BAGALKOT UNIVERSITY

Mudhol Road, Jamkhandi-587301 Dist: Bagalkot

PROGRAM /COURSE STRUCTURE AND SYLLABUS
FOR
MATHEMATICS

as per the Choice Based Credit System (CBCS) designed in
accordance with Learning Outcomes-Based Curriculum
Framework (LOCF)

For
Bachelor of Science
(MATHEMATICS)

(General Degree)

I and II Semester

w.e.f.

Academic Year 2024-25

Preamble for UG Syllabus of Bagalkot University

Bagalkot University Jamkhandi has been established by the Government of Karnataka and has started functioning from the academic year 2023-24. All the degree colleges other than engineering and medical colleges in the district of Bagalkote, are affiliated to this university as per the Karnataka State Universities Act 2000, as modified by the 26th Act of 2022. The students taking admission to any of the colleges in the district of Bagalkote, from the academic year 2023-24 will be students of Bagalkot University. The Government of Karnataka has instructed all the Universities to revise the under graduate syllabus as per the Government order no. ED 166 UNE 2023 Bengaluru Dated 08-05-2024 from the academic year 2024-25.

Hence the Bagalkot University has revised the syllabus as suggested by its Board of Studies and approved by Academic Council and Syndicate. The subject code format for all the subjects of the new syllabus is also revised.

The subject code format is described in the following.

Subject Code Format

1	2	3	4	5	6	7	8	9	10
VER	DEGREE	SEM	DISCIPLINE			SUB. TYPE	SL. NO. FOR SUB. TYPE		TH/LAB/F
2	A	1	C	H	E	M	0	1	T
2	B	1	P	O	L	M	0	1	T

[1] The Version information gives the version of the syllabus. It can take values 1,2..9,a,b,…

[2] The UG degree codes to be provided as / The code applicable to all degrees

Sl. No	Degree Code		Degree
1	B.Sc.	A	Bachelor of Science
2	B.A	B	Bachelor of Arts
3	B.Com.	C	Bachelor of Commerce
4	BBA	D	Bachelor of Business Administration
5	BCA	E	Bachelor of Computer Applications
6	BSW	F	Bachelor of Social Work
7.	-----------	S	Applicable to all degrees

[3] The Semester Information is provided as

Sl. No	Semester
1	1
2	2
3	3
….	

[4-6] The Discipline Information to be provided as

Sl No	Degree	Discipline Code
1	B.Com.	XXX
2	BCA	XXX
3	BBA	XXX
4	BSW	XXX
5	B.A	'HIS', POL','GEO','KAN', 'HIN' etc. The detailed list is to be provided
6	B.Sc.	'PHY','CHE', 'BOT','ELE' etc. The detailed List is to be Provided

[7] The Subject Type to be provided as

Sl. No.	TYPE	Description
1	Major	M
2	Language	L
3	Constitutional Moral Values	C
4.	Elective	E
5.	Skill / Practical based learning	S
6.	Mini Project	P
7.	Internship	I
8.	Case study/ Survey using principles of Research methodology	R

[8-9] The Running Serial Number is to be provided for a particular Subject type 01 to 99

[10] This character specifies the category of the subject namely, T=Theory, L-Practical, P-Project Work, F-Field work, Viva-V, I-Internship, Dissertation-D

PREAMBLE

The subject-wise expert committee to draft, as per the Curriculum Framework for various Under graduate Programmes to be followed with effect from academic year 2024-25. Recommended by the Joint Board of Studies, Bagalkot University, Jamkhandi. BGKUJ /RO/2024-25/245/16 dated:11 June 2024.

Curriculum Framework for various Undergraduate Programmes to be followed with effect from academic year 2024-25. Recommended by the Joint Board of Studies of Bagalkot University, Jamkhandi

The Framework for General degree -3 Majors/ Degree with deep Specialization up to4th semester under CBCS scheme is finalized and details are given below The syllabus for the First Year (First & Second Semesters)B.Sc Mathematics and detailed Course Structure for B. Sc Mathematics (three major up to 4th Semester).

To achieve the core objectives it is unanimously resolved to introduce computer based practical courses by using Free and Open-Source Software's (FOSS) tools for implementation of theory-based courses as it is also suggested by the LOCF committee that the papers may be taught using various Computer Algebra System (CAS) software's such as Mathematica, MATLAB, Maxima and R to strengthen the conceptual understanding and widen up the horizon of students' self-experience. In view of these observations the subject expert committee suggested the software's Python/R/Maxima/Sci lab/ Maple/Mat Lab/Mathematica for hands on experience of implementation of mathematical concepts in computer- based lab.

The subject expert committee designed the Course Learning Outcome (CO) to help the learners to understand the main objectives of studying the courses by keeping in mind of the Programmes Outcomes (PO) of the graduate degree in Mathematics or a graduate degree with Mathematics as a major subject.

