Sant Gadge Baba Amravati University, Amravati

Faculty: Science and Technology

Programme: B.Sc. (Mathematics)

POs:

At the end of the programme, graduates would be able to

1. Enhance the knowledge of student in all basic sciences.
2. Identify ,formulate and develop solutions to computational challenges.
3. Develop scientific temper and think in a critical manner.
4. Build up progressive and successful career in academics, industry and society.
5. Develop students abilities and aptitudes to apply the mathematical ideas.

PSOs :
Upon completion of the programme successfully, students would be able to
1. Understand major concepts in all disciplines of Mathematics
2. Formulate and develop Mathematical arguments in a logical manner
3. Gain good knowledge and understanding in advanced Mathematics
4. Create an awareness of the impact of Mathematics on the environment, society and development outside the scientific community.
5. Create sensitivity towards environmental concerns and contribute in the development of nation

Employability Potential of the Programme:

Career options for B.Sc. Mathematics students is not just limited to solving complex equation. Apart from the traditional career route of academics and research, there are many career options offer for B.Sc. Mathematics students that can pick up banking, corporate, accounting and even teaching as their career option on completion of B.Sc. Mathematics, even a career in medicine and law is possible for Mathematics Honors student. Also, a degree with Mathematics is even financially supporting for students because they help in landing placement opportunities by giving an edge over students with   B.Sc. physics or other major.

After completing B.Sc. Mathematics, a student can either decide to go for higher studies or apply for jobs. In the case of B.Sc. Mathematics Honors, both the options are very promising. After the B.Sc. Mathematics course, students can purse M.Sc. Mathematics and follow it up with an M. Phil or Ph.D. Students can become a mathematician doing research and also become a assistant professor. Also students can pursue a B. Ed. and become a school teacher. Moreover, student can work in related field which required mathematical skills (Machine learning, Data Science etc.). Thus, there exist innumerable B.Sc. Mathematics career options.

The best way to get a prestigious government job is through competitive exams. Exams like UPSC, Railways, and Commission etc. are some important competitive exams that one need to consider as portals for B.Sc. Mathematics career options.

Syllabus Prescribed for the year 2022-23, UG Programme

Programme : B.Sc.-I (Mathematics)

Semester- I

Code of the Course/Subject   **Title of the Course/Subject**   **(Total Number of Periods/week)**
DSC-I / Mathematics   Algebra and Trigonometry   **9+1**

Cos: After completing this course, students would be able to

1. find inverse and normal form of matrices .

2. evaluate the characteristic equation, eigen value and corresponding eigen vector of a given matrix

3. evaluate relation between the roots and coefficients of equations .

4. to study application of De Moivre's theorem .

5. compute summation of trigonometric series.

Unit	Content
Unit I	Various types of matrices, Square matrix, triangular matrix, Hermitian and skew-Hermitian matrix**,** orthogonal matrices, singular and non- singular matrices, adjoint and inverse of matrix. Elementary transformation of a matrix, inverse of elementary transformation of a matrix , normal form of a matrix. **(12 period)**
Unit II	Rank of a matrix, row rank, column rank, eigen values, eigen vectors and the characteristic equation of a matrix, Cayley-Hamilton theorem, inverse by Cayley-Hamilton theorem. **(12 period)**
Unit III	Theory of equations: Descarte's rule of signs, relations between the roots and coefficients, transformation of equations, cubic equations. **(12 period)**
Unit IV	De Moivre's theorem, roots of complex number, circular functions, hyperbolic function, inverse hyperbolic function, relation between circular functions and hyperbolic functions, separation of real and imaginary parts of circular and hyperbolic functions of complex variable. **(12 period)**
Unit V	Summation of trigonometric series**,** Gregory series, Euler's series, Machin's series, Rutherford's series, series based on $\sin x$, $\cos x$, $\sinh x$, $\cosh x$ and exponential series. **(13 period)**
***SEM**	
COs: 1.To enhance interest among the students about course. 2. To develop the learning and writing skills. 3. To create mental ability.	
**Activities	1. Unit Test 2. Assignment/ open book test 3. Quiz/ Study Tour

Text books :

1] T. M. Karade, Maya S.Bendre, V. G. Mete, R. S. Wadbudhe, S. N. Bayaskar, P. P.Khade: Elements of Algebra and Trigonometry. Sonu-Nilu , Nagpur, 2022.

