Field Work shall be compulsory components in the above extension service activities.*

L. N. GOVT. COLLEGE (AUTONOMOUS), PONNERI

Department: Mathematics

Summary of subject list for the candidates admitted from: 2020-21

Course: B.Sc. Mathematics

S No	Semester	Course Components	Subject		Nature	Inst. Hours	Credit	Max Marks			Passing Minimum
			Code	Name				Int	Ext	Total	
1	I	PART I		General Tamil I	Lang 1	4	3	25	75	100	40
2		PART II		General English I	Eng 1	4	3	25	75	100	40
3		PART III		Algebra and Trigonometry	Core 1	4	4	25	75	100	40
4				Differential Calculus	Core 2	5	4	25	75	100	40
5				Allied Physics I	Allied 1	7	4	25	75	100	40
5				Paper I: Physics Lab	Allied 1	2	<i>Exam at the end of Sem II</i>				
6		PART IV		1 (a) Basic Tamil I (or)	NME 1	2	2	25	75	100	40
7				1 (b) Adv. Tamil I (or)				25	75	100	40
8				1 (c) Non Major Elective I				25	75	100	40
9			Soft Skill I-Essentials of Language and Communication	Soft Skill 1	2	3	25	75	100	40	
10	II	PART I		General Tamil II	Lang 2	4	3	25	75	100	40
11		PART II		General English II	Eng 2	4	3	25	75	100	40
12		PART III		Numerical Methods	Core 3	4	4	25	75	100	40
13				Integral Calculus	Core 4	5	4	25	75	100	40
14				Allied Physics II	Allied 2	7	4	25	75	100	40
15				Practical -Allied Physics	Allied 2	2	2	40	60	100	40
16		PART IV		2 (a) Basic Tamil II (or)	NME 2	2	2	25	75	100	40
17				2 (b) Adv. Tamil I (or)				25	75	100	40
18				2 (c) Non Major Elective II				25	75	100	40
19			Soft Skill II - Essentials of Spoken and Presentation Skills	Soft Skill 2	2	3	25	75	100	40	
20	III	PART I		General Tamil III	Lang 3	5	3	25	75	100	40
21		PART II		General English III	Eng 3	5	3	25	75	100	40
22		PART III		Solid Geometry and Vector Calculus	Core 5	4	4	25	75	100	40
23				Differential Equations	Core 6	5	4	25	75	100	40
24				Paper III: Chemistry of Industrial Materials - I	Allied 3	6	4	25	75	100	40
25				Paper III: Chemistry Lab	Allied 3	3	<i>Exam at the end of Sem III</i>				
26		PART IV		Soft Skill III - Personality Enrichment	Soft Skill 3	2	3	25	75	100	40

27	IV	PART I		General Tamil IV	Lang 4	4	3	25	75	100	40	
28		PART II		General English IV	Eng 4	4	3	25	75	100	40	
29		PART III			Statics	Core 7	5	4	25	75	100	40
30					Integral Transforms and Fourier Series	Core 8	4	4	25	75	100	40
31					Paper IV: Chemistry of Industrial Materials II	Allied 4	6	4	25	75	100	40
32					Practical - Allied Chemistry	Allied 4	3	2	40	60	100	40
33		PART IV			Soft Skill IV - Computing Skills	Soft Skill 4	2	3	25	75	100	40
34					Environmental Studies	EVS 1	2	2	25	75	100	40
35	V	PART III		Abstract Algebra	Core 9	6	5	25	75	100	40	
36				Real Analysis I	Core 10	6	5	25	75	100	40	
37				Mathematical Programming with C Theory	Core 11	4	3	25	75	100	40	
38				Mathematical Programming with C Practicals	Core Prac 1	2	2	40	60	100	40	
39				Dynamics	Core 12	6	5	25	75	100	40	
				Elective 1: Operations Research	Elective	6	3	25	75	100	40	
41		PART IV		Value Education	Val. Edn		2	25	75	100	40	
42	VI	PART III		Linear Algebra	Core 13	6	5	25	75	100	40	
43				Real Analysis II	Core 14	6	5	25	75	100	40	
44				Complex Analysis	Core 15	6	5	25	75	100	40	
45				Elective 2: Graph Theory	Elective	6	3	25	75	100	40	
46				Elective 3: Mathematical Statistics	Elective	6	3	25	75	100	40	
47		PART IV		Extension Activities			1					
						180	141					

Elective - 1 (Semester V)

(Any one of the following courses shall be chosen as an Elective-1 for Semester V)

- A. Operations Research *(Chosen in V Semester)*
- B. Astronomy –I
- C. Discrete Mathematics

Elective - 2 (Semester VI)

(Any one of the following courses shall be chosen as an Elective-2 for Semester VI)

- A. Graph Theory *(Chosen in VI Semester)*
- B. Astronomy -II
- C. Fuzzy Mathematics

Elective - 3 (Semester VI)

(Any one of the following courses shall be chosen as an Elective-3 for Semester VI)

- A. Mathematical Statistics *(Chosen in VI Semester)*
- B. Number Theory
- C. Combinatorics

NON MAJOR ELECTIVE

- 1. Quantitative Aptitude I *(Offering for other Department)*
- 2. Quantitative Aptitude II *(Offering for other Department)*

. CORE PAPER I

Semester	Subject Code	Subject Title	Total Hours	Credit
I		ALGEBRA AND TRIGONOMETRY	60	4
Objective	<p>The main objective of this course is</p> <ul style="list-style-type: none"> • To introduce the polynomials and its various types of roots. • To study about the summation of Series. • To study about Circular, Hyperbolic functions and their inverse functions. 			
Learning Outcomes	<p>Students will acquire Knowledge about</p> <ul style="list-style-type: none"> • Basic ideas on Theory of Equations, Matrices and Theory of Numbers. • Knowledge of solving theoretical and applied problems using Matrices in Spectral theory. 			
Unit 1	Theory of Equations: Polynomial equations with Imaginary and irrational roots- Relation between roots and coefficients- Symmetric functions of roots in terms of coefficients.			
Unit 2	Reciprocal equations - Standard form-Increase or Decrease the roots of the given equation -Removal of terms Approximate solutions of roots of polynomials by Horner's method.			
Unit 3	Summation of Series: Binomial- Exponential -Logarithmic series (Theorems without proof)			
Unit 4	Expansions of $\sin n\theta$, $\cos n\theta$ - Expansions of $\tan n\theta$ in powers of $\tan \theta$ -Examples on formation of equations- Expansions of $\cos^n \theta$, $\sin^n \theta$, $\cos^m \theta \sin^n \theta$ in multiples of θ .			
Unit 5	$\sin \theta$, $\cos \theta$ in powers of θ -Hyperbolic functions-Relation between hyperbolic functions - Inverse hyperbolic functions			

<p>Contents & Treatment as in</p>	<ol style="list-style-type: none"> 1. Algebra, Volume I by T. K. ManicavachagamPillay,T.Natarajan, K.S.Ganapathy, Viswanathan Publication 2007. Unit 1: <i>Chapter 6 - Section 9 to 12.</i> Unit 2: <i>Chapter 6 - Section 16, 16.1, 16.2, 17, 30.</i> 2. Algebra, Volume II by T. K. ManicavachagomPillay,T.Natarajan, K.S.Ganapathy, Viswanathan Publication 2008 . Unit 3: <i>Chapter 3 - Section 10, Chapter 4: Section 3.1, 3.5, 3.6, 3.7</i> 3. Trigonometry, S. Narayanan and T.K. Manicavachagompillay _S.Viswanathan publishers 9th ed. 1995. Unit 4: <i>Chapter 3 – Section - 1 to 4.</i> Unit 5: <i>Chapter 4.</i>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Algebra by S. Arumugam , New Gama publishing house, Palayamkottai, August 2006. 2. Algebra and Trigonometry, Volume I and II by P.R.Vittal, V.Malini , Margham Publishers. 3. Trigonometry, Calculus, P.R. Vittal, Margham Publications.

CORE PAPER II

Semester	Subject Code	Subject Title	Total Hours	Credit
I		DIFFERENTIAL CALCULUS	75	4
Objective	<p>The Objective of this course is:</p> <ul style="list-style-type: none"> • To develop higher order derivatives using Leibnitz theorem. • To Study about Curvature, Evolutes, Involutes and Envelopes in Cartesian and Polar Coordinates. • To learn about Asymptotes. 			
Learning Outcomes	<p>Students will acquire Knowledge about</p> <ul style="list-style-type: none"> • To apply Higher order differentiation in Business, Science, Engineering and Technology • The notion of curvature, Evolutes, Involutes and Envelopes in Cartesian and polar co-ordinates. • Nature of Asymptotes of the curves and applying it in Standard Normal distribution in Statistical methods. 			
Unit 1	Successive differentiation - nth derivative- standard results – Trigonometrical transformation – formation of equations using derivatives - Leibnitz’s theorem and its applications			
Unit 2	Total differential coefficient – special cases – implicit functions - partial derivatives of a function of two functions - Maxima and Minima of functions of two variables Lagrange’s method of undetermined multipliers.			
Unit 3	Polar coordinates - angle between the radius vector and the tangent – slope of the tangent in the polar coordinates – the angle of intersection of two curves in polar coordinates ,Envelopes – method of finding envelopes			
Unit 4	Curvature- circle, radius and centre of curvature- Cartesian formula for radius of curvature – coordinates of the centre of curvature – evolute-and involute - radius of curvature and centre of curvature in polar coordinates.			
Unit 5	Definition-Asymptotes parallel to the axes – special cases – another method for finding asymptotes - asymptotes by inspection – intersection of a curve with an asymptote.			