As the Mathematics subject is a vast with several branches of specializations, it is difficult for every student to learn each branch of Mathematics, even though each paper has its own importance. Hence the subject expert committee suggested to consider elective papers in this course, so student can select elective paper as per her/his needs and interest.

PROGRAM OUTCOMES:

1. **Disciplinary Knowledge:** Bachelor degree in Mathematics is the culmination of in-depth knowledge of Algebra, Calculus, Geometry, differential equations and several other branches of pure and applied mathematics. This also leads to study the related areas such as computer science and other allied subjects.

2. **Communication Skills:** Ability to communicate various mathematical concepts effectively using examples and their geometrical visualization. The skills and knowledge

gained in this program will lead to the proficiency in analytical reasoning which can be used for modeling and solving of real-life problems.

3. **Critical thinking and analytical reasoning:** The students undergoing this programme acquire ability of critical thinking and logical reasoning and capability of recognizing and distinguishing the various aspects of real-life problems.

4. **Problem Solving:** The Mathematical knowledge gained by the students through this programme develop an ability to analyze the problems, identify and define appropriate computing requirements for its solutions. This programme enhances students' overall development and also equip them with mathematical modelling ability, problem solving skills.

5. **Research related skills**: The completing this programme develop the capability of inquiring about appropriate questions relating to the Mathematical concepts in different areas of Mathematics.

6. **Information/digital Literacy:** The completion of this programme will enable the learner to use appropriate software's to solve system of algebraic equation and differential equations.

7. **Self-directed learning:** The student completing this program will develop an ability of working independently and to make an in-depth study of various notions of Mathematics.

8. **Moral and ethical awareness/reasoning:** The student completing this program will develop an ability to identify unethical behaviour such as fabrication, falsification or misinterpretation of data and adopting objectives, unbiased and truthful actions inall aspects of life in general and Mathematical studies in particular.

9. **Lifelong learning:** This programme provides self-directed learning and lifelong learning skills. This programme helps the learner to think independently and develop algorithms and computational skills for solving real word problems.

10. **Research Opportunities:** Ability to peruse advanced studies and research in pure and applied   Mathematical   sciences.

PROGRAM STRUCTURE

Syllabus and Credits Structure under Choice Based Credit System [CBCS] General Degree for the Three Years B.Sc. with Mathematics Undergraduate Programme with effect from 2024-25

First Semester B.Sc. (Mathematics) Scheme

Category	Course code	Title of the Paper	Marks			Teaching hours/ week			Credits	Duration of Exam (Hrs)	Teaching Department
			IA	SEE	Total	L	T	P			
L1	--------	Language 1	20	80	100	3	-	-	3	3	-
L2	--------	Language 2	20	80	100	3	-	-	3	3	-
Major	2A1MATM01T	Algebra and Calculus	20	80	100	3	-	-	3	3	Mathematics
	2A1MATM01L	Theory based practical's Algebra and Calculus.	10	40	50	-	-	4	2	3	Mathematics
Major	--------	Major Subject 2	20	80	100	3	-	-	3	3	---
	--------	Practical	10	40	50	-	-	4	2	3	---
Major	--------	Major Subject 3	20	80	100	3	-	-	3	3	---
	--------	Practical	10	40	50	-	-	4	2	3	---
Common	2S1XXXC01T	Constitutional Values	1s0	40	50	2	-	-	2	2	Constitutional Values: Political Science
	2S1XXXC02T	Environment Studies									Environmental Studies: Chemistry/ /Geography/ Botany
			Total Marks		**700**	**Semester Credits**			**23**		

SEMESTER-I

L1 & L2: Languages

Second Semester B.Sc. (Mathematics) Scheme

Category	Course code	Title of the Paper	Marks			Teaching hours/ week			Credits	Duration of exams (Hrs)	Teaching Department
			IA	SEE	Total	L	T	P			
											SEMESTER-II
L3	--------	Language 3	20	80	100	3	-	-	3	3	-
L4	--------	Language 4	20	80	100	3	-	-	3	3	-
Major	2A2MATM02T	Calculus and Three dimensional Geometry(Theory)	20	80	100	3	-	-	3	3	Mathematics
	2A2MATM02L	Theory based practical's Calculus and Three dimensional Geometry	10	40	50	-	-	4	2	3	Mathematics
Major	--------	Major Subject 2	20	80	100	3	-	-	3	3	------
	--------	Practical	10	40	50	-	-	4	2	3	------
Major	--------	Major Subject 3	20	80	100	3	-	-	3	3	----
	--------	Practical	10	40	50	-	-	4	2	3	------
Common	2S1XXXC01T	Constitutional Values	10	40	50	2	-	-	2	2	Constitutional Values: Political Science
	2S1XXXC02T	Environment Studies									Environmental Studies: Chemistry/Geography / Botany
		Total Marks			**700**	**Semester Credits**			**23**		

