A.S.D. Govt. Degree College for Women (Autonomous), Kakinada
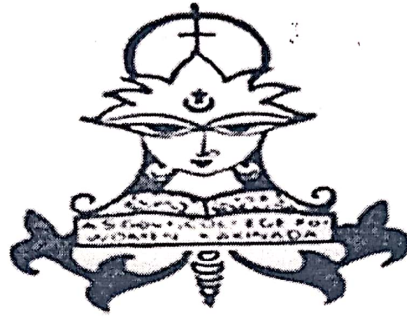
(Accredited by NAAC with "B" in Cycle 3)

(Affiliated to Adikavi Nannayya University)

DEPARTMENT of MATHEMATICS

BOARD of STUDIES

2020-21

REVISED SYLLABUS OF B.A. /B.Sc. MATHEMATICS UNDER CBCS

FRAMEWORK WITH EFFECT FROM 2020-2021

Course Title : DIFFERENTIAL EQUATIONS **Course Code:** 20MAT101
Total No. of Hrs.: 75hrs. Lecture: 6hrs. Credits: 5

Course Outcomes:

After successful completion of this course, the student will be able

1. Solve linear differential equations
2. Convert non-exact homogeneous equations to exact differential equations by using integrating factors.
3. Know the methods of finding solutions of differential equations of the first order but not of the first degree.
4. Solve higher-order linear differential equations, both homogeneous and non-homogeneous, with constant coefficients.
5. Understand the concept and apply appropriate methods for solving differential equations.

Course Syllabus:

UNIT – I (12 Hours)
Differential Equations of first order and first degree:

Linear Differential Equations; Differential equations reducible to linear form; Exact differential equations; Integrating factors; Change of variables.

UNIT – II (12 Hours)

I) Orthogonal Trajectories

II) Differential Equations of first order but not of the first degree:

Equations solvable for p; Equations solvable for y; Equations solvable for x; Equations that do not contain x (or y); Equations homogeneous in x and y; Equations of the first degree in x and y – Clairaut's Equation.

UNIT – III (12 Hours)

Higher order linear differential equations-I:

Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. General Solution of $f(D)y=0$.

General Solution of $f(D)y=Q$ when Q is a function of x,

i) P.I. of $f(D)y = Q(x)$ where $Q(x) = be^{ax}$ ii) P.I. of $f(D)y = Q(x)$ where $Q(x)$ is *bsinax or bcosax*

UNIT – IV (12 Hours)

Higher order linear differential equations-II:

Solution of the non-homogeneous linear differential equations with constant coefficients.

P.I. of $f(D)y = Q$ when $Q = bx^k$

P.I. of $f(D)y = Q$ when $Q = e^{ax}v(x)$

P.I. of $f(D)y = Q$ when $Q = xv(x)$

P.I. of $f(D)y = Q$ when $Q = x^m v(x)$

UNIT –V (12 Hours)

Higher order linear differential equations-III :

Method of variation of parameters; Linear differential Equations with non-constant coefficients; The Cauchy-Euler Equation, Legendre's linear equations, miscellaneous differential equations.

Co-Curricular Activities (15 Hours)

Seminar/ Quiz/ Assignments/ Applications of Differential Equations to Real life Problem /Problem Solving.

Text Books :

Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Pvt. Ltd, New Delhi-Second edition.

Reference Books :

1. A text book of Mathematics for B.A/B.Sc, Vol 1, by N. Krishna Murthy & others, published by S.Chand & Company, New Delhi.

2. Ordinary and Partial Differential Equations by Dr. M.D,Raisinghania, published by S. Chand & Company, New Delhi.

3. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha- Universities Press.

4. Differential Equations -Srinivas Vangala & Madhu Rajesh, published by Spectrum University Press.

V.Ananta Lakshmi   M. Madhavi   Y Bhanu   R. Suji
N. Vinay   P. Padma   Y. Kusuma   P. Tanuja

Course Title : Three Dimensional Analytical Solid Geometry   Course Code: 20 MAT2301

Total No. of Hrs.: 75hrs.   Lecture: 6hrs. Credits: 5

Course Outcomes:
After successful completion of this course, the student will be able to;
1. Understand the concept of planes.
2. Analyze the right lines, sphere and cones.
3. Understand the properties of planes, lines, spheres and cones.
4. Express the problems geometrically and then to get the solution.

