COURSES OF STUDIES

FOR

THREE YEAR DEGREE COURSE

IN

SCIENCE

DEPARTMENT OF MATHEMATICS

Choice Based Credit System(CBCS)

First & Second Semester Examination – 2018-19

Third & Fourth Semester Examination – 2019-20

Fifth & Sixth Semester Examination – 2020-21

GOVERNMENT AUTONOMOUS COLLEGE,
PHULBANI, KANDHAMAL

SYLLABI FOR CBCS COURSE

Sem	CORE COURESE (14)	Ability Enhancement Compulsory Course (AECC) (2)	Skill based Enhancement Compulsory Course (SECC) (2)	Elective: Discipline Specific DSE (4)	Elective: Generic (GE) (4)
I	CORE-I				
	CORE-II				
II	CORE-III				GE-1 (Minor-2)
	CORE -IV				
III	CORE-V		SECC-1 (For Science Stream)		
	CORE-VI				
	CORE-VII				
IV	CORE-VIII		SECC-2 (For Arts/Commerce Stream)		GE-2 (Minor-2)
	CORE-IX				
	CORE-X				
V	CORE-XI			DSE-1	
	CORE-XII			DSE-2	
VI	CORE-XIII			DSE-3	
	CORE-XIV			DSE-4 (Project)	

SECC-1 : To be offered by English Department.
SECC-2 : To be offered by Mathematics Department.
GE : Minor-1 and Minor-2 is to be decided by the college Based on Subject.

QUESTION PATTERN FOR MID SEM

Mid Semester Examination	Full Marks	No. of Short Answer type Questions (2 marks each) (Compulsory)	No. of Long Answer type Questions (8 marks each)	No. of Long Answer type Questions (12 marks each)
Practical Subject	20	6	1	*
Non-Practical Subject	20	4	*	1

QUESTION PATTERN FOR END SEM

End Semester Examination	Full Marks	GROUP – A					GROUP - B									
		No. of Short Answer type Questions (2 marks each) (Compulsory)					No. of Long Answer type Questions (8 marks each)					No. of Long Answer type Questions (12 marks each)				
Units -->		I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V
Non-Practical Subject	80	10					*	*	*	*	*	1	1	1	1	1
Practical Subject	50	5					1	1	1	1	1	*	*	*	*	*

- There is no alternative questions (choice) in Group-A questions (Short Answer type questions). All questions are compulsory.
- There is internal alternative questions (choice) in each number in Group-B questions (Long Answer type questions). Examinee has to answer one questions out of two alternative questions from each number.
- There is little deviation in question pattern of AECC (Eng Communication) & SECC-I & II. Details regarding question pattern of concerned subject is given at appropriate place.)
- The duration of Mid Sem exam of each paper is 1 hour irrespective of Full marks.
- The duration of End Sem exam of each paper is 3 hours for 80 marks/50 marks.

YEAR & SEMESTER-WISE PAPERS & CREDITS AT A GLANCE

Three-Year (6-Semester) CBCS Programme (B.Sc. Hons.) (Mathematics Department)				
Yr.	Sl.No.	**Course Structure**	**Code**	**Credit Points**
FIRST YEAR		**SEMESTER-I**		
	1	Calculus-I (with Practical)	C-1.1	4+2
	2	Algebra-I	C-1.2	6
		SEMESTER-II		
	3	Real Analysis-I	C-2.1	6
	4	Differential Equation (with Practical)	C-2.2	4+2
	5	Calculus and Ordinary Differential Equations	GE-2.3	6
SECOND YEAR		**SEMESTER-III**		
	6	Real Analysis-II	C-3.1	6
	7	Group theory (Algebra –II)	C-3.2	6
	8	Partial Differential equation and systems of ordinary differential equation (with Practical)	C-3.3	4+2
	9	Quantitative and Logical Thinking (For Science Stream)	SECC-3.5	6
		SEMESTER-IV		
	10	Numerical methods (with Practical)	C-4.1	4+2
	11	Riemann integration and series of functions (Analysis –III)	C-4.2	6
	12	Ring theory and linear algebra-I (Algebra-III)	C-4.3	6
	13	Linear Algebra and Advanced Algebra	GE-4.4	6
	14	Quantitative and Logical Thinking (For Arts/Commerce Stream)	SECC-4.5	6
FINAL YEAR		**SEMESTER-V**		
	15	Multivariate Calculus (Calculus-II)	C-5.1	6
	16	Probability and statistics	C-5.2	6
	17	C^{++}	DSE-5.3	6
	18	Discrete Mathematics	DSE-5.4	6
		SEMESTER-VI		
	19	Metric Spaces and Complex Analysis	C-6.1	6
	20	Linear Programming	C-6.2	6
	21	Differential Geometry	DSE-6.3	6
	22	Project Work	DSE-6.4	6

Notes:

- C- Core Course
- GE- Generic Elective Course
- DSE- Discipline Specific Elective Course
- AECC- Ability Enhancement Compulsory Course
- SECC- Skill based Enhancement Compulsory Course
- For a 6 credit course, the total teaching hours are: Minimum- 50 Hours, Maximum-65 Hours

SEMESTER-I

C-1.1: CALCULUS-I

Full Marks – 100 (70+30)
Mid Sem – 20/1 hr
End Sem Theory – 50/3 hrs

UNIT-1

Hyperbolic function, higher order derivative, Leibnitz rule and its applications to problems, Homogeneous functions, Euler's theorem for two variables, concavity and point of inflection, special types of function (gamma and betta function with relation). L-H-Rule

UNIT-II

Asymptotes, curvature and curve tracing

UNIT-III

Reduction formula for the integral $\int \sin^n x\,dx$, $\int \cos^n x\,dx$, $\int \tan^n x\,dx$, $\int \sec^n x\,dx$, $\int \operatorname{cosec}^n x\,dx$, $\int (\log x)^n\,dx$, area, length, volume and area of surface of revolution.

UNIT-IV

Sphere, cone, cylinder and central conicoids

UNIT-V

Triple product, introduction to vector functions, operations with vector valued functions, limit and continuity of vector function s, differentiation and integration of vector functions, tangent and normal, components of acceleration.

PRACTICAL

End Sem Practical – 30/3 hrs

List of practical's (Using any software)
Practical /Lab work to be performed on a computer.
Record=7, Attendance=3, vive-voce=5, Experiment=15.