<p>Contents & Treatment as in</p>	<p>Calculus, Volume - 1 by S. Narayanan and T.K. Manicavachagom Pillay, S.Viswanathan publishers, 2006</p> <p>Unit 1: Chapter 3 - Section 1.1 to 1.6, 2.1 and 2.2</p> <p>Unit 2: Chapter 8 - Section 1.3 to 1.5 and 1.7, Section 4 and 5.</p> <p>Unit 3: Chapter 9 - Section 4.1 to 4.4, Chapter 10 - Section 1.1 to 1.4</p> <p>Unit 4: Chapter 10 - Section 2.1 to 2.6</p> <p>Unit 5: Chapter 11 - Section 1 to 7</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Calculus, P.R. Vittal & V. Malini, Margham Publications, Chennai. 2. Calculus, George B. Thomas and Ross L. Fenny, Pearson Education. 3. Calculus by James Stewart, Cengage Learning, 8th Edition.

CORE COURSE III

Semester	Subject Code	Subject Title	Total Hours	Credit
II		NUMERICAL METHODS	60	4
Objective	<p>The Objective of this course is:</p> <ul style="list-style-type: none"> To solve linear algebraic and transcendental equations and system of linear equations and Interpolation by using finite difference formulae. To expose the study of numerical techniques as powerful tool in scientific computing. 			
Learning Outcomes	<p>Students will acquire Knowledge about</p> <ul style="list-style-type: none"> solving the linear equations numerically and finding interpolation by using difference formulae. This will be useful for solving the real-life problems like Profit. Trend line in business studies. 			
Unit 1	<p>Solution of Equations Bisection Method –Iteration method – Solution of linear system by Gauss elimination method – Gauss-Jordan method – Gauss Jacobi method – Gauss-Seidel method</p>			
Unit 2	<p>Finite Differences First and higher order differences – Operators – Properties of operators – Relation between the operators – Differences of a polynomial.</p>			
Unit 3	<p>Interpolation Newton’s forward and backward difference formulae – Newton’s divided differences formula for interpolation – Lagrange’s interpolation formula – Inverse Interpolation by Lagrange’s method.</p>			
Unit 4	<p>Numerical Differentiation Derivatives using Newton’s forward and backward difference formulae – Derivatives using Newton’s divided difference formula.</p>			
Unit 5	<p>Numerical Integration Newton Cote’s formula – Numerical integration by Trapezoidal rule – Simpson’s 1/3rd and 3/8th rules – Double integration using Trapezoidal rule.</p>			

<p style="text-align: center;">Contents & Treatment as in</p>	<p>Numerical Methods, P. Kandasamy, K. Thilagavathy, K. Gunavathy, S.Chand& Company Ltd., 2006.</p> <p>Unit 1: Chapter 3 - Section 3.1, 3.2, Chapter 4 Section 4.2, 4.8,4.9</p> <p>Unit 2: Chapter 5 - Section 5.1,5.3</p> <p>Unit 3: Chapter 6 - Section 6.2,6.3., Chapter 8 - Section 8.5, 8.7, 8.8. (problems on Inverse Interpolation by Lagrange’s method only)</p> <p>Unit 4: Chapter 9 - Section 9.2, 9.3, 9.6(Problems on Newton’s divided difference formula only)</p> <p>Unit 5: Chapter 9 - Section 9.8, 9.9, 9.13,9.14, Chapter 14 - Section 14.1 (Proofs/derivations excluded)</p>
<p style="text-align: center;">Books for Reference</p>	<ol style="list-style-type: none"> 1. Introductory Methods of Numerical Analysis, S. S. Sastry, Prentice Hall of India, Pvt. Ltd., New Delhi, 2000. 2. Numerical Methods for Scientists and Engineers, SankaraRao K., 2nd Edition, Prentice Hall India 2004. 3. Numerical Methods in Science and Engineering, M. K. Venkataraman, National Publishing Company, V Edition 1999.

CORE COURSE IV

Semester	Subject Code	Subject Title	Total Hours	Credit
II		INTEGRAL CALCULUS	75	4
Objective	<p>The main objective of this course is:</p> <ul style="list-style-type: none"> • To introduce definite integrals and its properties • To study about the Geometrical application of double integrals. • To introduce Beta and Gamma integrals. 			
Learning Outcomes	<p>Students will acquire Knowledge about</p> <ul style="list-style-type: none"> • Applications of definite integrals in Geometrical properties of the curve. • Concepts of Beta, Gamma functions and its applications in Engineering Mathematical problems such as life span of electronic component, statistical analysis, etc. 			
Unit 1	Definite integrals –Properties of the Definite integrals – simple problems.			
Unit 2	Integration by parts, Bernoulli's formula, Reduction formulae Types, $\int \cos^n x dx$, $\int_0^{\frac{\pi}{2}} \cos^n x dx$, $\int \sin^n x dx$, $\int_0^{\frac{\pi}{2}} \sin^n x dx$, $\int \sin^m \cos^n x dx$, $\int_0^{\frac{\pi}{2}} \sin^m \cos^n x dx$, $\int \tan^n x dx$, $\int \cot^n x dx$, $\int \sec^n x dx$, $\int \operatorname{cosec}^n x dx$, $\int x^n (\log x)^m dx$ – simple problems.			
Unit 3	Geometric Application of Integration-Area under plane curves: Cartesian co-ordinates -Area of a closed curve - Areas in polar co-ordinates– Simple problems.			
Unit 4	Double integrals – changing the order of Integration – Triple Integrals– Simple problems.			
Unit 5	Beta & Gamma functions and the relation between them – Integration using Beta & Gamma functions – Simple problems.			

<p>Contents & Treatment as in</p>	<p>Calculus Volume II, S.Narayanan and T.K.ManicavachagomPillai, S.Viswanathan (Printers & Publishers) Pvt Limited, 2006</p> <p>Unit 1:Chapter 1 Section 13, 13.1 to 13.10,14,15.1. Unit 2: Chapter 1 section 11, 12 & 13 Unit 3: Chapter 2 section 1.1, 1.2, 1.3 & 1.4 Unit 4: Chapter 5 section 2.1, 2.2 & 4 Unit 5: Chapter 7 section 2.1 to 2.5</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Shanti Narayan, P.K. Mittal, Integral Calculus.S.Chand Publishers. 2. P.R. Vittal, Calculus, Margham publishers. 3. S. Sudha, Calculus, Emerald publishers

CORE COURSE V

Semester	Subject Code	Subject Title	Total Hours	Credit
III		SOLID GEOMETRY AND VECTOR CALCULUS	60	4
Objective	<p>The objective of this course is</p> <ul style="list-style-type: none"> • To study three dimensional Cartesian Co-ordinates system. • To enable students to develop their skills in three dimensional structures. • To learn more about Vectors by using Calculus. 			
Learning Outcomes	<p>Students will acquire Knowledge</p> <ul style="list-style-type: none"> • To analyze characteristics and properties of two and three dimensional geometric shapes. • To develop mathematical arguments about geometric relationships. • About Vector Differentiation and Integration and applying it in Fluid dynamics, Quantum mechanics, etc. 			
Unit 1	<p>Planes and Line Skew lines – Angle between a plane and a line – Condition for two straight lines to be coplanar –Equation of the plane containing the coplanar lines – Shortest Distance between two given lines – Line of Shortest distance.</p>			
Unit 2	<p>Sphere Equation of sphere in centre-radius form – General form – Plane section of Sphere – Equation of a circle on a sphere – Equation of a sphere passing through a given circle – Intersection of two spheres – Equation of the tangent Line and Tangent plane to a sphere.</p>			
Unit 3	<p>Cone and Cylinder Cone - Right Circular cone – General equation of a cone – Quadric cone – Condition for the plane to touch the quadric cone – Cylinder – Right circular cylinder</p>			
Unit 4	<p>Vector Differentiation Gradient – Divergence and Curl – Properties of Divergence and Curl – Directional Derivative – Irrotational and Solenoidal vector fields – Unit normal to a surface – simple problems</p>			

<p>Unit 5</p>	<p>Vector Integration Line – Surface and Volume integral – Greens Theorem in a plane (without proof) – simple problems– Gauss Divergence Theorem and Stoke’s Theorem (without proofs) – simple problems</p>
<p>Contents & Treatment as in</p>	<p>Analytical Geometry 3D by P.Duraipandian & Others, S. Viswanathan & Co Publications, 1998</p> <p>Unit 1: Chapter 4,Sections 4.2 Unit 2: Chapter 5,Sections 5.1, 5.2 & 5.3 Unit 3: Chapter 6, Sections 6.1& 6.2</p> <p>Vector Analysis by P.Duraipandian & Others, S. Viswanathan & Co Publications, 1984.</p> <p>Unit 4: Chapter 2,Sections 2.1 to 2.13 Unit 5: Chapter 4,Sections 4.1 to 4.8</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Analytical Geometry (Three Dimensional) by T.K. Manicavachagom Pillay, S. Chand & Co Publications. 2. Vector Analysis, Murray Spiegel, Schaum Publishing Company, New York. 3. Vector Analysis, Analytical Solid Geometry & Sequence and Series by P.R. Vittal, Margham Publications.