Course Syllabus

UNIT – I (12 Hours)
The Plane :
Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

UNIT – II (12 hrs)
The Line :
Equation of a line; Angle between a line and a plane; The condition that a given line may lie in a given plane; The condition that two given lines are coplanar; Number of arbitrary constants in the equations of straight line; Sets of conditions which determine a line; The shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines; Length of the perpendicular from a given point to a given line.

UNIT – III (12 hrs)
The Sphere :
Definition and equation of the sphere; Equation of the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; Sphere through a given circle; Intersection of a sphere and a line; Power of a point; Tangent plane; Plane of contact; Polar plane; Pole of a Plane; Conjugate points; Conjugate planes;

UNIT – IV (12 hrs)
The Sphere and Cones :
Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres; Simplified from of the equation of two spheres.
Definitions of a cone; vertex; guiding curve; generators; Equation of the cone with a given vertex and guiding curve; equations of cones with vertex at origin are homogenous; Condition that the general equation of the second degree should represent a cone;

UNIT – V (12 hrs)
Cones :
Enveloping cone of a sphere; right circular cone: equation of the right circular cone with a given vertex, axis and semi vertical angle: Condition that a cone may have three mutually perpendicular generators; intersection of a line and a quadric cone; Tangent lines and tangent plane at a point; Condition that a plane may touch a cone; Reciprocal cones; Intersection of two cones with a common vertex.

Co-Curricular Activities(15 Hours)

Seminar/ Quiz/ Assignments/Three dimensional analytical Solid geometry and its applications/ Problem Solving.

Text Book :

Analytical Solid Geometry by Shanti Narayan and P.K. Mittal, published by S. Chand & Company Ltd. 7th Edition.

Reference Books :

1. A text book of Mathematics for BA/B.Sc Vol 1, by V Krishna Murthy & Others, published by S. Chand & Company, New Delhi.

2. A text Book of Analytical Geometry of Three Dimensions, by P.K. Jain and Khaleel Ahmed, published by Wiley Eastern Ltd., 1999.

3. Co-ordinate Geometry of two and three dimensions by P. Balasubrahmanyam, K.Y. Subrahmanyam, G.R. Venkataraman published by Tata-MC Gran-Hill Publishers Company Ltd., New Delhi.

4. Solid Geometry by B.Rama Bhupal Reddy, published by Spectrum University Press.

V.Ananta lakshmi M. Madhavi Y Baburao R. Siji

N. Vinay P. Padma Y. Kusuma P. Tanuja

Course Title :Abstract Algebra   Course Code: MAT3301

Total No. of Teaching Hrs.: 60hrs.   Lecture: 6hrs.   Credits: 5

UNIT – 1 (10hrs)GROUPS : -

Binary Operation; Algebraic structure; semi group; monoid; Group definition and elementary properties; Finite and Infinite groups with examples; order of a group. Composition tables with examples.

UNIT – 2 (14hrs)SUBGROUPS : -

Complex Definition; Multiplication of two complexes, Inverse of a complex-Subgroup definition with examples; criterion for a complex to be a subgroup.

Criterion for the product of two subgroups to be a subgroup; union and Intersection of subgroups.

Co-sets and Lagrange's Theorem :-

Co-sets Definition; properties of Cosets;Index of a subgroups of a finite groups:Lagrange's Theorem.

UNIT –3 (12hrs) NORMAL SUBGROUPS : -

Definition of normal subgroup; proper and improper normal subgroup; Hamilton group; criterion for a subgroup to be a normal subgroup; intersection of two normal subgroups; Sub group of index 2 is a normal sub group; simple group; quotient group; criteria for the existence of a quotient group.

UNIT – 4 (10hrs) HOMOMORPHISM : -

Definition of homomorphism; Image of homomorphism;elementary properties of homomorphism; definition of Isomorphism ,automorphism and their elementary properties; kernel of a homomorphism; fundamental theorem on Homomorphism and applications.