L3 & L4 : Languages

First Semester B.Sc Mathematics Theory

Paper Title : Algebra and Calculus (Theory)	Marks:Th-80+IA-20=100
Paper Code: 2A1MATM01T	Total hours:42
Teaching Hours:3 Hours/Week	Credits:03

UNIT-I:MATRICES AND DETERMINANTS	10 Hours
Recapitulation of Elementary Transformations of matrices, Rank of a Matrix, Row and column reduction to Echelon form. Reduction to Normal forms, Inverse of matrix by elementary transformations, Cayley-Hamilton theorem (Without Proof), .	
UNIT-II:REAL NUMBER SYSTEM	**12 Hours**
Properties of real number system, inequalities & absolute values, l.u.b, g.l.b and Archimedean properties of real numbers. Limits and Continuity: Recapitulation of limits and continuity. Algebra of limits (with proofs). Algebra of continuous functions (without proofs). Properties of Continuous functions. Boundedness of continuous functions, Intermediate value theorems.	
UNIT-III: HIGHER ORDER DERIVATIVES	**10 Hours**
The nth derivative of a polynomial function $(ax+b)n$, $1/ax+b$, logarithmic function $(ax+b)$, exponential function $(ax+b)$, Trigonometric function $\sin(ax+b)$, $\cos(ax+b)$, $e^{ax}.\sin(bx+c)$, $e^{ax}.\cos(bx+c)$, Leibntz's theorem for n^{nt} derivative of a product of two functions.	
UNIT-IV:MEAN VALUE THEOREMS	**10 Hours**
Rolle's Theorem, Lagrange's MeanValueTheorem, Cauchy's MeanValue Theorem, Taylor's Theorem (with Sclomilch and Rouche's form of reminder)	

Reference Books:

1. Differential Calculus–Shantinarayan and Mittal
2. Real Analysis-NP Bali
3. First Course in Real Analysis-M.K.Singal and Asha Rani
4. Text book of B.Sc Mathematics-G.K. Raganath
5. Matrices and determinants- M.L.Khanna

First Semester B.Sc. Mathematics Practicals

Paper Title: Theory based Practicals Algebra and Calculus	Marks:PR-40+IA-10
Paper Code: 2A1MATM01L	Total Marks:50
Teaching Hours: 4Hours/Week/ batch	Credits:02

Introduction to Sci Lab/Maxima and commands related to the topic.

1. Computation of Sum, Difference and Product of two Matrices.

2. Computation of trace and transpose of matrices.

3. Computation of rank of matrix and row reduced echelon form.

4. Computation of inverse of a matrix using Cayley–Hamilton theorem.

5. Solution of system of homogeneous and non-homogeneous equations.

6. Finding n^{th} derivative of exponetial, trigonometric and hyperbolic functions.

7. Finding n^{th} derivative of algebraic functions and Logarithmic functions.

8. Finding n^{th} derivative of $e^{ax}.\sin(ax+b), e^{ax}.\cos(ax+b)$.

9. Examples on Rolle's theorem, Lagrange's and Cauchy's mean value theorem.

10. Taylor's and Maclaurin's series expansion of a given function.

NOTE: Use the SciLab / MAXIMAOpen – source Software to execute the practicalproblems. SciLab:is an open-source software and it can be downloaded from http://www.scilab.org/download. Some materials for Sci Lab can be found on http://wiki.scilab.org/Tutorialsarchives.
MAXIMA: is an Open-sourceComputer Algebra System for solving typical calculus problems. The latest version is available on http://maxim.source.forge,net/documentation.html

Second Semester BSc Mathematics Theory

Paper Title: DSC: Calculus and 3-Dimensional Geometry (Theory)	Marks:Th-80+IA-20
Paper Code:2A2MATM02T	Totalhours:60
Teaching Hours:3 Hours/Week	Credits: 03

UNIT-I: Polar Coordinates	12 Hours
Polar coordinates of a point and polar curve. Angle between the radius vector and the tangent at a point on the curve. Angle of intersection of two curves. Polar and pedal equation of the curves. Polar sub-tangent and polar sub - normal. Derivative of arc length, Curvature, Radius of curvature in Cartesian, Parametric, polar and pedal forms. Centre Of curvature.	

UNIT-II: Partial derivatives and Jacobians.	10 Hours
Limits, continuity of functions of two variables. Partial derivatives, higher order partial derivatives, Euler's theorem on homogeneous functions. Total derivatives and differentiation of implicit and composite functions. Jacobian of second and third orders and its properties	

UNIT-III: Reduction Formulae	10 Hours
Reduction formulae for integration of $\sin^n x$, $\cos^n x$, $\tan^n x$, $\cot^n x$, $\sec^n x$, $\csc^n x$, $\sin mx \cos nx$, x^n, e^{ax} and $x^m.(\log x)^n$.	