1. Plotting the graph of the functions $\log(ax+b)$, $\sin(ax+b)$, $\cos(ax+b)$, e^{ax+b}, $|ax+b|$.
2. Plotting the graphs of the polynomials of degree 4 and 5, the derivative graph, the second derivative graph and comparing them.
3. Sketching parametric curves (Eg. Trochoid cycloid, epicycloids, hypocycloid)
4. Obtaining surface of revolution of curves.
5. Tracing of conics in Cartesian co-ordinates/polar co-ordinates.
6. Sketching ellipsoid, hyperboloid of one and two sheets, elliptic cone, elliptic, paraboloid, hyperbolic paraboloid using Cartesian co-ordinates.
7. Matrix operations (addition, multiplication, inverse and transpose)

Books Recommended :

1. Topics in calculus by R.K.PANDA AND P.K. SAPATHY, S.G. Publication.
2. Analytical Geometry of Quadratic surfaces, B.P. Acharya and D.C. Sahu, Kalyani Publishers, New Delhi, Ludhiana
3. Elements of vector calculus-N-Soren and R-Prasad.
4. Text book of Calculus, part-II Shanti Narayan and P.K. Mittal, S.Chand and Co.
5. Text book of Calculus, part-III Shanti Narayan and P.k.Mittal, S.Chand and Co.
6. M.J.Strauss,G.I.Bradly and K.J. Smith, 3rd Ed. Dorling Kindersly (India) P. Ltd .(Pearson Education),New Delhi -2007, chapter 4(4.3,4.4,4.5,&4.7),999.4),10(10.1-10.4)
7. H.Anton, I.Bivens and S. Davies, Calculus, 7th Ed. John Wiley and Sons (Asia)P. Ltd, Singapore, 2002: chapter: 6(6.2-6.5), 7(7.8), 8(8.2-8.3), pages 532-538, 11(11.1), 13(13.5).
8. Analytical Solid Geometry by Shanti Narayan and P.k. Mittal, S. Chand and Co.
9. G.B.Thomes and R.L. Finney, Calculus, 9th Ed. Pearson Education, Delhi, 2005.
10. R. Courant and F. john, Introduction to Calculus and analysis (volume I and II)

C-1.2: ALGEBRA-I

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Polar representation of complex number, n-th roots of unity, De-Movire's theorem and its applications

UNIT-II

Equivalence relations, functions, composite functions, invertible functions, one-to-one corresponds and cardinality of a set, division algorithm, divisibility and Euclidean algorithm, Congruence relation between integers, principal of method of induction, statement of Fundamental Theorem of Arithmetic

UNIT-III

Systems of linear equations, row reduction and echelon forms, vector equations, the matrix equation Ax=b, solution sets of linear systems (Gauss elimination, gauss Jordan method), application of linear systems

UNIT-IV

Vector space, linear independence, span of a vector, subspace, rank of a matrix

UNIT-V

Introduction to linear transformation, matrix of a linear transformation, inverse of a matrix, characterizations of invertible matrices, Eigen values, Eigen vectors and characteristic equation of a matrix

Books Recommended :

1. Complex Analysis, S. Armugan, A. Thangapandi Issac, Somasundaram, SCITECH Publication (India) Pvt. Ltd, Chennai.
2. Discrete Mathematics by K.H. Rosen.
3. An Introduction to linear algebra by V. Krishna Murty, V.P. Mainra, J.L Arora, Affiliated –east-west press Pvt Ltd.
4. L.V. Ahlfors, complex Analysis, McGraw-Hill (International Students Ed.)
5. Titu Andreescu and Dorin Andrica, Complex Numbers from A to Z, Birkhauser, 2006, chapter-2 .
6. Edgr G. Goodaire and Michael M. Parmenter, Discrete Mathematics with graph theory, 3rd Ed. Pearson Education (Singapore) P. Ltd, Indian Reprint, 2005, chapter: 292.4), 3, 4(4.1-4.1.6, 4.2-4.2.11, 4.4(4.1-4.4.80, 4.3-4.3.9, 5(5.1-5.1.4).
7. Dvid C. Lay, Linear Algebra and its Application .3rd Ed. Pearson Education, Asia, Indian Reprint -2007: chapter :1(1.1-1.9), 2(2.1-2.3, 2.8, 2.9), 5(5.1-5.2)

SEMESTER-II

C-2.1: REAL ANALYSIS-I

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Review of Algebraic and Order properties of R : Neighbourhood of a point in R : Idea of countable sets, uncountable sets and uncountability of R, Bounded above sets, Bounded below sets, bounded sets, unbounded sets, suprema and Infima

UNIT-II

The completeness property of R : The A Archimedean property, Density of rational and irrational numbers in R, Intervals, Limit points of asset, isolated points, Illustrations of Boolean–Weierstrass theorem for sets

UNIT-III

Sequences, Bounded sequence, Convergent sequence, limit of a sequence, limit theorems, monotonic sequence, monotone convergence theorem, Subsequence, divergence criteria, monotone subsequence theorem (statement only), Bolzano-Weierstrass theorem for sequence, Cauchy sequence, Cauchy's convergence criterion

UNIT-IV

Infinite series, convergence and divergence of infinite series, Cauchy Criterion, Tests for convergence, comparisons test, Ratio test, Cauchy's root test, Raabe's Test

UNIT-V

Logarithimic test, integral test, Gauss test, alternating series, Leibniz test, absolute and conditional convergence

Books Recommended :

1. G.Das and S .Pattnayak , Fundamental of Mathematics Analysis, TMH Publishing Co.,chapter; 2(2.1-to2.4,2.5 to 2.7 0,3(3.1-3.5), 4(4.1-4.7,4.10,4.11,4.12,4.13).
2. S.C. Malik and S.C. Arora- Mathematical Analysis, New Age International publications.

3. R.G. Bartle and D.R. Sheraporbert, Introduction to Real Analysis, 3rd Ed. John Wiley and Sons (Asia) Pvt. Ltd, Singapore, 2002.
4. Gerald G. Bilodeau, Paul R.Thie, G.E. Keough, An Introduction to Analysis, 2nd Ed. Johns & Bartlett 2010.
5. Brain S. Thomson, Andrew M. Bruckner and Judith B. Bruckner, Elementary Real Analysis, Prentice Hall,2001.
6. S.K. Berberian, A First Course in real analysis, Springer Verlag, New York, 1994.
7. D. Smasundaram and B. Choudhury –A First Course in Mathematical Analysis, Narosa Publication House.
8. S.L. Gupta and Nisha Rani –Real Analysis, Vikas Publishing House Pvt. Ltd, New Delhi.