UNIT – 5 (14hrs) PERMUTATIONS AND CYCLIC GROUPS : -

Definition of permutation; permutation multiplication ; Inverse of a permutation ;cyclic permutations ; transposition; even and odd permutations ;Cayley's theorem.

Cyclic Groups :-

Definition of cyclic group and its elementary properties; classification of cyclic groups.

Reference Books :

1. Abstract Algebra, by J.B. Fraleigh, Published by Narosa Publishing house.
2. A text book of Mathematics for B.A. / B.Sc. by B.V.S.S. SARMA and others, Published by S.Chand& Company, New Delhi.
3. Modern Algebra by M.L. Khanna.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on Group theory and its applications in Graphics and Medical image Analysis.

Course Title : Real Analysis **Course Code: MAT4301**

Total No. of Teaching Hrs.: 60hrs. **Lecture: 6hrs.** **Credits: 5**

UNIT – I (12hrs) REAL NUMBERS :

The algebraic and order properties of R, Absolute value and Real line, Completeness property of R, Applications of supreme property; intervals. (**No Question is to be set from this portion**).

Real Sequences: Sequences and their limits, Range and Boundedness of Sequences, Limit of a sequence and Convergent sequence.

The Cauchy's criterion, properly divergent sequences, Monotone sequences, Necessary and Sufficient condition for Convergence of Monotone Sequence, Limit Point of Sequence, Subsequences and the Bolzano-weierstrasstheorem,Cauchy Sequences, Cauchy's general principle of convergence theorem.

UNIT –II (12hrs) INFINITIE SERIES :

*Series :*Introduction to series, convergence of series, Cauchy's general principle of convergence of series, tests for convergence of Series of Non-Negative Terms:

i)P-test

ii)Cauchy's n^{th} root test or Root Test.

iii) D'-Alemberts' Test or Ratio Test.

Alternating Series:

Leibnitz Test.

Absolute convergence, conditional convergence and semi convergence.

UNIT – III (12hrs)CONTINUITY :

Limits : Real valued Functions, Boundedness of a function, Limits of functions, Some extensions of the limit concept, Infinite Limits, Limits at infinity. (No Question is to be set from this portion.)

Continuous functions: Continuous functions, Combinations of continuous functions, Continuous functions on intervals, uniform continuity.

UNIT – IV (12hrs) DIFFERENTIATION AND MEAN VALUE THEORMS :

The derivability of a function at a point and on an interval, relation between derivability and continuity of a function, Graphical meaning of the Derivative, Mean value Theorems; Role's Theorem, Lagrange's Theorem and Cauchy's Mean value Theorem

UNIT – V (12hrs) RIEMANN INTEGRATION :

Riemann Integral, Riemann integral functions, Darboux theorem, Necessary and sufficient condition for Riemann integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral as the limit of a sum, Mean value Theorems.

Reference Books :
1. Real Analysis by Rabert&Bartely and .D.R. Sherbart, Published by John Wiley.
2. A Text Book of B.Sc Mathematics by B.V.S.S. Sarma and others, Published by S. Chand & Company Pvt. Ltd., New Delhi.
3. Elements of Real Analysis as per UGC Syllabus by Shanthi Narayan and Dr. M.D. Raisingkania Published by S. Chand & Company Pvt. Ltd., New Delhi.

Suggested Activities:
Seminar/ Quiz/ Assignments/ Project on Real Analysis and its applications.

Foundation Course - 8

ANALYTICAL SKILLS

Syllabus, Forall Degree Programmes.

w.e.f. 2015-16 (Revised in April, 2016)

Semester – IV   (Total 30 Hrs)

UNIT – 1

Data Analysis:-The data given in a Table, Graph, Bar Diagram, Pie Chart, Venn diagram or a passage is to be analyzed and the questions pertaining to the data are to be answered.

UNIT – 2

Sequence and Series:- Analogies of numbers and alphabets completion of blank spaces following the pattern in A:b::C: d relationship odd thing out; Missing number in a sequence or a series.