CORE PAPER-VI

Semester	Subject Code	Subject Title	Total Hours	Credit
III		DIFFERENTIAL EQUATIONS	75	4
Objective	<p>The Objective of this Course is</p> <ul style="list-style-type: none"> • To introduce various types of Ordinary and Partial Differential Equations. • To solve standard forms of differential equations. • To apply Lagrange's and Charpit's Methods in solving PDE 			
Learning Outcomes	<p>Students will acquire knowledge</p> <ul style="list-style-type: none"> • About the methods of solving Ordinary and Partial Differential Equations. • To apply Differential Equation as a powerful tool in solving problems in Engineering, Science & Technology. 			
Unit 1	<p>Ordinary Differential Equations Variable separable-Homogeneous Equation-Non-Homogeneous Equations of first degree in x and y-Linear Equation-Bernoulli's Equation-Exact differential equations.</p>			
Unit 2	<p>Ordinary Differential Equations(Cont.) Equation of first order but not of higher degree, Equation solvable for dy/dx- Equation solvable for y- Equation solvable for x- Clairauts form.</p>			
Unit 3	<p>Ordinary Differential Equations(Cont.) Second Order Linear Differential Equations with constant coefficients-Particular integrals, Ve^{ax} where V is $\sin ax$ or $\cos ax$ or x^m- Second Order Linear Differential Equations with variable coefficients -Method of Variation of Parameters.</p>			
Unit 4	<p>Partial differential equation Formation of PDE by Eliminating arbitrary constants and arbitrary functions-complete integral-singular integral-General integral- Lagrange's Linear Equations $Pp+Qq=R$.</p>			

<p>Unit 5</p>	<p>Partial differential equation (Cont.) Standard forms - Charpit's Methods - Related problems</p>
<p>Contents & Treatment as in</p>	<p>Differential Equations and its applications, by S.Narayanan, T.K.ManikavachagamPillay -- S.Viswanathan (Printers and Publishers) Pvt. Ltd(2006).</p> <p>Unit 1:Chapter 2: Section 1 to 6.</p> <p>Unit 2:Chapter 4: Section 1, 2.1, 2.2, 3.1. Chapter 5: Section 4.</p> <p>Unit 3:Chapter 6: Section6 , Chapter 8:Section- 1,2,3,4.</p> <p>Unit 4:Chapter 12: Section 1, 2, 3.1, 3.2, 4.</p> <p>Unit 5:Chapter 12: Section5.1, 5.2, 5.3, 5.4, 6.'</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1.Mathematics for B.Sc-Branch-I Volume –III by P.Kandasamy,K.Thilagavathy, S.Chand Publishers. 2.Differential equations with applications and historical notes by George F.Simmons, 2ndEd.,TataMcgraw Hill Publications. 3. Differential Equations by ShepleyL.Ross, 3rdEdn.,JohnWiley and sons 1984. 4. Differential Equations by N.P.Bali,Laxmi Publications Ltd,New Delhi-2004. 5. Ordinary and Partial differential Equation by M.D.Raisinghania,S.Chand Publishers.

CORE PAPER- VII

Semester	Subject Code	Subject Title	Total Hours	Credit
IV		STATICS	75	4
Objective	<p>The Objective of this Course is</p> <ul style="list-style-type: none"> • To understand the vector and scalar representation of forces and moments. • To describe the static equilibrium of particle under the influence of forces. • To analyse the properties of surfaces and solids in relation to center of mass. 			
Learning Outcomes	<p>Students will acquire knowledge about</p> <ul style="list-style-type: none"> • Particles or body in rest under the given forces. • Forces, equilibrium of a particle and centre of mass of various bodies. • To apply architectural and structural engineering 			
Unit 1	Force- Newtons laws of motion - resultant of two forces on a particle- Equilibrium of a particle			
Unit 2	Forces on a rigid body – moment of a force – general motion of a rigid body- equivalent systems of forces – parallel forces – forces along the sides of a triangle – couples			
Unit 3	Resultant of several coplanar forces- equation of the line of action of the resultant- Equilibrium of a rigid body under three coplanar forces – Reduction of coplanar forces into a force and a couple.- problems involving frictional forces			
Unit 4	Centre of mass – finding mass centre – a hanging body in equilibrium			
Unit 5	Hanging strings- equilibrium of a uniform homogeneous string – suspension bridge			

<p>Contents & Treatment as in</p>	<p>Mechanics, P. Duraipandian, Laxmi Duraipandian, Muthamizh Jayapragasham, S. Chand and Co limited 2008.</p> <p>Unit 1:Chapter 2 - Section 2 .1, 2.2, Chapter 3 - Section 3.1.</p> <p>Unit 2:Chapter 4 - Section 4 .1 to 4.6.</p> <p>Unit 3:Chapter 4 - Section 4.7 to 4.9, Chapter 5 - Section 5.1, 5.2.</p> <p>Unit 4:Chapter 6 - Section 6.1 to 6.3.</p> <p>Unit 5:Chapter 9 - Section 9.1, 9.2.</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Dynamics – K. ViswanathaNaik and M. S. Kasi, Emerald Publishers. 2.Dynamics – A. V. Dharmapadam, S. Viswanathan Publishers. 3. Classical Mechanics, Walter Grenier. Springer

Core Paper VIII

Semester	Subject Code	Subject Title	Total Hours	Credit
IV		INTEGRAL TRANSFORMS AND FOURIER SERIES	60	4
Objective	<p>The main objective of this course is</p> <ul style="list-style-type: none"> • To introduce Laplace Transform, Fourier Series, Fourier Transform and their inverses. • To solve Ordinary Differential Equations using Laplace Transform. 			
Learning Outcomes	<p>Students will acquire knowledge</p> <ul style="list-style-type: none"> • About Laplace Transforms, Fourier Series, Fourier Transform and their inverses. • To apply Laplace and Fourier Transforms techniques in signals and system, Digital signal processing, etc., 			
Unit 1	<p>Laplace Transforms Laplace transform of simple functions – Basic operational properties – Laplace transform of periodic functions-Some General Theorems-solve integrals using Laplace transform</p>			
Unit 2	<p>Inverse Laplace Transforms Inverse Laplace transforms – Application of Laplace transforms to solution of linear differential equations of second order with constant coefficients.</p>			
Unit 3	<p>Fourier series Dirichlet conditions – Fourier series in $(0, 2\pi)$ and $(-\pi, \pi)$ -Fourier series for odd and even functions</p>			
Unit 4	<p>Fourier series contd. Half range cosine and sine series-Change of interval</p>			
Unit 5	<p>Fourier Transforms Statement of Fourier integral theorem(without proof) – Properties of Fourier Transform- Fourier sine and cosine transforms –Properties of Fourier sine and cosine transforms– Parseval's identity (without proofs) – simple problems.</p>			

<p>Contents & Treatment as in</p>	<p>Calculus Vol 3, Narayanan S. and T.K.ManikavachagamPillay, S. Viswanathan Publishers, 2006</p> <p>Unit 1: Chapter 5 Section 1 to 5</p> <p>Unit 2: Chapter 5 Section 6 to 8</p> <p>Unit 3: Chapter 6 Section 1 and 3</p> <p>Unit 4: Chapter 6 Section 4 to 6</p> <p>Unit 5: Chapter 6 Section 9 to 13</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Higher Engineering Mathematics by B.S. Grewal, Khanna publishers. 2. Engineering Mathematics, Volume III, M. K. Venkataraman, National Publishing 3. Engineering Mathematics, Volume III, P. Kandasamy and others, S. Chand and Co.

Core Paper VIII

Semester	Subject Code	Subject Title	Total Hours	Credit
V		ABSTRACT ALGEBRA	90	4
Objective	<p>The main objective of this course is</p> <ul style="list-style-type: none"> To enable the students to understand the concepts of sets, groups and rings. Also the mappings on sets, groups and rings. 			
Learning Outcomes	<p>Students will acquire knowledge</p> <ul style="list-style-type: none"> Students will acquire concrete knowledge about the abstract thinking like sets, groups and rings by proving theorems. Applying the concept in cryptography and group codes. 			
Unit 1	Definition of a Group – Examples –Some preliminary lemmas – Subgroups			
Unit 2	Counting Principle – Normal Subgroups and Quotient groups – Homomorphisms			
Unit 3	Automorphisms– Cayley’s Theorem – Permutation Groups.			
Unit 4	Definition and Examples of rings – Some special classes of rings – Integral Domain – Homomorphism of Rings – Ideals and Quotient Rings.			
Unit 5	Prime Ideal and Maximal Ideal – The Fields of Quotients of an Integral Domain – Euclidean Rings.			
Contents & Treatment as in	<p>Topics in Algebra, I N Herstein, Vikas Publishing House Pvt Ltd., New Delhi, 2nd ed. 1975</p> <p>Unit 1: Chapter 2: Sections 2.1, 2.2, 2.3, 2.4 .</p> <p>Unit 2: Chapter 2: Sections 2.5 2.6, 2.7 (Applications 1 and 2 excluded)</p> <p>Unit 3: Chapter 2: Sections 2.9, 2.10.</p> <p>Unit 4: Chapter 3: Sections 3.1, 3.2, 3.3, 3.4.</p> <p>Unit 5: Chapter 3: Sections 3.5, 3.6, 3.7.</p>			
Books for Reference	<ol style="list-style-type: none"> Modern Algebra, T.K. Manicavasagam. Pillai and others, S.ViswanathanPublishers,Chennai. Modern Algebra, S. Arumugam, Scitech Publications. 			

CORE PAPER-X

Semester	Subject Code	Subject Title	Total Hours	Credit
V		REAL ANALYSIS –I	90	4
Objective	To introduce the concepts which provide a strong base to understand and analyze the real number system, sets and metric spaces.			
Learning Outcomes	<p>Students will acquire knowledge to</p> <ul style="list-style-type: none"> • Apply Mathematical concepts and Principles to perform numerical and symbolic computations. • Understand and perform simple proofs. • Know how abstract ideas and rigorous methods in Mathematical Analysis can be applied to practical problems. 			
Unit 1	Sets and Functions: Sets and elements- Operations on sets- functions- real valued functions- equivalence-countability - real numbers- least upper bounds.			
Unit 2	Sequences of Real Numbers: Definition of a sequence and subsequence- limit of a sequence- convergent sequences- divergent sequences- bounded sequences- monotone sequences-			
Unit 3	Operations on convergent sequences- operations on divergent sequences- limit superior and limit inferior- Cauchy sequences.			
Unit 4	Series of Real Numbers: Convergence and divergence- series with non-negative terms- alternating series- conditional convergence and absolute convergence- tests for absolute convergence- series whose terms form a non-increasing sequence- the class l^2			
Unit 5	Limits and Metric Spaces: Limit of a function on a real line-. Metric spaces - Limits in metric spaces. Continuous Functions on Metric Spaces: Function continuous at a point on the real line- Function continuous on a metric space.			