2] V. A. Sharma, V. R. Patil, S. R. Bhoyar, G. U. Khapekar, A. N. Rangari: A Text book of Algebra and Trigonometry, Dnyanpath Publication, Amravati, First Edition, 2022.

Reference Books:

1] K.B.Datta, Matrix and Linear Algebra, Prentice Hall of India Pvt.Ltd. New Delhi, 2000.
2] H.S.Hall and S.R.Knight, Higher Algebra, H.M.Publications, 1994.
3] S.L.Loney, Plane Trigonometry Part-II, MacMillan & Co., London.

4] Ayres Jr Frank : Matrices : Schaum's outline series, McGraw Hill   Book Company, Singapore, 1983.

5] Hohn Franz E : Elementary Matrix Algebra, Amerind Publishing Co., Pvt.Ltd. 1964.

6] Shanti Narayan : A Test Book of Matrices, S.Chand & Co. Delhi.

Programme: B.Sc.-I (Semester-I), Mathematics

Syllabus Prescribed for the Year 2022-23 , UG Programme

Programme : B.Sc.-I
Semester- I
Code of the Course/Subject   Title of the Course/Subject   (Total Number of Periods/week)
DSC-II / Mathematics   Differential and Integral Calculus   **9+1**

Cos: After completing this course, students would be able to

1.   define limit and study the basic properties .
2.   classify continuity and discontinuity of the functions.
3.   solve the differentiability and L'Hospital rule with their applications.
4.   describe the geometrical applications of mean value theorems.
5. evaluate the reduction formulae for integration.

Unit	Content
Unit I	Limit of a function, ε-δ definition, basic properties of limits, some standard limits. **(12 period**)
Unit II	Continuous and discontinuous functions, types of discontinuity, properties of continuous functions, uniform continuous functions, properties of uniform continuous functions. **(12 period)**
Unit III	Differentiability, successive differentiation, Leibnitz theorem, indeterminate forms and L' Hospital rule. **(12 period)**
Unit IV	Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Maclaurin's and Taylor's series expansions. **(12 period)**
Unit V	Integration of the form $\int \frac{P_n(x)}{\sqrt{Q}} dx$, reduction formulae for $\int \sin^n x\, dx$, $\int \cos^n x\, dx$, $\int \tan^n x\, dx$, $\int \cot^n x\, dx$, $\int \sec^n x\, dx$, $\int \cos ec^n x\, dx$, $\int \sin^n x . \cos^m x\, dx$ and Walli's formula. **(13 period)**

*SEM	
COs: 1.To enhance interest among the students about course. 2.To develop the learning and writing skills. 3.To create mental ability.	
**Activities	1. Unit Test 2. Assignment/ open book test 3. Quiz/ Study Tour

Text books :

1] T.M. Karade , Maya S. Bendre, V. P. Kadam, A.S.Nimkar,K.S.Wankhade,C.D.Wadale:
   Elements of Calculus (Differential and Integral), Sonu- Nilu, Nagpur, 2022.

2] V. A. Sharma, V. R. Patil, S. R. Bhoyar, G. U. Khapekar, A. N. Rangari: A Text book of   Differential and
Integral Calculus: Dnyanpath Publication, Amravati, First Edition, 2022.