UNIT - 3

Arithmetic ability:-Algebraic operations BODMAS, Fractions, Divisibility rules, LCM&GCD (HCF).

Date, Time and Arrangement Problems: Calendar Problems, Clock Problems, Blood Relationship.

UNIT - 4

Quantitative aptitude:- Averages, Ration and proportion, Problems on ages, Time-distance – speed.

UNIT – 5

Business computations:- Percentages, Profit &loss, Partnership, simple compound interest.

Reference Books:

1. Quantitative Aptitude for Competitive Examination by R S Agrawal, S.Chand publications.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude : Numerical Ability (Fully Solved) Objective Questions, Kiran Prakashan, Pratogitaprakasan, Kic X, Kiran Prakasan publishers
4. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata Mc Graw hill publications.
5. Old question Paper of the exams conducted by (Wipro, TCS, Infosys, Etc) at their recruitment process, source-Internet.

Course Title : Ring Theory and Vector Calculus   **Course Code: MAT5301**

Total No. of Teaching Hrs.: 60hrs.   **Lecture: 5hrs.**   **Credits: 5**

UNIT – 1(12hrs) RINGS-I : -
Definition of Ring and basic properties, Boolean Rings, zero divisors and cancellation laws of Rings, Integral Domains, Division Ring and Fields, The characteristic of a ring :The characteristic of an Integral Domain, The characteristic of a Field. Sub Rings, Ideals.

UNIT – 2 (12hrs) RINGS-II : -
Definition of Homomorphism ;homomorphic Image ; Elementary Properties of Homomorphism ;Kernel of a Homomorphism ; Fundamental theorem of Homomorhphism .Maximal Ideals ,Prime Ideals.

UNIT –3 (12hrs) VECTOR DIFFERENTIATION : -
Vector Differentiation, Ordinary derivatives of vectors, Differentiability, Gradient, Divergence, Curl operators, Formulae Involving these operators.

UNIT – 4 (12hrs) VECTOR INTEGRATION : -
Line Integral, Surface Integral and Volume integral with examples.

UNIT – 5 (12hrs) VECTOR INTEGRATION APPLICATIONS : -
Theorems of Gauss , Stokes and Green's theorem in plane, applications of these theorems.

Reference Books :-
1. Abstract Algebra by J. Fralieh, Published by Narosa Publishing house.
2. Vector Calculus by SanthiNarayana, Published by S. Chand & Company Pvt. Ltd., New Delhi.
3. A text Book of B.Sc., Mathematics by B.V.S.S.Sarma and others, published by S. Chand & Company Pvt. Ltd., New Delhi.
4. Vector Calculus by R. Gupta, Published by Laxmi Publications.
5. Vector Calculus by P.C. Matthews, Published by Springer Verlagpublicattions.
6. Rings and Linear Algebra by Pundir&Pundir, Published by PragathiPrakashan.

Suggested Activities:
Seminar/ Quiz/ Assignments/ Project on Ring theory and its applications.

Course Title :Linear Algebra   **Course Code: MAT5302**

Total No. of Teaching Hrs.: 60hrs.   **Lecture: 5hrs.**   **Credits: 5**

UNIT – I (12hrs) Vector Spaces-I :

Vector Spaces, General properties of vector spaces, n-dimensional Vectors, addition and scalar multiplication of Vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of Vectors, Linear span, Linear independence and Linear dependence of Vectors.

UNIT –II (12hrs) Vector Spaces-II :

Basis of Vector space, Finite dimensional Vector spaces, basis extension, co-ordinates, Dimension of a Vector space, Dimension of a subspace, Quotient space and Dimension of Quotientspace.

UNIT –III (12hrs)Linear Transformations :

Linear transformations, linear operators, Properties of L.T, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations;Rank – Nullity Theorem.

UNIT –IV (12hrs)Matrix :

Matrices, Elementary Properties of Matrices, Inverse of a Matrix, Rank of a Matrix Characteristic roots and Vectors of a square Matrix, Cayley – Hamilton Theorem, Linear system of equations

UNIT –V (12hrs) Inner product space :

Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz's inequality, Triangular Inequality, Parallelogram law, Orthogonal vectors , Orthonormal set, complete orthonormal set, Gram – Schmidt orthogonalisation process. Bessel's inequality and Parseval's Identity.