<p>Contents & Treatment as in</p>	<p>Methods of Real Analysis : Richard R. Goldberg (Oxford and IBH Publishing Co.), 1970.</p> <p>Unit 1:Chapter 1 Section 1. 1 to 1.</p> <p>Unit 2: Chapter 2 Section 2.1 to 2.6</p> <p>Unit 3: Chapter 2 Section 2.7 to 2.10</p> <p>Unit 4: Chapter 3 Section 3.1 to 3.4, 3.6, 3.7 and 3.10</p> <p>Unit 5: Chapter 4 Section 4.1 to 4.3, Chapter 5 Section 5.1 and 5.3 (Excluding Section 5.2)</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Principles of Mathematical Analysis by Walter Rudin,TataMcGrawHill. 2. Mathematical Analysis, Tom M Apostol, Narosa Publishing House. 3. Introduction to Real Analysis, Donald R. Shebert and Robert G. Bartle, Wiley Publisher 4. Mathematical Analysis, S.C. Malik and Savita Arora, New Age international Publishers.

Core Paper XI

Semester	Subject Code	Subject Title	Total Hours	Credit
V		Mathematical Programming with C	90	4
Objective	<ul style="list-style-type: none"> To enable the students to learn about the basic structure, Statements, arrays, functions and various concepts of C language. 			
Learning Outcomes	<p>Students will acquire knowledge about</p> <ul style="list-style-type: none"> The basic structure, operators and statements of C language. Decision making statements, Arrays, Functions, Strings and Structures to solve practical problems based on it. 			
Unit 1	<p>Introduction Constants Variables – data types – operators – precedence of operators – library functions – input statements – output statements – escape sequences – formatted outputs– storage classes – command line arguments.</p>			
Unit 2	<p>Control Statements if– if else– nested if and switch case statements– conditional operators- go to– while– do while– for– nested for– continue– exit– break statements.</p>			
Unit 3	<p>Arrays One dimensional arrays – declaration– initialization of arrays– two dimensional arrays– multi dimensional arrays.</p>			
Unit 4	<p>Functions and Strings Functions – Definition– declaration– calling a function– call by reference– call by value. Categories of functions– nesting of functions– recursion– function with arrays. Strings - arithmetic operators on characters– comparing strings– string handling functions.</p>			

<p>Unit 5</p>	<p>Structure Definition– Structure initialization– Comparison of structure variables– Arrays of structure– Arrays within structures– Structure within structures– Structures and functions.</p>
	<p><u>List of programs:</u></p> <ol style="list-style-type: none"> 1. Converting centigrade to Fahrenheit 2. Finding the area& circumference of a circle 3. Convert days to months and days 4. Finding the roots of a quadratic equation 5. Finding the sum of n given numbers 6. Evaluation of the power series 7. Evaluation of the cosine series 8. Evaluation of the sine series 9. Finding addition & subtraction of two matrices 10. Finding multiplication of two matrices 11. Finding a Fibonacci series 12. To evaluate compound interest using function 13. Adding two complex numbers 14. To write a given n numbers in ascending order 15. Uses of the string functions. <p>Note: In the Theory Question Paper, the ratio of theory and programs should be 40:60.</p>
<p>Contents & Treatment as in</p>	<p>Programming in ANSI C (Third Edition)-E Balagurusamy, Tata McGrawHill Publishing Company</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Programming with C - Gottfried, Schaum's Outline Series, Tata McGrawHill Publishing Company. 2. Programming Language C, Ananthi Seshaiyah, Margham Publishers.

CORE PAPER- XII

Semester	Subject Code	Subject Title	Total Hours	Credit
V		DYNAMICS	90	4
Objective	<ul style="list-style-type: none"> • To introduce Kinematics, Simple Harmonic motion, Projectile and Impact of a particle on a surface, Circular motions and Moment of inertia. • To enable the students to apply Laws, Principles, Postulates governing the Dynamics in physical reality. 			
Learning Outcomes	<p>Students will acquire knowledge of</p> <ul style="list-style-type: none"> • The motion of bodies under the influence of forces. • Rectilinear motion of particles, Projectiles, Impact and Moment of Inertia of Particles. • Reason for dynamic changes in the body. 			
Unit 1	Kinematics -Basic units – velocity – acceleration- coplanar motion – simple problems.			
Unit 2	Work, Energy and Power – work – conservative field of force – Power – Rectilinear motion under varying Force: Simple harmonic motion – S.H.M. along a horizontal line- S.H.M. along a vertical line – simple problems.			
Unit 3	Projectiles -Forces on a projectile- projectile projected on an inclined plane. Impact: Impulsive force - impact of sphere - impact of two smooth spheres – impact of a smooth sphere on a plane – oblique impact of two smooth spheres – simple problems.			
Unit 4	Circular motion – Conical pendulum – simple pendulum – central orbits -general orbits - central orbits- conic as centered orbit – simple problems.			
Unit 5	Moment of inertia, Perpendicular and parallel axes theorem – simple problems.			

<p>Contents & Treatment as in</p>	<p>Mechanics, P.Duraipandian, LaxmiDuraipandian ,MuthamizhJayapragasham, S. Chand and Co limited 2008 .</p> <p>Unit 1: Chapter 1 - Section 1.1 to 1.4 Unit 2: Chapter 11 - Section 11.1to 1 1.3 , Chapter 12 - Section 12.1 to 12.3 Unit 3: Chapter 13 - Section 13.1,13.2 Chapter 14 - Section 14.1, 14.5 Unit 4: Chapter 15 - Section 15.1, 15.2, 15.6 Chapter 16 - Section 16.1 to 16.3 Unit 5: Chapter 17 -Section 17.1, 17.1.1</p>
<p>Books for Reference</p>	<p>1. Dynamics – K. ViswanathaNaik and M. S. Kasi, Emerald Publishers. 2. Dynamics – A. V. Dharmapadam, S. Viswanathan Publishers 3. Mechanics – Walter Grenier, Springer.</p>

Elective 1A

Semester	Subject Code	Subject Title	Total Hours	Credit
V		Operations Research	90	4
Objective	<ul style="list-style-type: none"> • Formulation of Linear Programming Problems (L.P.P), • Methods to solve L.P.P. like simplex methods. • Duality in L.P.P and • Transportation and Assignment problems with application • Game theory and Networks 			
Learning Outcomes	Students will acquire Mathematical knowledge to convert real life problems into mathematical models to obtain optimal solutions for optimal use of resources.			
Unit 1	Linear Programming Problem Mathematical formulation of LPP - Graphical solution method - Simplex method - Big M method - Two phase method (Special Cases description only).			
Unit 2	Duality in LPP Primal – Dual relation (without proof) – Duality in LPP– Dual Simplex method.			
Unit 3	Transportation and Assignment Problems Transportation Problem - North-West Corner Rule – Least Cost method - Vogel's Approximation Method - MODI Method - Degeneracy and Unbalanced Transportation Problem. Assignment Problem: Hungarian Method - Unbalanced Assignment Problem.			
Unit 4	Game Theory Two Person Zero sum Games - The Maximin – Minimax Principle - Games without Saddle Points - Mixed Strategies - Graphical Solution of $2 \times n$ and $m \times 2$ games - Dominance Property.			

Unit 5	<p>PERT / CPM Network and basic components – Rules of Network Construction - Time Calculation in network - Critical Path Method (Crashing excluded) - PERT computation.</p>
Contents & Treatment as in	<p>Operations Research, Kanti Swarup, P.K. Gupta and Manmohan, Sultan Chand & Sons, 13th ed., 2007.</p>
Books for Reference	<ol style="list-style-type: none"> 1. Operations Research, P.K. Gupta and D.S. Hira, Sultan Chand & Company. 2. Operations Research, P. R. Vittal, Margham Publishers, Chennai.

Elective 1B

Semester	Subject Code	Subject Title	Total Hours	Credit
V		ASTRONOMY – I	90	4
Objective	To enable the students to understand the Astronomical aspects and about the laws governing the planet movements.			
Learning Outcomes	Students will acquire knowledge about the Solar system, Celestial sphere, Dip-Twilight &Keplar’s laws.			
Unit 1	General description of the Solar system. Comets and meteorites – Spherical trigonometry.			
Unit 2	Celestial sphere – Celestial co – ordinates – Diurnal motion – Variation in length of the day.			
Unit 3	Dip – Twilight – Geocentric parallex.			
Unit 4	Refraction – Tangent formula – Cassinis formula.			
Unit 5	Kepler’s laws – Relation between true eccentric and mean anamolies.			
Contents & Treatment as in	Astronomy by S.Kumaravelu and Susheela Kumaravelu, SKV Publishers, Sivakasi, 1999.			
Books for Reference	<ol style="list-style-type: none"> 1. G V Ramachandran, Text Book of Astronomy, Mission Press, Palayamkottai, 1965. 2. V. Thiruvenkatacharya, A Text Book of Astronomy, S. Chand and Co., Pvt Ltd., 1972 			

Elective 1C

Semester	Subject Code	Subject Title	Total Hours	Credit
V		Discrete Mathematics	90	4
Objective	To enable the students to learn about the interesting branches of Mathematics.			
Learning Outcomes	Students will acquire knowledge about about the Formal languages Automata Theory, Lattices & Boolean Algebra and Graph Theory.			
Unit 1	Mathematical logic: Connections well formed formulas, Tautology, Equivalence of formulas, Tautological implications, Duality law, Normal forms, Predicates, Variables, Quantifiers, Free and bound Variables. Theory of inference for predicate calculus			
Unit 2	Relations and functions: Composition of relations, Composition of functions, Inverse functions, one-to- one, onto, one-to-one& onto, onto functions, Hashing functions, Permutation function, Growth of functions. Algebra structures: Semi groups, Free semi groups, Monoids.			
Unit 3	Formal languages and Automata: Regular expressions, Types of grammar, Regular grammar and finite state automata, Context free and sensitive grammars			
Unit 4	Lattices and Boolean algebra: Partial ordering, Poset, Lattices, Boolean algebra, Boolean functions, Theorems, Minimization of Boolean functions(Karnaugh Method only).			
Unit 5	Graph Theory: Directed and undirected graphs, Paths, Reachability, Connectedness, Matrix representation, Euler paths, Hamiltonian paths, Trees, Binary trees simple theorems, and applications.			