C-2.2: DIFFERENTIAL EQUATION

Full Marks – 100 (70+30)
Mid Sem – 20/1 hr
End Sem Theory – 50/3 hrs

UNIT-I

Differential equation and mathematical models, orders and degree of the differential equation, formation of differential equation, Ist order and Ist degree ODE (variable separable, homogeneous exact, linear), Equation of Ist order but not Ist degree

UNIT-II

Application of Ist order differential equation (growth, Decay and chemical reactions, heat flow and oxygen debt, economics), Second order linear equations (homogeneous and non-homogeneous) with constant coefficients

UNIT-III

Second order equations with variable coefficients, variation of parameters, method of undetermined coefficients, equations reducible to linear equations with constant coefficients, Euler's equation, application of second order differential equations

UNIT-IV

Power series solutions of second order differential equations

UNIT-V

Laplace transform and its applications to solution of differential equation

PRACTICAL

End Sem Practical – 30/3 hrs

List of practical's(Using any software)
Practical /Lab work to be performed on a computer.
Record=7, attendance=3, vive-voce=5, Experiment=15

1. Plotting of second order solution of family of differential equations.
2. Plotting of third order solution of family of differential equations.
3. Growth model (exponential case only)
4. Decay model (exponential case only)
5. Oxygen debt model
6. Economic model
7. Vibration problem

Books Recommended :

1. Acourse of ordinary and partial differential equations by J. Sinha and S. Padhy, Kalyani Publication, New Delhi Chapter:1, 2(2.1-2.7), 3 4(4.1-4.7), 5, 7(7.1-7.4), 9(9.1-9.5, 9.10, 9.11, 9.13).
2. Differential Equations and their Applications, Martin Baraun, Springer International.
3. Advanced Differential Equations by M.D. Raisinghania, S. Chand & Company Ltd. New Delhi.
4. S.L. Ross, Differential Equations, John Wiley & Sons, India, 2004.
5. G. Dennis Zill, A First Course in differential equations with Modelling applications, Cengage Learning India Pvt. Ltd.

GE-2.3: CALCULUS AND ORDINARY DIFFERENTIAL EQUATIONS

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Asymptotes, curvature and curve tracing, length, volume and area of surface of revolution

UNIT-II

Sphere, cone, cylinder and central conicoids

UNIT-III

Explicit and Implicit functions, limit and continuity of functions of several variables, partial derivatives, partial derivative of higher orders, homogeneous functions, change of variables mean value theorem, Taylor's theorem and Maclaurin's theorem for function of two variables, maxima and minima of functions of two and three variables, implicit functions

UNIT-IV

Ordinary Differential equation Ist order and Ist degree (variable separable, homogeneous exact, linear), Equation of Ist order but not Ist degree

UNIT-V

Second order linear equations (homogeneous and non-homogeneous) with constant coefficients, second order equations with variable coefficients, variation of parameters, Laplace transform, and its applications to solution of differential equation

Books Recommended:

1. Acourse of ordinary and partial differential equations by J. Sinha and S. Padhy, Kalyani Publication, New Delhi Chapter :1, 2(2.1-2.7), 3 4(4.1-4.7), 5, 7(7.1-7.4), 9(9.1-9.5, 9.10, 9.11, 9.13).
2. Text book of Calculus, part-II Shanti Narayan and P.K. Mittal, S. Chand and Co.
3. Text book of Calculus, part-III Shanti Narayan and P.K. Mittal, S. Chand and Co.
4. Analytical Geometry of Quadratic surfaces, B.P. Acharya and D.C. Sahu, Kalyani Publishers, New Delhi, Ludhina
5. S.C. Malik and S. Aroro-Mathematical Analysis, New age International publications,
6. Advanced Calculus by Santosh K. Sengar chapter: 2,4,5,6,7,11,12,13
7. Differential Equations and their Applications, Martin Baraun, Springer International.
8. Advanced differential Equations by M.D. Raisinghania, S. Chand & Company Ltd. New Delhi.
9. Analytical Solid Geometry by Shanti Narayan and P.K. Mittal, S. Chand and Co.
10. G. Dennis Zill, A First Course in differential equations with Modelling Applications, Cengage Learning India Pvt. Ltd.
11. Advanced Calculus by David V. Weider, Dover Publication.

SEMESTER-III

C-3.1: THEORY OF REAL ANALYSIS (ANALYSIS-II)

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Limits of functions $(\in -\delta)$ approach, sequential criterion for limits, divergence criteria, limit theorem, one sided limits, Infinite limits and limits at infinity, continuous functions, sequential criterions for continuity and discontinuity.

UNIT-II

Algebra of continuous function, continuous functions on an interval, intermediate value theorem, location of roots theorem, preservation of intervals theorem, uniform continuity, non-uniform continuity criteria, uniform continuity theorem

UNIT-III

Differentiability of a function at a point and in an interval, algebra of differentiable functions, Increasing and decreasing function, Darboux's theorem, Rolle's theorem

UNIT-IV

Relative extreme, interior extremum theorem, mean value theorem, intermediate value property of derivatives, Applications of mean value theorem to inequalities and approximation of polynomials, Taylors theorem to inequalities.

UNIT-V

Cauchy's mean value theorem, Taylors theorem with Lagranges from of remainder, Taylors theorem with Cauchy's from of remainder, application of Taylors theorem to convex functions, relative extrema, Taylors series and Maclaurins series expansions and trigonometric functions $\log(1+x), \frac{1}{ax+b}, (1+x)^n$

Books Recommended:

1. G. Das and S. Pattanayak, Fundamental of Mathematics Analysis, TMH Publishing Co., chapter; 6(6.1-to 6.8), 7(7.1-7.7)
2. S.C. Malik and S. Aroro-Mathematical Analysis, New Age International publications.
3. R.G. Bartle and D.R. Sheraporbert, Introduction to Real Analysis, 3rd Ed. John Wiley and Sons (Asia) Pvt. Ltd, Singapore, 2002.
4. K.A. Ross, Elementary Analysis, The theory of calculus, Springer, 2004
5. A. Mattuck, Introduction to analysis, Prentice Hall, 1999
6. S.R. Ghorpada and B.V. Limaye, A Course in calculus and real analysis, Springer, 2006