Reference Books :

1. Linear Algebra by J.N. Sharma and A.R. Vasista, published by Krishna PrakashanMandir, Meerut-250002.
2. Matrices by Shanti Narayana, published by S.Chand Publications.
3. Linear Algebra by Kenneth Hoffman and Ray Kunze, published by Pearson Education (low priced edition), New Delhi.
4. Linear Algebra by Stephen H. Friedberg et al published by Prentice Hall of India Pvt. Ltd. 4th Edition 2007.

Suggested Activities:

Seminar/ Quiz/ Assignments/ Project on "Applications of Linear algebra Through Computer Sciences"

Course Title : Numerical Analysis   **Course Code:** MAT6301

Total No. of Teaching Hrs.: 60hrs.   **Lecture:** 5hrs.   **Credits:** 5

UNIT- I(10hrs) Errors in Numerical computations :

Errors and their Accuracy, Mathematical Preliminaries, Errors and their Analysis, Absolute, Relative and Percentage Errors, A general error formula, Error in a series approximation.

UNIT – II(12hrs) Solution of Algebraic and Transcendental Equations:

The bisection method, The method of false position, The iteration method ,Newton- Raphson method, Generalized Newton-Raphson method. Muller's Method.

UNIT – III(12hrs) Interpolation - I

Interpolation : Errors in polynomial interpolation, Finite Differences, Forward differences, Backward differences, Central Differences, Symbolic relations, Detection of errors by use of Differences Tables, Differences of a polynomial.

UNIT – IV(12hrs) Interpolation - II

Newton's formulae for interpolation. Central Difference Interpolation Formulae, Gauss's central difference formulae, Stirling's central difference formula, Bessel's Formula, Everett's Formula.

UNIT – V :(14hrs) Interpolation - III

Interpolation with unevenly spaced points, Lagrange's formula, Error in Lagrange's formula, Divided differences and their properties, Relation between divided differences and forward differences, Relation between divided differences and backward differences Relation between divided differences and central differences, Newton's general interpolation Formula, Inverse interpolation by Lagrange's interpolation formula.

Reference Books :
1. Numerical Analysis by S.S.Sastry, published by Prentice Hall of India Pvt. Ltd., New Delhi. (Latest Edition)
2. Numerical Analysis by G. SankarRao published by New Age International Publishers, New – Hyderabad.
3. Finite Differences and Numerical Analysis by H.C Saxena published by S. Chand and Company,Pvt.Ltd., New Delhi.
4. Numerical methods for scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K. Jain.

B.Sc. THIRD YEAR MATHEMATICS SEMESTER –VI SYLLABUS

Course Title : Advanced Numerical Analysis   **Course Code:** 18301

Total No. of Teaching Hrs.: 60hrs.   **Lecture:** 5hrs.   **Credits:** 5

Unit – I (10 Hours)
Curve Fitting: Least – Squares curve fitting procedures, fitting a straight line, nonlinear curvefitting, Curve fitting by a sum of exponentials.

UNIT- II : (12 hours)
Numerical Differentiation: Derivatives using Newton's forward difference formula, Newton'sbackward difference formula, Derivatives using central difference formula, Stirling's interpolationformula, Newton's divided difference formula, Maximum and minimum values of a tabulatedfunction.

UNIT- III : (12 hours)
Numerical Integration: General quadrature formula on errors, Trapizoidal rule, Simpson's 1/3 rule, Simpson's 3/8 rule, and Weddle's rules, Euler – Maclaurin's Formula of summation and quadrature, The Euler transformation.

UNIT – IV: (14 hours)
Solutions of simultaneous Linear Systems of Equations: Solution of linear systems by Direct methods: Matrix inversion method, Gaussian elimination methods, Gauss-Jordan Method ,Method of factorization, Solution of Tri diagonal Systems.
Iterative methods: Jacobi's method, Gauss-siedel method.