Reference Books :

1] Ayres F Jr. : Differential equations, Schaum's outline series, McGraw Hill, 1981.
2] Ayres F.Jr. : Calculus, Schaum's Outline series, McGRaw Hill, 1981.
3] Edwards J : Differential Calculus for Beginners, MacMillan and Co.Ltd.,1963.
4] Greenspan D. : Introduction to Calculus, Harper and Row, 1968.
5] Gorakh Prassad: Differential Calculus, Pothishala Pvt. Ltd., Allahabad, 1963
6] Gorakh Prassad: Integral Calculus, Pothishala Pvt. Ltd., Allahabad,1981
7] N.Piskunov : Differential and Integral Calculus, Peace Publishers, Moscow.
8] B. Choudhary and D. Somasundaram "Á first course in Mathematical analysis'',
   Narosa Publication

Programme: B.Sc.- 1 (Semester- II), Mathematics

Syllabus Prescribed for the year 2022-23 , UG Programme

Programme : B.Sc.-I

Semester II

Code of the Course/Subject   Title of the Course/Subject   (Total Number of Periods/week)

DSC-III / Mathematics   Ordinary Differential Equations   **9+1**

COs: After completing this course, students would be able to

1.   Solve first order differential equations using different techniques..

2.   solve higher order differential equations and orthogonal trajectories.

3.   calculate complementary function and particular integral of the second order differential
      Equation.

 4.   Describe the different methods to solve second order differential equations.

5.   illustrate applications of differential equations **.**

Unit	Content
Unit I	Formation of ordinary differential equation**,** degree and order of a ordinary differential equation, homogeneous differential equations, linear differential equations, Bernoulli's equation, differential equations reducible to the linear form, exact differential equations. **(12 period**)
Unit II	Differential equations of first order and higher degree, differential equations solvable for p, x and y, Clairaut's equation, orthogonal trajectories (Cartesian and Polar form) **(12 period)**

Unit III	Linear differential equations with constant coefficients, complementary function of the differential equation, particular integral of the differential equation, homogeneous linear ordinary differential equations. **(12 period)**
Unit IV	Second order differential equation, Wronskian, method of change of dependent variable, normal form, method of change of independent variable, variation by parameters. **(12 period)**
Unit V	Applications of ODE: Electric circuit, steady state heat flow, radio active decay and carbon dating, Newton's law of cooling, compound interest. **(13 period)**
*SEM	
COs: 1.To enhance interest among the students about course. 2.To develop the learning and writing skills. 3.To create mental ability.	
**Activities	1. Unit Test 2. Assignment/ open book test 3. Quiz/ Study Tour

Text books :

1] T.M.Karade , V. G. Mete, V.S.Bawane , P.R. Agrawal , A.Y.Shaikh ,R.V.Kene: Differential Equations (Ordinary and Partial), Sonu-Nilu, Nagpur, 2022.

2] V. A. Sharma, V. R. Patil, S. R. Bhoyar, G. U. Khapekar, A. N. Rangari: A Text book of , Ordinary Differential Equations, Dnyanpath Publication,Amravati, First Edition, 2022.

Reference Books :

1] Ayres F Jr.: Differential equations, Schaum's outline series, McGraw Hill, 1981.

2] Coddington: An Introduction to Ordinary Differential Equations, E.A.Prentice Hall of India, 1998.

3] T.M.Karade, N.T.Karade: Ordinary Differential Equations, Sonu-Nilu. Nagpur, 2016.

4] Murray D.A.: Introductory course in Differential Equations, Orient Longman(India), 1967.

5] Piaggio HTS: Differential Equations, CBS Publishers &Distributors, Delhi, 1985.

6] Siminons G.F.: Differential Equations, Tata McGraw Hill, 1972.

7] A.R.Forsyth. A Treatise on Differential Equations. Macmillan and Co.Ltd.London.

8] H. K Dass, Advanced Engineering Mathematics, S. Chand Publication, 2010.

9] B.S.Grewal, Higher Engineering mathematics, Khanna Publisher, New Delhi, 2017.

Programme: B.Sc.- I (Semester-II), Mathematics

Part B

Syllabus Prescribed for the year 2022-23 , UG Programme

Programme : B.Sc.-I

Semester- II

Code of the Course/Subject	Title of the Course/Subject	(Total Number of Periods/week)
DSC –IV/ Mathematics	Vector Analysis and Geometry	9+1

COs: After completing this course, students would be able to

1. interpret the vectors, their products, differentiation and integration.