C-3.2: GROUP THEORY (ALGEBRA-II)

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Group, semi group, and examples of group, elementary properties of groups, subgroups and examples of subgroups

UNIT-II

Normaliser, Normal subgroup, centre of group, centralizer, product of two subgroups, Properties of cyclic groups, classification of subgroups of cyclic groups

UNIT-III

Cycle notation for permutations, permutation groups, properties of permutations, even and odd permutations, alternating groups, properties of cosets, Lagranges theorem and consequences, Fermat's Little theorem

UNIT-IV

External direct product of a finite number of groups, normal subgroups, factor groups, Cauchy's theorem for finite abellian groups

UNIT-V

Group homomorphisms, properties of homomorphisms, Cayle' theorem, properties of isomorphisms, First, second and third isomorphism theorem

Books Recommended :

1. Joseph A. Gallian, Contemporary Abstract Algebra (4th Edn.), Narosa publishing House, New Delhi.
2. A course in abstract algebra by V.K. KHANA and S.K. Bhamri, Vikash pub. house New Delhi
3. A Ist course in Abstract Algebra, by John B. Fraleigh, 7th Ed. Person, 2002.
4. Abstract Algebra, M. Artin, 2nd Ed. Pearson, 2011.
5. An introduction to the theory of groups, Joseph J Rotman, 4th. Ed. Springer Verlag, 1995.
6. Topics in Algebra, I.N. Herstain, Wiley Easten Limited, India, 1975.

C-3.3: PARTIAL DIFFERENTIAL EQUATIONS AND ORDINARY DIFFERENTIAL EQUATIONS

Full Marks – 100 (70+30)
Mid Sem – 20/1 hr
End Sem Theory – 50/3 hrs

UNIT-I

Systems of linear differential equations, types of linear systems, differential operators, an operator, method for linear system with constant coefficients, basic theory of linear systems in normal form, homogeneous linear systems with constant coefficient (two equation in two unknown functions)

UNIT-II

Simultaneous linear first order equations in three variables, methods of solution, pfaffian differential equations, methods of solutions of pfaffian differential equations in three variables

UNIT-III

Formation of Ist order partial differential equations, linear and non-linear partial differential equations of Ist order, special types of Ist order equations, solution of partial differential equations of first order satisfying given conditions

UNIT-IV

Linear partial differential equations with constant coefficients, Equations reducible to linear partial differential equations with constant coefficients, partial differential equations with variable coefficients, separation of variables, non-linear equation of the second order (Monge's method)

UNIT-V

Canomical form (Normal form) of second order linear differential equation, Laplace equations, Solution of the Laplace equation by separation of variables, one dimensional wave equation, solution of the wave equation (method of separation of variables). Diffusion equation, solution of one-dimensional diffusion equation, method of separation of variables

PRACTICAL

End Sem Practical – 30/3 hrs

List of practical's(Using any software)
Practical /Lab work to be performed on a computer.
Record=7, attendance=3, vive-voce=5, Experiment=15.

1. To find the general solution of the non-homogeneous system of the form $\frac{dx}{dt} = ax + by + f(t)$, $\frac{dy}{dt} = cx + dy + g(t)$ with given conditions.
2. Plotting the integral surfaces of a given first order PDE with initial data.
3. Solution of wave equation $\frac{\partial^2 u}{\partial t^2} - c^2 \frac{\partial^2 u}{\partial x^2} = 0$ for the following associated conditions
   (i) $u(x,0) = \phi(x)$, $u_t(x,0) = \psi(x)$ $x \in R$, $t > 0$.
   (ii) $u(x,0) = \phi(x)$, $u_t(x,0) = \psi(x)$,, $u_x(0,t) = 0$ $x \in R^+$, $t > 0$
   (iii) $u(x,0) = \phi(x)$, $u_t(x,0) = \psi(x)$,, $u\ (0,t) = 0$ $x \in R^+$, $t > 0$
   (iv) $u(x,0) = \phi(x)$, $u_t(x,0) = \psi(x)$,, $u\ (0,t) = 0$ $u\ (l,t) = 0$ $0 < x < l, t > 0$
4. Solution of wave equation $\frac{\partial^2 u}{\partial t^2} - c^2 \frac{\partial^2 u}{\partial x^2} = 0$ for the following associated conditions
   (i) $u(x,0) = \phi(x)$, $u\ (0,t) = a$ $u\ (l,t) = b$ $0 < x < l, t > 0$
   (ii) $u(x,0) = \phi(x)$, $x \in R$ $0 < t < T$,
   (iii) $u(x,0) = \phi(x)$, $u\ (0,t) = a$, $x \in R^+$, $t \geq 0$

Books Recommended :

1. A course of ordinary and partial differential equations by J. Sinha and S. Padhy, Kalyani Publication, New Delhi Chapter: 11, 12, (13.1-13.5), 15(15.1, 15.5), 16(16.1, 16.1.1), 17(17.1, 17.2, 17.3)
2. Tyn Myint- and Lokenath Debnath, Linear partial Differential equations for scientist and Engineers, 4th edition, Springer, Indian reprint, 2006.
3. S.L Ross, Differential equations, 3rd Ed. John Wiley and sons, India, 2004.

GE-3.5: QUANTITATIVE AND LOGICAL THINKING

(For Science Stream)

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

I. QUANTITATIVE APTITUDE & DATA INTERPRETATION

UNIT – I :

Whole numbers, Integers, Rational and irrational numbers, Fractions, Square roots and Cube roots, Surds and Indices, Problems on Numbers, Divisibility
Steps of Long Division Method for Finding Square Roots:

UNIT – II :

Basic concepts, Different formulae of Percentage, Profit and Loss, Discount, Simple interest, Ratio and Proportion, Mixture

UNIT – III :

Time and Work, Pipes and Cisterns, Basic concepts of Time, Distance and Speed; relationship among them

UNIT – IV :

Concept of Angles, Different Polygons like triangles, rectangle, square, right angled triangle, Pythagorean Theorem, Perimeter and Area of Triangles, Rectangles, Circles

UNIT – V :

Raw and Grouped Data, Bar Graphs, Pie charts, Mean, Median and Mode, Events and Sample Space, Probability

II. LOGICAL REASONING

UNIT – I :

Analogy basing on kinds of relationships, Simple Analogy; Pattern and Series of Numbers, Letters, Figures. Coding-Decoding of Numbers, Letters, Symbols (Figures), Blood relations

UNIT – II :