<p>Contents & Treatment as in</p>	<p>Discrete mathematical structures with applications to computer science J.P.Trembly, R.Manohar, Mc.Graw Hill, 1975.</p> <p>Unit I : .Sec.1-2, 1-2.7, 1-2.9, 1 -2.10, 1 -2.11, 1-3, 1-5.1, 1-5.2, 1-5.4, 1-6.4</p> <p>Unit II : Sec.2-3.5, 2-3.7, 2-4.2, 2-4.3, 2-4.6, 3-2, 3-5, 3-5.3</p> <p>Unit III : Sec.3-3.1, 3-3.2, 4-6.2</p> <p>Unit IV : Sec.4-1.1, 4-2, 4-3, 4-4.2</p> <p>Unit V : Sec.5-1.1, 5-1.2, 5-1.3, 5-1.4</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Discrete Mathematics Prof.V.Sundaresan, K.S.GanapathySubramaniyan, K.Ganesan Tata McGraw Hill, New Delhi 2000 2. Mathematics L.Lovarz, J.Pelikan, K.Vexztergombi Springer International Edition 2002 3. Discrete Mathematics N. Chandrasekaran M. Uma parvathi PHI Learning P. Ltd. 2010

Core Paper XIII

Semester	Subject Code	Subject Title	Total Hours	Credit
VI		Linear Algebra	90	4
Objective	To enables the students to understand the concept of matrices and linear transformations			
Learning Outcomes	<p>Students will acquire concrete knowledge about</p> <ul style="list-style-type: none"> • The elementary operations on matrices, characteristic vector of a square matrix, vector spaces and linear transformations. • Applying matrices techniques in Spectral theory, Engineering and Technology. 			
Unit 1	<p>Vector Spaces Elementary basic concepts – Linear Independence and Bases.</p>			
Unit 2	<p>Vector Spaces(Cont.) Dual spaces – Inner product spaces</p>			
Unit 3	<p>Linear Transformations The Algebra of Linear Transformations – Characteristic Roots</p>			
Unit 4	<p>Linear Transformations Matrices – Canonical Forms: Triangular Form.</p>			
Unit 5	<p>Matrix Algebra Symmetric– Skew symmetric– Hermitian– Skew Hermitian– Orthogonal and Unitary matrices– Eigen values– Eigen vectors– Cayley_Hamilton Theorem– Powers and inverse of square matrices.</p>			

<p>Contents & Treatment as in</p>	<p>1. Topics in Algebra, I.N. Herstein, Vikas Publishing House Pvt Ltd, 2nd ed., New Delhi</p> <p>Unit 1: Chapter 4, Sec. 4.1, 4.2.</p> <p>Unit 2: Chapter 4, Sec. 4.3, 4.4.</p> <p>Unit 3: Chapter 6, Sec. 6.1, 6.2.</p> <p>Unit 4: Chapter 6, Sec. 6.3, 6.4.</p> <p>2. Algebra - T.K. Manickavasagam Pillai and S. Narayanan, S. Viswanathan Printers and Publisher, Pvt Ltd., 2004.</p> <p>Unit 5: Chapter 2, Sec. 6.1, 6.2, 6.3, 9.1, 16, 16.3, 16.4</p>
<p>Books for Reference</p>	<p>1. Modern Algebra, M.L. Santiago, Tata McGraw Hill Publishing Co., 2001.</p> <p>2. Linear Algebra, J.N. Sharma and A.R. Vashistha, Krishna Prakash Nandir.</p> <p>3. Modern Algebra, S. Arumugam and A. Thangapandi Issac, Scitech Publications</p> <p>4. A first course in Modern Algebra, John B. Fraleigh, Addison Wesley Publishing Co, II Edition.</p>

CORE PAPER – XIV

Semester	Subject Code	Subject Title	Total Hours	Credit
VI		REAL ANALYSIS –II	90	4
Objective	To enable students to learn about: Nature of functions and mappings like continuity, connectivity, and derivative. It also includes the concept of monotonic functions with properties and Riemann - Stieltjes integral.			
Learning Outcomes	<p>Students will acquire knowledge about</p> <ul style="list-style-type: none"> • The Real Numbers and the Analytic Properties of Real- Valued Functions. • The Analytic concepts of Connectedness, Compactness, Completeness and Calculus. 			
Unit 1	Continuous Functions on Metric Spaces: Open sets- closed sets- Discontinuous function on \mathbb{R}^1 . Connectedness, Completeness and Compactness: More about open sets- Connected sets.			
Unit 2	Bounded sets and totally bounded sets: Complete metric spaces- compact metric spaces continuous functions on a compact metric space, continuity of inverse functions, uniform continuity.			
Unit 3	Calculus: Sets of measure zero, definition of the Riemann integral, existence of the Riemann integral- properties of Riemann integral.			
Unit 4	Derivatives- Rolle's theorem, Law of mean, Fundamental theorems of calculus.			
Unit 5	Taylor's theorem- Pointwise convergence of sequences of functions, uniform convergence of sequences of functions.			

<p>Contents & Treatment as in</p>	<p>“Methods of Real Analysis”- Richard R. Goldberg (Oxford and IBH Publishing Co) , 1970.</p> <p>Unit 1: Chapter 5: Section 5.4 to 5.6 , Chapter 6: Section 6.1 and 6.2 Unit 2: Chapter 6: Section 6.3 to 6.8 Unit 3: Chapter 7: Section 7.1 to 7.4 Unit 4: Chapter 7: Section 7.5 to 7.8 Unit 5: Chapter 8 Section 8.5 Chapter 9 Section 9.1 and 9.2</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Principles of Mathematical Analysis by Walter Rudin,TataMcGrawHill. 2. Mathematical Analysis Tom M Apostol,Narosa Publishing House. 3. Introduction to Real Analysis, Donald R. Shebert and Robert G. Bartle, Wiley Publisher 4. Mathematical Analysis, S.C. Malik and Savita Arora, New Age international Publishers.

CORE PAPER XV

Semester	Subject Code	Subject Title	Total Hours	Credit
VI		COMPLEX ANALYSIS	90	4
Objective	To enable students to learn about complex functions with some fundamental theorems. Singularity and residues in complex functions, integrations of complex functions and meromorphic functions.			
Learning Outcomes	<p>Students will acquire knowledge about</p> <ul style="list-style-type: none"> • The basic ideas of analysis of Complex Functions in solving Complex Variables. • Applications of functions and transformations in Computer graphics, Engineering and Technologies. 			
Unit 1	Analytic Functions: Functions of a Complex Variable – Limit- Theorems on Limits – Continuous functions- Differentiability – Cauchy – Riemann equations – Analytic functions- Harmonic functions – Conformal mapping.			
Unit 2	Bilinear Transformations: Elementary transformations – Bilinear transformations – Cross ratio- Fixed Points of Bilinear Transformations – Mapping by Elementary Functions - The Mapping $w = z^2$, $w = e^z$			
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 – Zeroes of analytic functions-Singularities.			
Unit 5	Residues : Cauchy’s Residue Theorem – Evaluation of definite integrals.			

<p>Contents & Treatment as in</p>	<p>Complex Analysis by S. Arumugam, Thangapandi Isaac, A. Somasundaram, SciTech Publications (India) Pvt Ltd, 2002</p> <p>Unit 1: Chapter 1 – sec 2.1 to 2.9. Unit 2: Chapter 3 – sec 3.1 to 3.4, Chapter 5 – sec 5.1 & 5.3 Unit 3: Chapter 6 – sec 6.1 to 6.4 Unit 4: Chapter 7 – 7.1 to 7.4 Unit 5: Chapter 8 – 8.1 to 8.3.</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Complex variables and Applications (Sixth Edition) by James Ward Brown and Ruel V. Churchill, Mc.Grawhill Inc. 2. Complex Analysis by 3. P. Duraipandian, S. Chand & Co Pvt. Ltd. 4. Complex Analysis, T.K. Manickavachagom Pillay, S. Viswanathan Publishers Pvt. Ltd.

Elective 2A

Semester	Subject Code	Subject Title	Total Hours	Credit
VI		Graph Theory	90	4
Objective	To enable the students to understand the basic concepts of Graph Theory.			
Learning Outcomes	<p>Students will acquire knowledge about Graphs, Sub Graphs, Trees, Planar graphs and to convert Engineering and Technology problems into Graphical models to obtain the effective results. It has wide application in areas like circuit theory, telecommunications, etc.</p>			
Unit 1	<p>Graphs-Incidence ,adjency matrices ,complete graph, functional theorem of graph theory, bipartite graphs, Subgraphs-edge disjoint subgraph,vertex disjoint subgraph,induced and spanning subgraph,operation on graphs-isomorphism of graphs</p>			
Unit 2	<p>Walks, paths and cycles – distance between two vertices, Circumference and diameter of a graphs, odd and even cycle, Connected graphs – Connected components of a graph, K disconnected graph.</p>			
Unit 3	<p>Trees – Acyclic graph – Characterisation Thereom of a Tree- Spanning Tree of a graph- Branches and chords- Cotee- Rank and nullity- Eccentricity, radius, Centre - Identification of vertices in a graph- Contraction in a graph(Algorithm parts are excluded).</p>			
Unit 4	<p>Connectivity- Cut vertex, Vertex cut- Vertex connectivity- Cut edge- Cut set- Fundamental cut set- Edge connectivity- Separable graph- K – connected graph- Block- Subdivision of an edge.</p>			
Unit 5	<p>Eulerian graphs- Necessary and sufficient condition for an Eulerian graph, Konigsbery Bridge problem, characterization theorem, unicursal graph, Hamiltonian graphs – Necessary condition for Hamiltonian graphs, Dirac’s theorem, closure of graph, theta graph.</p>			

<p>Contents & Treatment as in</p>	<p>S.Kumaravelu, Susheela Kumaravelu, Graph Theory, SKV Publishers, Sivakasi, 1999. Unit 1: Chapter 1, 2 and 3 Unit 2: Chapter 4 and 5 Unit 3: Chapter 6 – Article 79 – 93 Unit 4: Chapter 7 Unit 5: Chapter 9 -Article 150 – 155, Chapter 10- Article 160- 166,168,169.</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Narsing Deo – “Graph Teory with Application to Engineering and Computer Science”Prentice - Hall of India Pvt. Ltd , New Delhi-110 001. 2. V.K Bala Krishnan - Graph Theory – Schaum’s Outline Series,2004- Tata McGraw Hill Edition 2004,New Delhi. 3. J.A.Bondy and U.S.R. Murthy, Graph Theory with Applications, Macmillon, London. B.Sc Mathematics: Syllabus.

