BAGALKOT UNIVERSITY

Mudhol Road, Jamkhandi – 587301 Dist: Bagalkote
The Draft
REGULATIONS AND COURSE STRUCTURE
Governing the Choice Based Credit System (CBCS) Semester
Scheme with multiple entry and exit options in
BACHELOR OF SCIENCE WITH MATHEMATICS
III Semester

As Per NEP – 2020 and Adapted from RCU Belagavi
Applicable from the Academic Year 2024-25

Category	Course code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs.)
			IA	SEE	Total	L	T	P		
L5	----------------	Languages	40	60	100	4	-	-	3	2
L6	--------------	Languages	40	60	100	4	-	-	3	2
DSC3	126BSC03MATDSCO3T	Ordinary Differential Equations and Real Analysis-I	40	60	100	4	-	-	4	2
	126BSC03MATDSCO3L	Theory based Practical's on Ordinary Differential Equations and Real Analysis-I	25	25	50	-	-	4	2	3
DSC3	-	Another Department Course Title	40	60	100	4	-	-	4	2
			25	25	50	-	-	4	2	3
SEC2	126COM03XXXSEC03T	Artificial Intelligence	25	25	50	1	-	2	2	2
VBC5	126COM03XXXVBC05T	NCC/NSS/R&R(S&G) / Cultural	25	-	25	-	-	2	1	-
VBC6	126COM03XXXVBC06B	Physical Education Sports	25	-	25	-	-	2	1	-
OEC3	126BSC03MATOEC05T	Ordinary Differential Equations	40	60	100	3	-	-	3	2
	126BSC03MATOEC06T	Quantitative Mathematics								
	126BSC03MATOEC07T	Vedic Mathematics								
		Total Marks	700			Semester Credits			25	

SECOND YEAR; SEMESTER-III

SEMESTER – III

Year	II	Course Code: 126BSC03MATDSCO3T		Credits	04
Sem.	III	Course Title: Ordinary Differential Equations and Real Analysis – I		Hours	56
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 40		Summative Assessment Marks: 60	Duration of ESA:.02 hrs.		
Course Outcomes		**Course Learning Outcomes**: This course will enable the students to: • Solve first-order non-linear differential equations and linear differential equations. • To model problems in nature using Ordinary Differential Equations. • Formulate differential equations for various mathematical models • Apply these techniques to solve and analyze various mathematical models. • Understand the fundamental properties of the real numbers that lead to define sequence and series, the formal development of real analysis. • Learn the concept of Convergence and Divergence of a sequence. • Able to handle and understand limits and their use in sequences, series, differentiation, and integration. • Apply the ratio, root, alternating series, and limit comparison tests for convergence and absolute convergence of an infinite series.			
Unit No.		**Course Content**		**Hours**	
Unit I		**Ordinary Differential Equations:** Recapitulation of Differential Equations of first order and first degree, Exact Differential equations, Necessary and sufficient condition for the equations to be exact, Reducible to the exact differential equations. Differential equations of the first order and higher degree: Equations solvable for p, x, y. Clairaut's equation and singular solution. Orthogonal trajectories of Cartesian and polar curves.		14	
Unit II		Linear differential equations of the nth order with constant coefficients. Particular Integrals when the RHS is of the form e^{ax}, $\sin(ax+b)$, $\cos(ax+b)$, x^n, e^{ax} V and x V (with proofs), where V is a function of x. Cauchy – Euler equations, Legendre differential equations, Method of variation of parameters. Simultaneous differential equations with two and more than two variables. Condition for integrability of total differential equations P dx +Q dy+ R dz = 0.		14	
Unit III		**Real Analysis – I :** **Sequences**: Sequences of real numbers, Bounded sequences. Limit of a sequence. convergent, divergent,		14	

	and oscillatory sequences. Monotonic sequences. Algebra of convergent sequences. Limit points of a sequence. Bolzano Weierstrass theorem for sequence. Limit superior and limit inferior of sequences. Cauchy's first and second theorem on limits of a sequence. Cauchy's general principle for convergence of a sequence. Subsequence and their properties.	
Unit IV	**Infinite Series:** Definition of convergent, divergent and oscillatory series. Series of non-negative terms, Cauchy's general principle of convergence. Geometric series, P-series (Harmonic series). Comparison tests for positive term series. D'Alembert's ratio test, Raabe's test. Cauchy's Root test and Cauchy's integral test. Alternating series. Leibnitz's theorem. Absolute convergence and conditional convergence of a series. Summation of series: Binomial, exponential and logarithmic.	**14**

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Recommended Leaning Resources