Logical Statements– Two premise argument, More than two premise argument using connectives

UNIT – III :

Venn Diagrams, Mirror Images, Problems on Cubes and Dices

SEMESTER-IV

C-4.1: NUMERICAL METHODS

Full Marks – 100 (70+30)
Mid Sem – 20/1 hr
End Sem Theory – 50/3 hrs

UNIT-I

Algorithms, convergence, errors, relative, absolute, round off, truncation, transcendental and polynomial equations, bisections method, Newton's method, Secant method, rate of convergence of these methods

UNIT-II

Systems of linear algebraic equations, Gaussian Elimination and Gauss Jordan methods, gauss Jacobi method, Gauss Seidel method and their convergence analysis

UNIT-III

Interpolation, Lagrange and Newton's method, error bounds, finite difference operator, Gregory forward and back ward difference interpolation

UNIT-IV

Numerical Integration, Trapezoidal rule, Simpsons rule, Simpsons 3/8 rule mid point rule, composite trapezoidal rule, composite Simpsons rule,

UNIT-IV

Ordinary differential equations, Euler's method, Runga kutta methods of order two and four.

PRACTICAL

End Sem Practical – 30/3 hrs

List of practical's (Using any software)
Practical/Lab work to be performed on a computer.
Record=7, attendance=3,vive-voce=5,Experiment=15.

1. Calculate the sum $1+\frac{1}{2}+\frac{1}{3}+---+\frac{1}{n}$.
2. To find the absolute value of an integer.
3. Enter 100 integers into an array and sort them in an ascending order.
4. Bisection method
5. Newton rapson method
6. Secant method
7. Regular method
8. LU decomposition method
9. Gauss Jacobi method

10. SOR Method or Gauss-Seidel method
11. Lagranges or Newton's interpolation
12. Simpsons method

Books Recommended :

1. Numerical methods for scientific and engineering computation by M.K.Jain, S.R.K.Iyengar and R.K.Jain, 6th Ed. New age International publisher, India, 2007.
2. Numerical Methods, Dutta and Jena.
3. A friendly Introduction to numerical analysis, Brain Bradie, Pearson Ed. India, 2007.
4. A course on Numerical Analysis, B.P. Acharya and R.N. Das, Kalyani Publishers.
5. Applied Numerical Analysis by C.F. Gerald and P.O. Wheatley, Pearson Ed., India, 2008.
6. A first course in Numerical Methods by Uri M. Ascher and Chen Greif, 7th Ed., PHI Learning Private Ltd., 2013.
7. Numerical methods using Matlab by John H. Mathews and Kurties D. Fink, 4th Ed. PHI Learning Private Ltd., 2012.

C-4.2: RIEMANN INTEGRATION AND SERIES OF FUNCTIONS (ANALYSIS-III)

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Riemann integration: Inequality of upper and lower sums, Riemann conditions of Integrability, Riemann sum and definition of Riemann integral through Riemann sums, equivalence of two definitions, Riemann integrability of monotone and continuous functions, properties of Riemann integral, definition and integrability of piecewise continuous and monotone functions, intermediate value theorem for integrals, Fundamental theorem of integral calculus

UNIT-II

Improper integral, convergence of Betta and Gamma function

UNIT-III

Point wise and uniform convergence of sequence of functions, theorem on continuity, derivability and integrability of the limit function of a sequence of functions, series of functions, theorems on the continuity and derivability of the sum functions of a series of functions

UNIT-IV

Cauchy criterions for uniform convergence and Weierstrass M. Test, Limit superior and limit inferior, power series, radius of convergence, Cauchy Hadamard theorem,

UNIT-V

Differentiation and integration of power series, Abels Theorem, Weierstrass Approximation theorem.

Books Recommended :

1. G. Das and S. Pattanayak, Fundamental of Mathematics Analysis, TMH Publishing Co., Chapter; 8,9,10
2. S.C. Malik and S. Aroro-Mathematical Analysis, New Age International Publications.
3. R.G. Bartle and D.R. Sheraporbert, Introduction to Real Analysis, 3rd Ed. John Wiley and Sons (Asia) Pvt. Ltd, Singapore, 2002.
4. K.A. Ross, Elementary Analysis, the theory of calculus, Springer, 2004
5. Charle G. Denlinger, Elements of real Analysis, Jones and Bartlett (Students Ed.), 2011
6. Shanti Narayan and M.D. Raisinghania, Elements of Real Analysis, S. Chand & Co. Pvt. Ltd.

C-4.3: RING THEORY AND LINEAR ALGEBRA (ALGEBRA-III)

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Definition and examples of rings, properties of rings, sub rings, integral domains and fields, characteristic of a ring

UNIT-II

Idel, idel generated by a subset of rings, factor rings, operation on ideals, prime and maximal idels

UNIT-III

Ring homeomorphisms, properties of ring homomorphisms, isomorphism theorem, I, II, III, field of quotients

UNIT-IV

Vector space, subspace, algebra of subspaces, quotient space, linear combination of vectors, linear span, linear independence, basis and dimension, dimension of subspace

UNIT-V

Linear transformation, null space, range, rank, and nullity of a linear transformation, matrix representation of a linear transformation, algebra of linear transformation, isomorphisms, isomorphism theorem, invertibility, and isomorphisms, change of co-ordinate matrix

Books Recommended :

1. Joseph A. Gallian, Contemporary Abstract Algebra (4th Edn.), Narosa Publishing House, New Delhi.
2. A course in abstract algebra by V.K. Khana and S.K. Bhamri, Vikash Pub. house, New Delhi.
3. Stephen H. Friedberg Amold J. Insel, Lawrence E.S. Pence, Liner Algebra, 4th Ed. Prentice Hall of India Pvt. Ltd, New Delhi, 2004 chapter 1(1.2-1.6) 2(2.1-2.5)
4. A Ist course in Abstract Algebra, by John B. Fraleigh, 7th Ed., Person, 2002.
5. Abstract Algebra, M. Artin, 2nd Ed. Pearson, 2011.
6. Introduction to linear algebra, S. Lang, 2nd Ed. Springer, 2005
7. Topics in Algebra, I.N. Herstain, Wiley Easten Limited, India, 1975.
8. Linear algebra and its application, by Gibert Strang. Cengage Learning India Pvt. Ltd.
9. Linear algebra by S. Kumar, A Geometric Approch, Prentice Hall of India, 1999.
10. Kenneth Ho man, Ray Alden Kunze, Linear Algebra, 2nd Ed. Prentice Hall of India, 1971.