Elective 2B

Semester	Subject Code	Subject Title	Total Hours	Credit
VI		ASTRONOMY II	90	4
Objective	To enable the students to learn about the interesting facts of Moon, Sun Planetary Motion.			
Learning Outcomes	Students will acquire knowledge about Time, Annual Parallax, Precession, Nutation and The Moon, Eclipses.			
Unit 1	Time: Equation of time – Conversion of time – Seasons – Calendar.			
Unit 2	Annual Parallax – Abberation.			
Unit 3	Precession – Nutation			
Unit 4	The Moon – Eclipses.			
Unit 5	Planetary Phenomenon – The Stellar system.			
Contents & Treatment as in	Astronomy by S.Kumaravelu and Susheela Kumaravelu, SKV Publishers, Sivakasi, 1999.			
Books for Reference	<ol style="list-style-type: none"> 1. G V Ramachandran, Text Book of Astronomy, Mission Press, Palayamkottai, 1965. 2. V. Thiruvengkatacharya, A Text Book of Astronomy, S. Chand and Co., Pvt Ltd., 1972 			

Elective 2C

Semester	Subject Code	Subject Title	Total Hours	Credit
VI		FUZZY MATHEMATICS	90	4
Objective	To enable the students to learn about <ul style="list-style-type: none"> • The fundamentals of fuzzy Algebra. • The basic definitions of fuzzy theory • The applications of fuzzy Technology. 			
Learning Outcomes	Students will acquire knowledge about <ul style="list-style-type: none"> • Operations & properties of fuzzy subsets of a set • Cartesian product of fuzzy subsets. • Algebra of fuzzy relations-logic-connectives. • Fuzzy invariant subgroups 			
Unit 1	Introduction- Fuzzy subsets-Lattices and Boolean Algebras- L fuzzy sets- operations on fuzzy – level sets – properties of fuzzy subsets of a set			
Unit 2	Algebraic product and sum of two fuzzy subsets-properties satisfied by Addition and product-cartesian product of fuzzy subsets.			
Unit 3	Introduction- Algebra of fuzzy relations-logic-connectives.			
Unit 4	Some more connectives-Introduction-fuzzy subgroup-homomorphic image and Preimage of subgroupoid.			
Unit 5	Fuzzy invariant subgroups-fuzzy subrings.			
Contents & Treatment as in	S.Nanda and N.R.Das “Fuzzy Mathematical concepts,Narosa Publishing House, New Delhi, 5th, 2012. Unit 1: Sections 1.1-1.10 Unit 2: Sections 1.11-1.13. Unit 3: Sections 2.1-2.4 Unit 4: Sections 2.5,3.1-3.3 Unit 5:Section 3.4 and 3.5.			
Books for Reference	Fuzzy sets and fuzzy logic theory And applications-J George klir and Boyuan Prentice Hall			

Elective 3A

Semester	Subject Code	Subject Title	Total Hours	Credit
VI		Mathematical Statistics	90	4
Objective	<p>To enable students to learn More about:</p> <ul style="list-style-type: none"> • Discrete and Continuous random variables • Calculating Moments and Moment Generating Function • Discrete and Continuous Distributions 			
Learning Outcomes	<p>Students will acquire knowledge to:</p> <ul style="list-style-type: none"> • compare Engineering and Technology problems with Discrete and Continuous Distributions to extract information from it to obtain the better results. • Apply sampling techniques in statistical analysis. 			
Unit 1	<p>Probability Axiomatic approach to Probability – Some theorems on probability - Conditional Probability – Multiplication theorem of probability – Independent events - Multiplication theorem of probability for independent events – Extension of Multiplication theorem of probability for independent events – Pair-wise independent events - Bayes theorem</p>			
Unit 2	<p>One Dimensional Random Variables Introduction – Distribution function – Discrete random variable- Continuous random variable – Two dimensional random variable – Mathematical Expectation Expected value of function of random variable – Properties of Expectation - Properties of Variance – Moments of Bivariate probability distributions – Conditional Expectation and conditional variance.</p>			
Unit 3	<p>Generating Functions Moment Generating Function - Cumulants – Characteristic Function – Some important theorems - Chebychev’s inequality - Probability generating function.</p>			

Unit 4	<p>Theoretical Discrete Distributions Discrete Uniform distribution – Bernoulli distribution – Binomial distribution – Poisson distribution – Negative Binomial distribution – Geometric distribution</p>
Unit 5	<p>Theoretical Continuous Distributions Normal distribution – Uniform distribution – Gamma distribution – Beta distribution of first kind – Beta distribution of second kind – Exponential distribution.</p>
Contents & Treatment as in	<p>Fundamentals of Mathematical Statistics, S.C. Gupta and V.K. Kapoor, Sultan Chand & Sons, New Delhi, 11th Edition, 2002.</p> <p>Unit 1: Chapter 3 – Sec. 3.8 to 3.15 and Chapter 4 – sec. 4.2 Unit 2: Chapter 5 – 5.1, 5.2, 5.3, 5.4, 5.5 Chapter – 6.2, 6.3, 6.4, 6.5, 6.6, 6.8, 6.9 (Omit 6.7) Unit 3: Chapter 7 – 7.1, 7.2, 7.3, 7.4, 7.5, 7.9 (Omit 7.6, 7.7, 7.8) Unit 4: Chapter 8 – 8.2, 8.3, 8.4, 8.5, 8.6, 8.7 Unit 5: Chapter 9 – 9.1, 9.2, 9.3, 9.5, 9.6, 9.7, 9.8 (Omit 9.4)</p>
Books for Reference	<ol style="list-style-type: none"> 1. Introduction to Mathematical Statistics, Hogg, Robert V. Mc Kean, Joseph W. Craig, Allen T. Upper Saddle River, New Jersey, Prentice Hall, V Edition, 2005. 2. Mathematical Statistics, J.N. Kapur, H.C. Saxena, S. Chand, Chennai.

Elective 3B

Semester	Subject Code	Subject Title	Total Hours	Credit
VI		NUMBER THEORY	90	4
Objective	<ul style="list-style-type: none"> To understand the concept of representation of integers and theory of congruence. To know about Fermat's and Wilson's theorem. To be familiar with number theoretic functions. 			
Learning Outcomes	<p>At the end of this course student will able</p> <ul style="list-style-type: none"> To understand the concept of number theory require to solve day to Day life problems To understand coding and decoding problems and cryptography 			
Unit 1	The Division Algorithm – The g.c.d. – The Euclidean Algorithm – The Diophantine Equation $ax + by = c$.			
Unit 2	The Fundamental theorem of arithmetic , The sieve of Eratosthenes – The Goldbach conjecture.			
Unit 3	Basic properties of congruence – Binary and decimal representation of integers Linear congruences – Chinese remainder theorem-			
Unit 4	The Little Fermat's theorem – Wilson's theorem.			
Unit 5	The sum and number of divisors - Mobius inversion formula – The greatest integer function.			
Contents & Treatment as in	<p>Elementary Number Theory David M. Burton McGraw-Hill pub.2007, 6th ed.</p> <p>Unit 1 : Chapter 2: 2.2 to 2.5</p> <p>Unit 2 : Chapter 3: 3.1 to 3.3</p> <p>Unit 3 : Chapter 4: 4.2 to 4.4</p> <p>Unit 4 : Chapter 5: 5.2 and 5.3</p> <p>Unit 5 :Chapter : 6.1 to 6.3</p>			
Books for Reference	Number Theory Kumaravelu and SuseelaKumaravelu , MurugaBhavanam, Chidambara Nagar, Nagarkoil-2. 2002			

Elective 3C

Semester	Subject Code	Subject Title	Total Hours	Credit
VI		COMBINATORICS	90	4
Objective	<p>To enable students to learn More about:</p> <ul style="list-style-type: none"> • Classical Techniques using Generating functions and Recurrence relations • Optimal assignment problem • The inclusion – Exclusion principle problem and Rook polynomial. 			
Learning Outcomes	<p>Students will acquire knowledge to:</p> <ul style="list-style-type: none"> • Generating functions and Recurrence relations • Optimal assignment problem • The inclusion – Exclusion principle problem and Rook polynomial. 			
Unit 1	Introduction to Basic ideas – General formula for $f(n,k)$ – Recurrence Relation – boundary condition - Fibonacci sequence – generating function .			
Unit 2	Permutation – Ordered selection – unordered selection – further remarks on Binomial theorem.			
Unit 3	Passing within a set – Pairing between set and optimal assignment problem – Gala’s optimal assignment problem.			
Unit 4	Fibonacci type relation – using generating function – Miscellaneous method – counting simple electrical networks .			
Unit 5	The inclusion – Exclusion principle - Rook polynomial.			
Contents & Treatment as in	A First Course in Combinatorial Mathematics Jan Anderson Oxford Applied Mathematics and Computing Science Series, UK 1974.			
Books for Reference	<ol style="list-style-type: none"> 1. Combinatorics V.K.Balakrishnan Schuam Series 1996 2. Introduction to Mathematical Statistics, Hogg, Robert V. Mc Kean, Joseph W. Craig, Allen T. Upper Saddle River, New Jersey, Prentice Hall, V Edition, 2005. 			