2. determine curvature and torsion .

3.apply the concepts of divergence, curls which are useful in physics.

4.. describe the different forms of sphere and properties.

5. discuss the equations of cone and cylinder.

Unit	Content
Unit I	Scalar and vector product of three vectors, product of four vectors, vector differentiation and vector integration. **(12 period)**
Unit II	Space curve, t, n, b vectors, fundamental planes, curvature, torsion, Frenet- Serret formulae. **(12 period)**
Unit III	Gradient, divergence and Curl, directional derivative, line integral and work done, circulation. **(12 period)**
Unit IV	Sphere: Different forms of sphere, section of a sphere by a plane, sphere through a given circle, intersection of spheres and a line, orthogonal spheres and condition of orthogonality. **(13 period)**
Unit V	Cone : The equation of a cone with a guiding curve, cone with vertex and origin, right circular cone. Cylinder: equation of right circular cylinder. **(12 period)**
*SEM	

COs: 1.to enhance interest among the students about course.
 	
      2.to develop the learning and writing skills.
 	
      3.to create mental ability.	

**Activities	1. Unit Test 2. Assignment/ open book test 3. Quiz/ Study Tour

Text books :

1] T.M.Karade, Maya S. Bendre, V. B Raut, R.S.Wadbudhe, S.B.Tadam, V.D.Elkar ,K.R.Muley:
   Vector Analysis and Geometry, Sonu Nilu , Nagpur,2022.

2] V. A. Sharma, V. R. Patil, S. R. Bhoyar, G. U. Khapekar, A. N. Rangari: A Text book of ,
   Vector Analysis and Geometry, Dnyanpath Publication,Amravati, First Edition, 2022.

Reference Books :

1] Murray R. Spiegel, Vector Analysis, Schaum Publishing Company, New York,1981.
2] N.Saran and S.N.Nigam , Introduction to vector Analysis Pothishala Pvt.Ltd.Allahabad.
3] Shanti Narayan, A Text Book of Vector Calculus, S.Chand & Co. New   Delhi.
4] R.J.T.Bell, Elementary Treatise on Co-ordinate Geometry of Three Dimensions, Macmillan
   India Ltd., 1994.
5] P.K.Jain and Khalil Ahmad, A Text Book of Analytical Geometry of Three Dimensions,
   Wiley Eastern Ltd., 1999.
6] N.Saran and R.S.Gupta, Analytical Geometry of three dimensions, Pothishala Pvt.Ltd.
   Allahabad,2000.

Programme: B.Sc.- I (Semester-II), Mathematics

Part B

Syllabus Prescribed for the year 2022-23 , UG Programme

Programme : B.Sc.-I

Semester- II

| **Code of the Course/Subject** | **Title of the Course/Subject** | **(Total Number of Periods/week)** |

GIC/ Mathematics   Numerical Ability-I   ----

COs: After completing this course, students would be able to

1.   restate the ideas and concept of HCF & LCM of number and also find square root &
     cube roots.
 2.   illustrate the problem on numbers, ages, percentage, profit and loss.
3.   analyze ratio and proportion , time , work and distance.
4.   outline the problems on train, simple interest, compound interest, area measurement.
5.   create the Bar graphs, Pie charts and Line graphs.

Unit	Content
Unit I	HCF & LCM of number, Decimal fraction, Simplification, Square root & cube roots.
Unit II	Average, Problem on numbers, Problem on ages, Percentage, Profit & Loss.
Unit III	Ratio & Proportion, pipes and cisterns, Time and work, Time and Distance.
Unit IV	Problem on train, Simple Interest, Compound Interest, Area.
Unit V	Bar Graphs, Pie Charts, Line Graphs.

Reference:

 1) R. S. Agrawal, Quantitative aptitude for Competitive examination, S. Chand Publication
2) Arun Sharma, How to Prepare for quantitative Aptitude for CAT, Mac Grow Hill Publication