GE-4.4: LINEAR ALGEBRA AND ADVANCED ALGEBRA

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Vector space, subspace, span of a set, linear independence and dependence, dimension and basis Linear transformation, range kernel, rank, and nullity, Inverse of a linear map, rank-nullity theorem

UNIT-II

Matrices and linear maps, rank and nullity of a matrix, transpose of a matrix, types of matrices, elementary row operations, System of linear equations, Matrix inversion using row operations, determinant and rank of matrices, Eigen values, Eigen vectors, quadratic forms

UNIT-III

Group theory : Definition and examples, subgroups, normal subgroups, cyclic groups, cosets, quotients groups, permutation groups, homomorphism

UNIT-IV

Ring theory : Definition and examples, some special classes of rings, ideals, quotients rings, ring homomorphism, isomorphism theorems

UNIT-V

Theory of equations : roots of an equation, relation between roots and coefficients, sum of power of roots, symmetric functions transformation of equations

Books Recommended :

1. An introduction to linear algebra by V. Krishna Murty, V.P. Mainra, J.L Arora, Affiliated –east-west press Pvt. Ltd. New Delhi, Chapter: 3, 4(4.1-4.7), 5(except 5.3), 6(6.1,6.2,6.5,6.6,6.8), 7(7.4)
2. Abstract Algebra, by I.H. Seth, Prentice Hall of India Pvt. Ltd, New Delhi, Chapter: 13, 14, 15, 16, 17, 18, 19, 20
3. A text book of Algebra –Rabindra Kumar and Sri Krishna Washna, Pitamber Publication
4. Joseph A. Gallian, Contemporary Abstract Algebra (4th Edn.), Narosa publishing House, New Delhi.
5. A course in abstract algebra by V.K. Khana and S.K. Bhamri, Vikash Pub. House New Delhi.
6. Abstract Algebra, M. Artin, 2nd Ed. Pearson, 2011.
7. Introduction to linear algebra, S. Lang, 2nd Ed. Springer, 2005
8. Topics in Algebra, I.N. Herstain, Wiley Easten Limited, India, 1975.
9. Linear algebra and its application, by Gibert Strang. Cengage Learning India Pvt Ltd.
10. Linear algebra by S. Kumar, A Geometric Approach, Prentice Hall of India, 1999.

SECC-4.5: QUANTITATIVE AND LOGICAL THINKING

(For Arts/Commerce Stream)

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

I. QUANTITATIVE APTITUDE & DATA INTERPRETATION

UNIT – I :

Whole numbers, Integers, Rational and irrational numbers, Fractions, Square roots and Cube roots, Surds and Indices, Problems on Numbers, Divisibility

Steps of Long Division Method for Finding Square Roots:

UNIT – II :

Basic concepts, Different formulae of Percentage, Profit and Loss, Discount, Simple interest, Ratio and Proportion, Mixture

UNIT – III :

Time and Work, Pipes and Cisterns, Basic concepts of Time, Distance and Speed; relationship among them

UNIT – IV :

Concept of Angles, Different Polygons like triangles, rectangle, square, right angled triangle, Pythagorean Theorem, Perimeter and Area of Triangles, Rectangles, Circles

UNIT – V :

Raw and Grouped Data, Bar Graphs, Pie charts, Mean, Median and Mode, Events and Sample Space, Probability

II. LOGICAL REASONING

UNIT – I :

Analogy basing on kinds of relationships, Simple Analogy; Pattern and Series of Numbers, Letters, Figures. Coding-Decoding of Numbers, Letters, Symbols (Figures), Blood relations

UNIT – II :

Logical Statements– Two premise argument, More than two premise argument using connectives

UNIT – III :

Venn Diagrams, Mirror Images, Problems on Cubes and Dices

SEMESTER-V

C-5.1: MULTIVARIATE CALCULUS (CALCULUS-II)

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Functions of several variables, limit and continuity of functions of two variables, partial differentiation, total differentiability, sufficient condition for differentiability, Chain rule for one and two independent parameters,

UNIT-II

Directional derivative, the gradient, maximal and normal property of the gradient, tangent planes, angle between planes

UNIT-III

Extreme of functions of two variables, method of Lagrange multipliers, constrained optimization problems, Definition of vector field, divergence and curl.

UNIT-IV

Double integration over rectangular region, double integration over non-rectangular region, double integrals in polar co-ordinates, Triple integral, triple integral over a parallelopiped and solid regions, Volume by triple integrals, cylindrical and spherical co-ordinate, change of variables in double integrals

UNIT-V

Line integrals, Applications of line integrals, Mass and work, Fundamental theorem for line integrals, conservative vector fields, independence of path, greens theorem, surface integrals, integrals over parametrically defined surfaces, Stokes theorem, The Divergence theorem.

Books Recommended :

1. Mathematical analysis by S.C. Malik and S.C. Arora.
2. Text book of calculus by Shanti Narayan, S. Chand & Co.
3. M.J. Strauss, G.L. Bradly and J. Smith, calculus, 3rd Ed. Dorling Kindersely (India) Pvt. Ltd. (Pearson Ed.), Delhi-2007.
4. G.B. Thomas and R.L. Finney, Calculus, 9th Ed. Pearson Ed. Delhi, 2005.
5. E. Marsden, A.J. Tromba and A. Weinstain, Basic Multivariable calculus, Springle (SIE), Indian reprint.
6. Santosh K. Sengar –Advanced Calculus, Cengage Learning India Pvt. Ltd.