Allied Mathematics I

Semester	Subject Code	Subject Title	Total Hours	Credit
I		Allied Mathematics I	135	4
Objective	<p>The main objective of this course is:</p> <ul style="list-style-type: none"> • To introduce Matrices and various types, inverse of the matrix. • To study circular, hyperbolic functions and its inverses. • To learn about higher order derivatives and its applications • To study about interpolation • 			
Learning Outcomes	<p>Students will acquire knowledge to:</p> <ul style="list-style-type: none"> • The importance of studying matrices and its applications to spectral theory. • Apply differentiation technique to various business, science and engineering problems. • Apply interpolation to social, economic and business problems. 			
Unit 1	<p>Matrices Symmetric– Skew-symmetric– Hermitian-Skew Hermitian- Orthogonal and Unitary matrices– Eigen values and Eigen-vectors– Cayley-Hamilton Theorem (without proof) – Verification- Computation of inverse matrix using Cayley - Hamilton Theorem</p>			
Unit 2	<p>Trigonometry: Expansions of $\cos n\theta$– $\sin n\theta$– $\tan n\theta$– $\cos^n\theta$– $\sin^n\theta$– $\cos^m\theta\sin^n\theta$.</p>			
Unit 3	<p>Differential Calculus Successive differentiation – n^{th} derivatives– Leibnitz Theorem (without proof) - Simple problems.</p>			

<p>Unit 4</p>	<p>Application of Differential Calculus Jacobians – Maxima and Minima of functions of two variables – Lagrange's multipliers - Simple problems.</p>
<p>Unit 5</p>	<p>Finite Differences Interpolation and interpolation formulae– simple problems.</p>
<p>Contents & Treatment as in</p>	<p>Allied Mathematics Volume I, Prof. P. Duraipandian and Dr. S. Udayabaskaran, S.Chand and Co., New Delhi, 1st ed. Unit 1: Chapter 4 Sec 4.1.1-4.1.6 and 4.5,4.5.2 and 4.5.3 Unit 2: Chapter 6_Section 6.1.1 to 6.1.3 Unit 5:Chapter 5</p> <p>Allied Mathematics Volume II, Prof. P. Duraipandian and Dr. S. Udayabaskaran, S.Chand and Co., New Delhi, 1st ed. Unit 3: Chapter 1_Section 1.1 Unit 4: Chapter 1_Section 1.2 and 1.3</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Ancillary Mathematics, S. Narayanan and T.K. Manickavasgam Pillai, Viswanathan Printers, Chennai, 1986. 2. Ancillary Mathematics Volume 1 and Volume 2, P. Balasubramanian and K. G. Subramanian, Vijay Nichole Publishers.

Allied Mathematics II

Semester	Subject Code	Subject Title	Total Hours	Credit
II		Allied Mathematics II	135	4
Objective	<p>The main objective of this course is:</p> <ul style="list-style-type: none"> • To introduce definite integral and its properties • To study double integrals • To learn about Fourier series expansion of $f(x)$. • To introduce vector calculus and its applications. 			
Learning Outcomes	<p>Students will acquire knowledge to:</p> <ul style="list-style-type: none"> • Apply for finding the area bounded by the curve and volume generated by the closed curve. • Apply Fourier series techniques in signals and systems. • Apply vector calculus technique in physical and mechanics sciences such as rate of flow, circulation, etc. 			
Unit 1	<p>Integral Calculus Bernoulli's formula – Properties of definite integral (without proof) – Evaluation of double integrals (with constant limits only) – Simple problems.</p>			
Unit 2	<p>Fourier series Fourier Series in the interval $(0, 2\pi)$ – and $(-\pi, \pi)$ – Simple problems</p>			
Unit 3	<p>Vector Differentiation Scalar point functions and Vector point functions – Level Surfaces– Directional derivative of a scalar point function - Gradient of a scalar point function– Divergence and Curl of a vector point functions– Laplace operator– Scalar Potential.</p>			
Unit 4	<p>Vector Integration Line , Surface and Volume integrals – Green's, Gauss divergence andStoke's Theorem (without proof) – Problems involving cubes and rectangular parallelopeds only.</p>			

<p>Unit 5</p>	<p>Laplace transform Laplace Transform –Basic results and properties of Laplace transform– Inverse Laplace Transforms Basic results(Methods involving partial derivatives only) – Properties of inverse Laplace transforms(without Proof)– Solving differential equation up to second order with constant coefficients using Laplace Transform.</p>
<p>Contents & Treatment as in</p>	<p>Allied Mathematics Volume II, Prof. P. Duraipandian and Dr. S. Udayabaskaran, S.Chand and Co., New Delhi, 1st ed.</p> <p>Unit 1 : Chapter 2 _Section 2.7 and 2.8. Chapter 3_Section 3.2 Unit 2 : Chapter 4_Section 4.1 Unit 3 : Chapter 8_Section 8.2, 8.3, 8.4(excluding Section 8.4.1) Unit 4 : Chapter 8_Section 8.5, 8.6 Unit 5 : Chapter 7_ Section 7.1.1 to 7.1.4, 7.2, 7.3.</p>
<p>Books for Reference</p>	<ol style="list-style-type: none"> 1. Ancillary Mathematics, S. Narayanan and T.K. ManickavasgamPillai, S.Viswanathan Printers, 1986, Chennai. 2. Ancillary Mathematics Volume 1 and Volume 2, P. Balasubramanian and K. G. Subramanian, Vijay Nichole Publishers.

Non-Major Elective I : (For other Departments)

Semester	Subject Code	Subject Title	Total Hours	Credit
II		Quantitative Aptitude I	30	2
Objective	To introduce a few basic and elementary concepts of mathematics for other major students.			
Learning Outcomes	Students will acquire knowledge to: <ul style="list-style-type: none"> • Tackle problems involving aptitude. • To solve logical problems • To know how to calculate simple and compound interest. 			
Unit 1	H.C.F. & L.C.M. of Numbers			
Unit 2	Averages			
Unit 3	Problems of Ages			
Unit 4	Profit and Loss			
Unit 5	Ratio and Proportion			
Contents & Treatment as in	Quantitative Aptitude, R.S. Aggarwal, S. Chand, 7th Revised edition 2016			
Books for Reference	Quantitative Aptitude, Dinesh Khattar, Pearson, 3rd Edition			

Non-Major Elective II (For other Departments)

Semester	Subject Code	Subject Title	Total Hours	Credit
I		Quantitative Aptitude II	30	2
Objective	The main objective of this course is to learn aptitude for the competitive examinations			
Learning Outcomes	Students will acquire knowledge to: <ul style="list-style-type: none"> • Tackle problems involving aptitude. • To solve logical problems • To know how to calculate simple and compound interest. 			
Unit 1	Time and Distance			
Unit 2	Time and Work			
Unit 3	Simple Interest			
Unit 4	Compound Interest			
Unit 5	Permutations and Combinations			
Contents & Treatment as in	Quantitative Aptitude, R.S. Aggarwal, S. Chand, 7th Revised edition 2016			
Books for Reference	Quantitative Aptitude, Dinesh Khattar, Pearson, 3rd Edition			

ALLIED COURSE for B.C.A.

Semester	Subject Code	Subject Title	Total Hours	Credit
III		STATISTICAL AND NUMERICAL METHODS	75	4
Objective	<p>The main objective of this course is:</p> <ul style="list-style-type: none"> • To solve linear algebraic, transcendental and system of equations. • To know the measurement of central tendency and deviation. • To study the relation and association between two variables. 			
Learning Outcomes	<p>Students will acquire knowledge about:</p> <ul style="list-style-type: none"> • To apply numerical techniques in scientific computing. • To solve real life problems. 			
Unit 1	<p>The Solution of Numerical Algebraic and Transcendental Equations: Bisection Method-Iteration Method-Newton Raphson method.</p> <p>Solution of Simultaneous Linear Algebraic equations: Gauss Elimination Method-Gauss Jordan elimination method-Inversion of matrix using Gauss Elimination Method-Method of Triangularization.</p>			
Unit 2	<p>Numerical Differentiation: Newton's forward difference and Newton's backward difference method.</p> <p>Numerical Integration: Trapezoidal rule- Simpson's one third rule- Simpson's three eighths rule.</p>			
Unit 3	<p>Measure of central tendency: Arithmetic mean-Weighted arithmetic mean-Combined mean-Geometric mean-Harmonic mean-Mean-Median-Mode.</p> <p>Measures of Dispersion: Mean Deviation-Standard Deviation.</p>			
Unit 4	<p>Random variables: Discrete random variables- Continuous random variables-Cumulative Distribution - Mathematical expectations (one dimension only)-Variance. Theorems without proof simple problems.</p>			

<p>Unit 5</p>	<p>Correlation and Regression: Correlation - Correlation Coefficient-Rank Correlation-Regression- Regression lines- Properties of Regression Coefficient(without proof), Simple problems.</p>
<p>Contents & Treatment as in</p>	<p>1. P. Kandasamy, k. Thilagavathy and K. Gunavathi : Numerical Methods, 3rd edition, S.Chand publication</p> <p>Unit 1:Chapter 3: Section 3.1, 3.2 & 3.4 and Chapter 4: Section 4.2 to 4.4</p> <p>Unit 2:Chapter 6 : Section 6.2, 6.3 & Chapter 9 : Section 9.7 to 9.14 (Omit 9.8 & 9.12)</p> <p>2. P.R.Vittal and V.Mallini: Statistical And Numerical Methods, Margham Publications, 2012</p> <p>Unit 3:Chapter 5: Section5.1 to 5.8, Chapter 6:Section- 6.3 and 6.4.</p> <p>Unit 4:Chapter 9: Section9.1and 9.2. Chapter 10 and 11,</p> <p>Unit 5: Chapter 13: Section 13.6and13.20. Chapter 14: Section 14.1 and 14.3</p>
<p>Books for Reference</p>	<p>1.Mathematics for B.Sc-Branch-I Volume –III by P.Kandasamy,K.Thilagavathy, S.Chand Publishers.</p> <p>2.Differential equations with applications and historical notes by George F.Simmons, 2ndEd.,TataMcgraw Hill Publications.</p> <p>3. Differential Equations by ShepleyL.Ross, 3rdEdn.,JohnWiley and sons 1984.</p> <p>4.Differential Equations by N.P.Bali,Laxmi Publications Ltd,New Delhi-2004.</p> <p>5. Ordinary and Partial differential Equation by M.D.Raisinghania,S.Chand Publishers.</p>