UNIT-IV: Sphere	10 Hours
Sphere: Equation of a sphere, section of a sphere by a plane, Equation of a sphere through a circle, Equation of a sphere through two given points as ends of a diameter. Equation to a tangent and normal planes of a sphere, Condition for tangency, Orthogonality of two spheres. Radical plane and coaxial system of spheres.	

Booksof reference:

1. Differential Calculus: Shantinarayan and Dr.P.K. Mittal

2. Integral Calculus :Shantinarayan and Dr.P.K.Mittal

3. Differential Calculus and integral Calculus :N.P.Bali

4. Text Book of B.Sc Mathematics : G.K. Ranganath

5. Differential Calculus and integral Calculus :P. N.Chatterji.

6. Analytical Solid Geometry: Shantinarayan and Dr.P.K.Mittal

7. Solid Geometry: N.P.Bali

Second Semester B.Sc Mathematics Practicals

Paper Title: Calculus and 3-Dimensional Geometry	Marks:PR-40+IA-10
Paper Code:2A2MATM02L	TotalMarks:50
Teaching Hours:4 Hours/Week/Batch	Credits:02

1. Program to find the angle between radius vector and tangent of a polar curve

2. Finding radius of curvature of the given curves.

3. Finding center of curvature of the given curves.

4. Computation of arc length of Cartesian, Parametric curves

5. Computation of arc length of Polar form

6. Evaluation of definite integrals and Reduction formulae.

7. Program to verify Euler's theorem and its extension.

8. Program to find Jacobian of second and third orders.

9. Program to find equation of a sphere and plot the graph.

10. Program to verify the condition for orthogonality of two spheres.

NOTE: Use the SciLab / MAXIMA Open – source Software to execute the practical problems. Sci Lab: is an open-source software and it can be downloaded from http://www.scilab.org/download. Some materials for Sci Lab can be found on http://wiki.scilab.org/Tutorialsarchives.
MAXIMA: is an Open-source Computer Algebra System for solving typical calculus problems. The latest version is available on http://maxim.source.forge,net/documentation.ht

ASSESSMENT METHODS

Formative Assessment for Theory

Evaluation Scheme for Internal Assessment: Continuous Internal Assessment (CIA)

Assessment Criteria 20 marks		
1st Internal Assessment Test for 20 marks of 1 hour duration after 8 weeks and later marks should be reduced to 5	CIA : C1	5 Marks
2nd Internal Assessment Test for 40 marks 2 hours duration after 15 weeks and marks should be reduced to 10	CIA : C2	10 Marks
Assignment/ Activity	CIA : C3	05 Marks
	Total	20 Marks

Summative Assessment for Theory:

SEMESTER END EXAM : SEE	C4	80 Marks

Formative Assessment for Practical:

Assessment Criteria 10 marks		
Internal Test including basic understanding of the concept, Viva Voce, Journal. Test should be conducted for 50 marks and later it should be reduced for 10 marks	CIA : C1	10 Marks

Summative Assessment for Practical:

SEMESTER END EXAM : SEE	C2	40 Marks

Semester End Practical Examination

Scheme for Lab Examination

Assessment Criteria		
Programme-01	Writing Program	7Marks
	Execution of program	8Marks
Programme-02	Writing Program	7Marks
	Execution of program	8Marks
Journal		05Marks
Viva Voce		05Marks
Total		40Marks

Instructions to set the question paper and question paper pattern

Instruction to set the question paper.

1. Question number 1 has 12 sub questions consisting of 3 questions from each unit. Eachquestion carries two marks. Student has to answer any ten questions.

2. Question number 2 to 7 are from unit I to IV.
Each question carries five marks. Student has to answer any four questions

3. Question number 8 to 12 are from unit I to IV.
Each question carries ten marks. Student has to answer any four questions

Question Paper pattern

First Semester B.Sc. Degree Examination (SEP)
MATHEMATICS
Mechanics and Properties of Matter

Time: 3 hours   Max. Marks: 80

		Part- A	
1.		**Answer any <u>TEN</u> questions**	**10 x 2 = 20**
	a)		
	b)		
	c)		
	d)		
	e)		
	f)		
	g)		
	h)		
	i)		
	j)		
	k)		
	l)		
		Part-B	
		Answer any <u>Four</u> questions	**4 x 5 = 20**
	2		
	3		
	4		
	5		
	6		
	7		
		Part-C	
		Answer any FOUR questions	**4 X 10 = 40**
	8		
	9		
	10		
	11		
	12		