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Print Resources	**References:** 1. M.D.Raisinghania, Ordinary Differential Equations & Partial Differential Equations, S. Chand & Company, New Delhi. 2. J. Sinha Roy and S Padhy: A course of Ordinary and Partial Differential Equation, Kalyani Publishers, New Delhi. 3. D. Murray, Introductory Course in Differential Equations, Orient Longman (India) 4. W. T. Reid, Ordinary Differential Equations, John Wiley, New Delhi. 5. M. L. Khanna, Differential Equations, Jai PrakashNath& Co. Meerut. 6. S. L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984. 7. R. G. Bartle and D. R. Sherbert, Introduction to Real Analysis, 3rd Ed., John Wiley and Sons (Asia) Pvt. Ltd., Singapore, 2015. 8. Gerald G. Bilodeau, Paul R. Thie, G.E. Keough, An Introduction to Analysis, 2nd Ed., Jones & Bartlett, 2010. 9. K. A. Ross, Elementary Analysis: The Theory of Calculus (2nd edition), Springer, 2013 10. S. K. Berberian, A First Course in Real Analysis, Springer Verlag, New York, 1994. 11. T. Apostol, Mathematical Analysis, Narosa Publishing House 12. M.L Khanna and L.S. Varhiney, Real Analysis by, Jai Prakash Nath & Co. Meerut. 13. Kreyzig, Advanced Engineering Mathematics, John Wiley, New Delhi.

Practicals

Year	II	Course Code: 126BSC03MATDSCO3L		Credits	02
Sem.	III	Course Title: Practicals on Ordinary Differential Equations and Real Analysis – I		Hours	56

Course Pre-requisites, if any	NA		
Formative Assessment Marks: 25	Summative Assessment Marks: 25	Duration of ESA:.02 hrs.	

Course Outcomes	Course Learning Outcomes: This course will enable the students to gain handson experience of • Free and Open Source software (FOSS) tools or computer programming. • Solving exact differential equations • Ploting orthogonal trajectories • Finding complementary function and particular integral of linear and homogeneous differential equations. • Acquire knowledge of applications of real analysis and differential equations. • Verification of convergence/divergence of different types of series

	Course Content	Hours
	Practicals/Lab Work to be performed in Computer Lab Use open-source software to executive the practical problems. (Maxima/ Scilab/MatLab /Mathematica/Python 1. Fundamentals of Ordinary differential equations and Real analysis using FOSS 2. Verification of exactness of a differential equation 3. Plot orthogonal trajectories for Cartesian and polar curves 4. Solutions of differential equations that are solvable for x, y, p. 5. To find the singular solution by using Clairaut's form. 6. Finding the Complementary Function and Particular Integral of linear and homogeneous differential equations with constant coefficients and plot the solutions. 7. Finding the Particular Integral of differential equations up to second order and plot the solutions. 8. Solutions to the Total and Simultaneous differential equations and plot the solutions. 9. Test the convergence of sequences 10. Verification of exponential, logarithm and binomial series. 11. Verification of geometric series, p-series, Cauchy's Integral test, root test, and D Alembert's Test 12. Examples on a series of positive terms. 13. Examples on alternating series using Leibnitz's theorem. 14. Finding the convergence of series using Cauchy's criterion for partial sums.	56

Open Elective Course

(For students of Science stream who have not chosen Mathematics as one of the Core Course)

Year	II	**Course Code:** 126BSC03MATOEC05T		**Credits**	03
Sem.	III	**Course Title: Ordinary Differential Equations**		**Hours**	42
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 40		Summative Assessment Marks: 60		Duration of ESA:.02 hrs.	
Course Outcomes		**Course Learning Outcomes**: This course will enable the students to: • Understand the concept of the differential equation and their classification • Know the meaning of the solution of a differential equation. • To solve first-order ordinary differential equations. • To Solve exact differential equations and Converts to separable and homogenous equations to exact differential equations by integrating factors. • To Solve Bernoulli differential equations. • To find the solution to higher-order linear differential equations.			

Unit No.	Course Content	Hours
Unit I	Recapitulation of Differential Equations of first order and first degree, Exact Differential equations, Necessary and sufficient condition for the equations to be exact, Reducible to the exact differential equations.	14
Unit II	Differential equations of the first order and higher degree: Equations solvable for p, x, y. Clairaut's equation and singular solution. Orthogonal trajectories of Cartesian and polar curves.	14
Unit III	Linear differential equations of the nth order with constant coefficients. Particular Integrals when the RHS is of the form e^{ax}, $\sin(ax+b)$, $\cos(ax+b)$, x^n, e^{ax} V and x V (with proofs), where V is a function of x.	14
	Recommended Leaning Resources	
Print Resources	**References:** 1. M.D.Raisinghania, Ordinary Differential Equations & Partial Differential Equations, S. Chand & Company, New Delhi. 2. J. Sinha Roy and S Padhy: A Course of Ordinary and Partial Differential Equation Kalyani Publishers, New Delhi. 3. D Murray, Introductory Course in Differential Equations, Orient Longman (India) 4. W T Reid, Ordinary Differential Equations, John Wiley, New Delhi 5. M. L. Khanna, Differential Equations, Jai PrakashNath& Co. Meerut. Shepley L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, 1984.	