C-5.2: PROBABILITY AND STATISTICS

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Sample space, probability axioms, real random variables (discrete and continuous), cumulative distribution function, probability mass/density functions

UNIT-II

Mathematical expectation, moments, moments generating function, characteristics function, joint cumulative distribution function and its properties, joint probability density functions, marginal and conditional distributions

UNIT-III

Discrete distributions, uniform, binomial, Poisson, geometric, negative binomial, continuous distributions uniform, normal, exponential

UNIT-IV

Expectation of function of two random variables, conditional expectations, independent random variables, bivarite normal distribution, correlation coefficient, joint moment generating function and calculation of covariance, linear regression for two variables

UNIT-V

Chebyshev's inequality, statements and interpretation of (weak) law of large numbers and strongly law of large numbers, central limit theorem for independent and identically distributed random variables with finite variance, Markov chains, Cheapman-Kolmogorov equations, classification of states

Books Recommended :

1. Introduction to Mathematical Statistics, by Robert V. Hogg, Joseph, W. McKean and Allen T. Craig, Pearson Ed. Asia, 2007, chapter: 1(1.1, 1.3, 1.5-1.9), 2(2.1, 2.3-2.5).
2. Irwin Miller and Marylees, John E. Freund, Mathematical statistics with Applications, 7th Ed. Pearson Ed. Asia, 2006, chapter 4, 5(5.1-5.5, 5.7), 6(6.2, 6.3, 6.5-6.7), 14(14.1, 14.2).
3. Sheldon Ross, Introduction to Probability Models, 9th Ed. Academic Press, Indian Reprint, 2007, Chapter 2(2.7), 4(4.1-4.3).
4. ALEXANDER M. Mood, Fraklin A.G. Raybill and Duance C. Boes, Introduction to the theory of Statistics, 3rd Ed. Tata McGraw-Hill, Reprint-2007.
5. S.C. Gupta and V.K. Kapoor-Fundamentals of Mathematical statistics, S. Chand and Company Pvt. Ltd. New Delhi.
6. S. Ross – A First Course in probability, Pearson Ed.

DSE-5.3: C++

Full Marks – 100 (70+30)
Mid Sem – 20/1 hr
End Sem Theory – 50/3 hrs

UNIT-I

Introduction to structured programming : data types, simple data types, floating data types, character data types, string data types, arithmetic operators and Operator precedence, variables and constant, declarations, expressions, input using the extraction operator >> and cin, output using the insertion operator << and count, pre-processor directives, increments (++) and decrement ({) operations, creating C++ program, input/output

UNIT-II

Relational operators, logical operators and logical expression, if and if–else statement, switch and break statements

UNIT-III

for, while and do-while loops and continue statement, nested control statement

UNIT-IV

value returning functions, value versus reference parameters, local and global variables

UNIT-V

one dimensional array, two-dimensional array, pointer data and pointer variables

Books Recommended :

1. D.S. Malik: C++ programming Language, Ed. 2009, Course technology, Cengage Learning, India Ed. chapter 2(pages-37-95), 3(pages-96-129), 49 pages (134-178), 5(pages-181-236), 6, 7(pages-287-304), 9(pages-357-390), 14(pages-594-600)
2. E. Balaguruswami: Object oriented programming with C++, Fifth Ed. Tata McGraw Hill Ed. Pvt. Ltd.
3. R. Johnsonbaugh and M. Kalin –Application programming in ANSIC, Pearson Ed.
4. S.B. Lippman and J. Lajoic, C++Primer, 3rd. Ed, Addison Wesley, 2000.
5. Bjarne Stroustrup, The C++ programming Language, 3rd Ed., Addison Wesley.

PRACTICAL

End Sem Practical – 30/3 hrs

List of practical's(Using any software)

Practical /Lab work to be performed on a computer.

Record =3, attendance=2, vive-voce=5, Experiment=15.

1. Calculate the sum $1+\frac{1}{2}+\frac{1}{3}+---+\frac{1}{n}$
2. Write a user defined function to find the absolute value of an integer and use it to evaluate the function $\frac{(-1)^n}{n!}$ for n=-2,-1,1,2
3. Calculate the factorial of any natural number.
4. Read floating numbers and compute two averages: the average of negative numbers and the average of positive numbers.
5. Write a program that prompts the user to input a positive integer. It should then output a message indicating whether the number is a prime number.
6. Write a program that prompts the user to input the value of a, b and c involved in the equation ax^2++bx+c=0 and out put the type of the roots of the equation, also the program should output all the roots of the equation.
7. Write a program that generate random integer between 0 and 99, given that first two Fibonacci numbers are 0 and 1, generate all Fibonacci numbers less than or equal to generated number.
8. Write a program that does the following :
   (i) Prompts the user to input five decimal numbers
   (ii) Points the five decimal numbers.
   (iii) Converts each decimal number to the nearest integer.
   (iv) Adds these five integers
   (v) Prints the sum and average of them.
9. Write a program that uses while loops to perform the following steps
   (i) prompt the user to input two integers first Number and second number (first number should be less than the second number)
   (ii) output all odd and even numbers between first number and the second number.
   (iii) output the sum of all even numbers between first number and the second number.
   (iv) output the sum of the square of all odd numbers first number and the second number.
   (v) output all uppercase letters corresponding to the numbers between first number and the second number.
10. Write a program that prompts the user to input five decimal numbers, the program should then add the five decimal numbers, convert the sum to the nearest integer, and print the result.
11. Write a program that prompts the user to inter the length of three sides of a triangle and then output a message indicating whether the triangle is a right triangle or scalene triangle.
12. Write a value returing function smaller to determine the smallest number from a set of numbers, use this function to determine the smallest number from set of 10 numbers.
13 Write a function that takes as a parameter an integer and returns the number of odd, even and zero digits, also write a program to test your function.

14. Enter 100 integers into an array and short them in an ascending /descending order and print the largest /smallest integers.
15. Enter 10 integers in to an array and then search for a particular integer in the array.
16. Multiplication /addition of two matrices using two dimensional array.

DSE-5.4: DISCRETE MATHEMATICS

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Logic, proportional equivalence, predicates and quantifiers, nested quantifiers, method of proof, relations and their properties, n-ary, relations and their applications

UNIT-II

Boolean functions and their representation, the basic counting, the pigeon–hole principle, generalised Permutation and combination

UNIT-III

Recurrence relation, counting using recurrence relations, solving linear homogeneous recurrence relations with constant coefficient, generating functions, solving recurrence relations using generating functions

UNIT-IV

Partially ordered sets, Hass diagram of partially ordered sets, maps between ordered sets, duality principle, Lattices as ordered sets, Lattices as algebraic structures, sub lattices, Boolean algebra and its properties

UNIT-V

Graphs: Basic concepts and graph terminology, representing graphs and graph isomorphism, Distance in a graph, cut-vertices and cut-edges, connectivity, Euler and Hamiltonian path

Books Recommended :

1. Kenneth H. Rosen, Discrete Mathematics and Applications, Tata McGraw Hill Publications, chapter 1(1.11-1.5),4(4.1,4.2,4.5),6(6.1,6.2,6.5,6.6),7(7.1,7.2) 8,10(10.1,10.2)
2. B.A. Davey and H.A. Priestley, Introduction to Lattices and order, Cambridge University Press, Cambridge, 1990.
3. Edgar G. Goodaire and Michael M. Parmeter, Discrete Mathematics with Graph theory, 2nd Ed., Pearson Ed. (Singapore) Pvt. Ltd, Indian Reprint 2003.
4. Rudolf Lidl and G Nter Pilz, Applied Abstract Algebra, 2nd Ed., Undergraduate texts in Mathematics, Springer, Indian reprint-2004.
5. D.S. Malik- Discrete Mathematics, theory and application, Cengage Learning India Pvt. Ltd.
6. Kevin Ferland- Discrete Mathematical Structures, Cengage Learning India Pvt. Ltd.