Semester	Subject Code	Subject Title	Total Hours	Credit
IV		ENVIRONMENTAL STUDIES PROGRAMME (ABILITY ENHANCEMENT COMPULSORY COURSES)	30	2
Objective	<p>The main objective of this course is to know about:</p> <ul style="list-style-type: none"> • eco-system Structure and functions • Renewable and Non – renewable Resources • Biodiversity and Conservation • Environmental Pollution • Environmental Policies & Practices • Human Communities and the Environment 			
Learning Outcomes	<p>Students will acquire Awareness and Learn how to safe guard :</p> <ul style="list-style-type: none"> • Nature and its eco-system, recourses • Earth from Biodiversity, Environmental Pollution 			
Unit 1	<p>Introduction to Environmental Studies</p> <ul style="list-style-type: none"> • Multidisciplinary nature of environmental studies; • Scope and importance; concept of sustainability and sustainable development. 			
Unit 2	<p>Ecosystem (2 lectures)</p> <p>What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: Food chains, food webs and ecological succession,</p> <p>Case studies of the following ecosystem:</p> <ol style="list-style-type: none"> a) Forest ecosystem b) Grass land ecosystem c) Desert ecosystem d) Aquatic ecosystem (ponds, stream, lakes, rivers, ocean, estuaries) 			

<p>Unit 3</p>	<p>Natural Resources : Renewable and Non – renewable Resources (6 lectures)</p> <ul style="list-style-type: none"> • Land resources and land use change: Land degradation, soil erosion and desertification. • Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. • Water : Use and over –exploitation of surface and ground water, floods, droughts, conflicts over water (international and inter-state). • Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies.
<p>Unit 4</p>	<p>Biodiversity and Conservation (8 lecturers)</p> <ul style="list-style-type: none"> • Levels of biological diversity: genetics, species and ecosystem diversity, Bio-geographic zones of India: Biodiversity patterns and global biodiversity hotspots • India as a mega-biodiversity nation, Endangered and endemic species of India. • Threats to biodiversity: Habitat loss, poaching of wildlife, man- wildlife conflicts, biological invasions; Conservations of biodiversity: In-situ and Ex-situ Conservation of biodiversity. • Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.
<p>Unit 5</p>	<p>Environmental Pollution (8lecturers)</p> <ul style="list-style-type: none"> • Environmental pollution: types, causes, effects and controls: Air, Water, soil and noise Pollution. • Nuclear hazards and human health risks • Solid waste management: Control measures of urban and industrial waste • Pollution case studies.

<p>Unit 6</p>	<p>Environmental Policies & Practices (8 lecturers)</p> <ul style="list-style-type: none"> • Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture. • Environment Laws: Environment Protection Act, Air (Prevention & Control of Pollution) Act; Water (Prevention and Control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD). • Nature reserves, tribal populations and rights, and human Wildlife conflicts in Indian context.
<p>Unit 7</p>	<p>Human Communities and the Environment (7lectures)</p> <ul style="list-style-type: none"> • Human population growth, impacts on environment, human health and welfare. • Resettlement and rehabilitation of projects, affected persons; case studies. • Disaster management: floods, earthquake, cyclone and landslides. • Environmental movements: Chipko, Silent Valley, Bishnois of Rajasthan. • Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. • Environmental communication and public awareness, casestudies (e.g. CNG Vehicles in Delhi)
<p>Unit 8</p>	<p>Field Work (6lectures)</p> <ul style="list-style-type: none"> • Visit to an area to document environmental assets: river/ forest/ flora/ fauna etc. • Visit to a local polluted site–Urban/ Rural/ Industrial/ Agricultural. • Study of common plants, insects, birds and basic principles of identification. • Study of simple ecosystem- pond, river, Delhi Ridge etc.

**Books
for
Reference**

1. Carson , R. 2002.Silent Spring, Houghton Mifflin Harcourt.
2. Gadgil , M.,& Guha, R. 1993.This Fissured Land: An Ecological History of India. Univ. of California Press.
3. Glesson, B. and Low, N.(eds.)1999. Global Ethics and Environment, London, Routledge.
4. Gleick,P.H.1993.Water Crisis. Pacific Institute for Studies in Dev., Environment &Security. Stockholm Env.Institute, Oxford Univ.Press.
5. Groom, Martha J., Gary K.Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates,2006.
6. Grumbine,R.Edward, and Pandit,M.K2013.Threats from India's Himalayas dams.Science,339:36-37
7. McCully,P.1996. Rivers no more :the environmental effects of dams(pp.29 -64).Zed books.
8. McNeill,John R.2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
9. Odum,E.P.,Odum, H.T.& Andrees,J.1971.Fundamental of Ecology. Philadelphia Saunders.
10. Pepper,I.L.,Gerba,C.P & Brusseau,M.L.2011.Environmental and Pollution Science. Academic Press.
11. Rao,M.N.& Datta,A.K1987.Waste Water Treatment. Oxford and IBH Publishing Co.Pvt.Ltd.
12. Raven,P.H.,Hassenzahl,D.M & Berg,L.R.2012 Environment.8 th edition. John Willey & sons.
13. Rosencranz, A., Divan,S.,& Noble, M.L.2001.Environmental law and policy in India.Tirupathi 1992.
14. Sengupta,R.2003.Ecology and Economics: An approach to sustainable development. OUP
15. Singh,J.S.,Singh,S.P and Gupta,S.R.2014.Ecology,Environmental Science and Conservation. S.Chand Publishing, New Delhi.
16. Sodhi,N.S.,Gibson,L.&Raven ,P.H(eds).2013.Conservation Biology :Voices from the Tropics. John Willey & Sons.
17. Thapar,V.1998.Land of the Tiger: A Natural History of the Indian Subcontinent.
18. Warren,C.E.1971.Biology and water Pollution Control. WB Saunders.
19. Willson,E.O.2006. The Creation: An appeal to save life on earth..New York: Norton
20. World Commission on Environment and Development.1987.Our Common Future. Oxford University Press.

Semester	Subject Code	Subject Title	Total Hours	Credit
V		VALUE EDUCATION		2
Objective	<p>Values are socially accepted norms to evaluate objects, persons, and situations that form part and parcel of sociality. A value system is a set of consistent values and measures. Knowledge of the values are inculcated through education. It contributes informing true humanbeing, who are able to face life and make it meaningful. There are different kinds of values like, ethical or moral values, doctrinal or ideological values, social values and aesthetic values. Values can be defined as broad preferences concerning appropriate courses of action or outcomes. As such, values reflect a person's sense of right and wrong or what "ought" to be. There are representative values like, "Equal rights for all", "Excellence deserves admiration". "People should be treated with respect and dignity". Values tend to influence attitudes and behavior and help to solve common human problems. Values are related to the norms of a culture.</p>			
Learning Outcomes	<p>Students will acquire Knowledge and Awareness about:</p> <ul style="list-style-type: none"> • Role of culture and civilization-Holistic living • Salient values for life • Human Rights • Environment and Ecological balance • Social Evils 			
Unit 1	<p>Value education-its purpose and significance in the present world – Value system – The role of culture and civilization-Holistic living – Balancing the outer and inner – Body, Mind and Intellectual level- Duties and responsibilities.</p>			
Unit 2	<p>Salient values for life- Truth, commitment, honesty and integrity, forgiveness and love, empathy and ability to sacrifice, care, unity , and inclusiveness, Self esteem and self confidence, punctuality–Time,task and resource management-Problem solving and decision making skills- Interpersonal and Intra personal relationship – Team work – Positive and creative thinking</p>			

Unit 3	Human Rights – Universal Declaration of Human Rights–Human Rights violations–National Integration–Peace and non-violence Dr.APJKalam’s ten points for enlightened citizenship – Social Values and Welfare of the citizen – The role of media in value building
Unit 4	Environment and Ecological balance – interdependence of all beings – living and non-living. The binding of man and nature – Environment conservation and enrichment.
Unit 5	Social Evils – Corruption, Cyber crime, Terrorism – Alcoholism, Drug addiction – Dowry – Domestic violence – Untouchability–female infanticide–atrocities against women- How to tackle them.
Books for Reference	<ol style="list-style-type: none"> 1. M.G.Chitakra: Education and Human Values, A.P.H.Publishing Corporation, New Delhi,2003 2. Chakravarthy, S.K. : Values and ethics for Organizations: Theory and Practice, Oxford University Press, New Delhi , 1999. 3. Satchidananda, M.K.: Ethics, Education, Indian Unity and Culture, Ajantha Publications, Delhi,1991 4. Das,M.S.&Gupta,V.K.:SocialValuesamongYoung adults: A changing Scenario, M.D. Publications, New Delhi,1995 5. Bandiste,D.D.:HumanistValues:ASourceBook,B.R. Publishing Corporation, Delhi,1999 6. Ruhela, S.P. : Human Values and education, Sterling Publications, New Delhi,1986 7. Kaul,G.N.:ValuesandEducationinIndependentIndian, Associated Publishers, Mumbai,1975 8. NCERT, Education in Values, New Delhi,1992 9. Swami Budhananda (1983) How to Build Character A Primer : Ramakrishna Mission, NewDelhi 10. ACulturalHeritageofIndia(4Vols.),BharatiyaVidya Bhavan, Bombay. (Selected Chaptersonly) 11. For Life, For the future :Reserves and Remains – UNESCOPublication 12. Values,AVedantaKesariPresentation,SriRamakrishna Math, Chennai,1996 13. Swami Vivekananda, Youth and Modern India, Ramakrishna Mission 14. Swami Vivekananda, Call to the Youth for Nation Building, Advaita Ashrama,Calcutta 15. Awakening Indians to India, Chinmayananda Mission, 2003.