Year	II	**Course Code:** 126BSC03MATOEC06T		**Credits**	03
Sem.	III	**Course Title: Quantitative Mathematics**		**Hours**	42

Course Pre-requisites, if any	NA	
Formative Assessment Marks: 40	Summative Assessment Marks: 60	Duration of ESA:.02 hrs.

Course Outcomes	**Course Outcomes:** This course will enable the students to: - Understand number system and fundamental operations - Understand the concept of linear quadratic and simultaneous equations and their applications in real life problems - Understand and solve the problems based on Age. - Solve Speed and Distance related problems.

Unit No.	Course Content	Hours
Unit I	NumberSystem Numbers, Operations on Numbers,Tests on Divisibility, HCF and LCM of numbers. Decimal Fractions, Simplification, Square roots and Cube roots - Problems thereon. Surds and Indices. Illustrations thereon.	14
Unit II	Theory of equations Linear equations, quadratic equations, simultaneous equations in two variables, simple application problems - Problems on Ages, Problems on conditional Age calculations, Present & Past age calculations.	14
Unit III	Quantitative Aptitude Percentage, Average, Average Speed-problems.Time and distance, problems based on trains, problems on-work and time,work and wages, clock and calendar.	14
Recommended Leaning Resources		

Print Resources	**References:** - R.S. Aggarwal, *Quantitative Aptitude*, S. Chand and Company Limited, NewDelhi-110 055 . - Abhijit Guha, *QuantitativeAptitude*,5th Edition,Mc.Grawhillpublications.2014. - R V Praveen,*QuantitativeAptitudeand Reasoning*,PHI publishers. - R S Aggarwal, Objective Arithmetic, S. Chand & Company Ltd. - Qazi Zameerddin,Vijay K Khanna, S K Bhambri, *BusinessMathematics-II Edition.* S. K. Sharma and Gurmeet Kaur, Business Mathematics , Sultan Chand & Sons. - Hazarika Padmalochan, A Text Book of Business mathematics for B.Com and BBA Course, Chand Publication. - J K Thukrol, Business Mathematics, abci book:2020 First Edition. N. G. Das and J. K. Das, Business Mathematics and Statics, Mc Graw Hill Education, 2017.

Open Elective Course

Year	II	**Course Code:** 126BSC03MATOEC07T		**Credits**	03
Sem.	III	**Course Title: Vedic Mathematics**		**Hours**	42
Course Pre-requisites, if any		NA			
Formative Assessment Marks: 40		Summative Assessment Marks: 60	Duration of ESA:.02 hrs.		
Course Outcomes		**Course Outcomes:** This course will enable the students to: • Understand number system and fundamental operations • Understand the concept of linear quadratic and simultaneous equations and their applications in real life problems • Understand and solve the problems based on Age. • Solve Speed and Distance related problems.			
Unit No.		**Course Content**		**Hours**	
Unit I		**Multiplication:** 1. Ekadhikenpurven method (multiplication of two numbers of two digits). 2. Eknunenpurven method (multiplication of two numbers of three digits). 3. Urdhvatiragbhyam method (multiplication of two numbers of three digits). 4. Nikhilam Navtashchramam Dashtaha (multiplication of two numbers of three digits). 5. Combined Operations.		14	
Unit II		**Division and Divisibility** **Part A: Division** 1. NikhilamNavtashchramamDashtaha (two digits divisor) 2. ParavartyaYojyet method (three digits divisor) **Part B:Divisibility** 1. Ekadhikenpurven method (two digits divisor) 2. Eknunenpurven method (two digits divisor)		14	
Unit III		**Power and Root Power:** 1. Square (two digit numbers) 2. Cube (two digit numbers). **Root:** 1. Square root (four digit number) 2. Cube root (six digit numbers). Solution of linear simultaneous equations.		14	
Recommended Leaning Resources					
Print Resources		**Reference Books:** 1. Vedic Mathematics, Motilal Banarsi Das, New Delhi. 2. Vedic Ganita: Vihangama Drishti-1, SikshaSanskritiUthana Nyasa, New Delhi. 3. Vedic GanitaPraneta, Siksha Sanskriti Uthana Nyasa, New Delhi. 4. Vedic Mathematics: Past, Present and Future, Siksha Sanskriti Uthana Nyasa, New Delhi. 5. Leelavati, ChokhambbaVidya Bhavan, Varanasi. 6. Bharatiya Mathematicians, Sharda Sanskrit Sansthan, Varanasi.			

(For Students of other than Science Stream)