UNIT – V (12 Hours)
Numerical solution of ordinary differential equations: Introduction, Solution by Taylor's Series, Picard's method of successive approximations, Euler's method, Modified Euler's method,Runge – Kutta methods.

Reference Books :
1. Numerical Analysis by S.S.Sastry, published by Prentice Hall India (Latest Edition).
2. Numerical Analysis by G. SankarRao, published by New Age International Publishers, NewHyderabad.
3. Finite Differences and Numerical Analysis by H.C Saxena published by S. Chand and Company, Pvt.Ltd., New Delhi.
4. Numerical methods for scientific and engineering computation by M.K.Jain, S.R.K.Iyengar, R.K. Jain.

B.Sc. FIRST YEAR MATHEMATICS SEMESTER –VI SYLLABUS

Course Title : Special Functions   **Course Code:** 18302

Total No. of Teaching Hrs.: 60hrs.   **Lecture:** 6hrs.   **Credits:** 5

Unit – I :(HERMITE POLYNOMIAL)

Hermite Differential Equations, Solutions of Hermitic Equation, Hermite's polynomials, Generating function, Other forms of Hermite Polynomial, first few Hermite Polynomials, Orthogonal properties of Hermite Polynomials, Recurrence formulae for Hermite Polynomials.CHAPTER: 6.1 to 6.8

Unit – II :(LAGUERRE POLYNOMIALS-I):

Laguerre's differential equation, Solution of Laguerre's equation, Laguerre polynomials, Generating function, other forms for Laguerre Polynomials, first few Laguerre Polynomials, Orthogonal property of the Laguerre Polynomials, Recurrence formula for Laguerre Polynomials, Associated Laguerre Equation.CHAPTER: 7.1 to 7.9

Unit – III:(LEGENDER'S EQUATION)

Definition, Solution of Legender's Equation, Definition of $P_n(x), Q_n(x)$, General solution of Legender's Equation (derivations not required),Generating function, Orthogonal properties of Legender's Equation, Recurrence formulae, Rodrigues formula. CHAPTER: 2.1 to,2.8,2.12,

Unit – IV:(BESSEL'S EQUATION):

Definition, Solution of Bessel's General Differential Equations, General solution of Bessel's Equation, Integration of Bessel's equation in series for n=0, Definition of $J_n(x)$, Recurrence formulae for $J_n(x)$, Generating function for $J_n(x)$. CHAPTER: 5.1 to 5.7

Unit – V:(BETA &GAMMA FUNCTIONS):

Euler's Integrals-Beta and Gamma Functions, Elementary properties of Gamma Functions, Transformation of Gamma Functions, Another form of Beta Function, Relation between Beta and Gamma Functions, Other Transformation.CHAPTER: 2.9to 2.15

Prescribed text book:

Special Functions by J.N.Sharma and Dr.R.K.Gupta.

Course Title :Project **Course Code:** 18303

Total No. of Teaching Hrs.: 60hrs. **Lecture:** 5hrs. **Credits:** 5

Some of the Suggested Topics for Projects Work

1. Applications of Differential Equations in
a) Physics b)Chemistry c)Mechanics d) Bio-Life Sciences
2. Applications of Graph Theory a) Chemistry b) Physics
3. Numerical solution of ordinary differential equations using 'C' langage.
a)Euler Methods b) R-K Methods
4. Applications of Graph Theory
5. Applications of Numerical Integration using 'C' language.
6. Applications of Laplace transformations in a) Mechanics b)Electricity
7. Applications of Linear algebra in Electronics.
8. Applications of Linear transformation in Graphics
9. Applications of Interpolation and extrapolation
10. Applications of "C" language for Riemann integration problems.
11. Applications of Matrix theory to Chemistry
12. Mathematical modeling for Aqua Culture using differential equations.
13. Project on finding Mathematics in Carpentry, Pottery, String Art.
14. Mathematics -Nature
15. Mathematics -Fine arts

Note: The above areas of project are only suggested, the topics can be chosen according to the convenience& creativity of the Concerned Staff and students.