SEMESTER-VI

C-6.1: METRIC SPACES AND COMPLEX ANALYSIS

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Metric space : definition and examples, sequences in metric spaces, Cauchy sequences, complete metric spaces, open and closed balls, neighbourhood, open sets, interior of a set, limit point of a set, closed set, diameter of a set, Cantors theorem, subspace, dense sets, separable spaces

UNIT-II

Continuous mapping, sequential criterion and other characterization of continuity, Uniform continuity, homeomorphism, contraction mapping, Banach Fixed point theorem, connectedness, connected subsets of R

UNIT-III

Properties of complex number, regions in the complex plane, functions of complex variable, mappings, derivatives, differentiation formulae, Cauchy-Riemann equations, sufficient conditions for differentiability

UNIT-IV

Analytic functions, example of analytic function, exponential functions, Logarithmic functions, trigonometric functions, derivative of function definite integrals of functions, contours, contour integrals and its examples, upper bounds for moduli of contour integral integrals, Cauchy-Goursat theorem, Cauchy integral formula

UNIT-V

Liouvile's theorem and the fundamental theorem of algebra, convergence of sequences and series, Taylor series and its example, Laurent series and its example, absolute and uniform convergence of power series

Books Recommended :

1. P.K. Jain and K. Ahmad, metric space, Narosa publishing house, New Delhi, Chapter -2(1-9), 3(1-4), 4(1-4), 6(1-2), 7(1 only).
2. James Ward Brown and Ruael V. Churchill, complex variable s and applications, 8th Ed. McGraw Hill international Ed. 2009 chapter 1(11 only), 2(12, 13), 2(15-22, 24, 25), 3(29, 30, 34), 4(37-41, 43-46, 50-53), 5(55-60, 62, 63, 66)
3. Satish Shirali and Harikishan L. Vasudevaa, Metric spaces, Springer Verlag, London -2006.
4. SS. Kumaesen topology of metric spaces, 2nd Ed., Narosa publishing House, 2011
5. S. Ponnusamy –Foundations of complex analysis, Alpha Science International Ltd. J.B. Convey – functions of complex variable, Springle.
6. N. Das–complex function theory, Allied Publishers Pvt. Ltd., Mumbai.

C-6.2: LINEAR PROGRAMMING

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Introduction to linear programming problem, theory of simplex method, optimality and unboundedness, the simplex algorithm, simplex method in tableau format

UNIT-II

Introduction to artificial variables, two phase method, big M method and their comparison, Duality, formulation of the dual problem, primal-dual relationships, economic interpretation of the dual

UNIT-III

Transportation problem and its mathematical formulation, north west corner method, least cost method and vogel approximation method for determination of starting basic solution, algorithm for solving transportation problem

UNIT-IV

assignment problem and its mathematical formulation, Hungarian method for solving assignment problem

UNIT-V

Game theory, formulation of two person zero sum games, solving two person zero sum game, games with mixed strategies, graphical solution procedure, linear programming solution of games

Books Recommended :

1. Mokhtar S. Bazaara, John J. Jarvis and Hanif D. Sherali, linear programming and network flows, 2nd Ed. John Wiley and Sons, India, 2004, Chapter- 3(3.2-3.3,3.5-3.8), 4(4.1-4.4), 6(6.1-6.3)
2. F.S. Hillier and G.J. Lieberman, Introduction to operation research, 9th Ed., Tata McGraw Hill, Singapore 2009 chapter -14.
3. Hamdy A. Taha, Operation research, An Introduction, 8th Ed. Prentice Hall India, 2006, Chapter 5(5.1,5.3,5.4)
4. G. Hadley, Operation Research, Narosa publishing house, New Delhi, 2002.
5. Kanti Swarup, P.K. Gupta and Man Mohan - Operation research, S. Chand and Co. Pvt. Ltd.
6. N.V.R Naidu, G. Rajenddra and T. Krishna Rao - Operation Research, I.K. International Publishing house Pvt. Ltd, New Delhi, Bangalore.
7. P.K. Gupta and D.S. Hira - Operation research, S. Chand and Co. Pvt. Ltd.

DSE-6.3: DIFFERENTIAL GEOMETRY

Full Marks – 100
Mid Sem – 20/1 hr
End Sem – 80/3 hrs

UNIT-I

Theory of space curves, space curves, planer curves, curvature, torsion and serret-Frenet formule, osculating circles, Existence of space curves, Evolutes and involutes

UNIT-II

Osculating circle and spheres, Existence of space curves, Evolutes and involutes

UNIT-III

Developable: developable associated with space curves and curves on surfaces, minimal surfaces

UNIT-IV

Theory of Surfaces: parametric curves on surface, direction coefficient, first and second fundamental forms, principal and Gaussian curvatures,

UNIT-IV

Lines of curvature, Euler's theorem, Rodrigue's formula, conjugate and asymptotic lines

Books Recommended :

1. C.E. Weatherbun, Differential geometry of three dimension, Cambridge University Press-2003, chapter 1(1-4,7,8,10), 2(13,14,16,17), 3, 4(29-31,35,37,38)
2. A text book of vector calculus, Shanti Narayana and J.N. Kapoor
3. T.J. Willmore, An introduction to differential geometry, Dover publication.
4. S. Lang, Fundamental of differential geometry, Springer, 1999.
5. B.O'Neill Elementary differential geometry 2nd Academic Press, 2006.
6. A.N. Pressley –Elementary differential geometry, Springer.
7. B.P. Acharya and R.N. Das, fundamentals of differential geometry, Kalyani publisher, Ludhiana, New Delhi.

DSE-6.4: PROJECT WORK

Full Marks – 100
End Sem Project – 100

Project=75, Viva-Voce =25

Topics to be announced by the HOD.

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