BAGALKOT UNIVERSITY

Mudhol Road, Jamkhandi – 587301 Dist: Bagalkote

PROGRAM /COURSE STRUCTURE AND SYLLABUS

of

MATHEMATICS

IV SEMESTER

Bachelor of Science (MATHEMATICS)

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

SEMESTER-IV										
Category	**Course code**	**Title of the Paper**	**Marks**			**Teaching hours/week**			**Credit**	**Duration of exams (Hrs)**
			IA	**SEE**	**Total**	**L**	**T**	**P**		
L7		Kannada Functional Kannada	40	60	100	4	-	-	3	2
L8		English	40	60	100	4	-	-	3	2
		Hindi								
		Sanskrit								
		Arabic								
		Urdu								
DSC4	126BSC04MATDSC07T	Partial Differential Equations and Integral Transforms	40	60	100	4	-	-	4	2
	126BSC04MATDSC08L	Partial Differential Equations and Integral Transforms	25	25	50	-	-	4	2	4
DSC4	Another Department Code	Another Department Course Title	40	60	100	4	-	-	4	3
			25	25	50	-	-	4	2	3
SEC	126COM03XXXSEC03T	Artificial Intelligence	20	30	50	1	-	2	2	2
VBC7	126COM04XXXVBC08B	Yoga/ Sports	25	-	25	-	-	2	1	-
VBC8	126COM03XXXVBC09B	H&W, /NCC/NSS/R&R/CA	25	-	25	-	-	2	1	-
Total Marks					**600**	**Semester Credits**			**22**	

SEMESTER – IV

<table>
<tr><td>Year</td><td>II</td><td colspan="3" rowspan="2"><u>Course Code:</u>
126BSC04MATDSC07T
<u>Course Title:</u>
Partial Differential Equations and Integral Transforms</td><td>Credits</td><td>04</td></tr>
<tr><td>Sem.</td><td>IV</td><td>Hours</td><td>56</td></tr>
<tr><td colspan="2">Course Pre-requisites, if any</td><td colspan="4">NA</td></tr>
<tr><td colspan="2">Formative Assessment Marks: 40</td><td colspan="2">Summative Assessment Marks:60</td><td colspan="2">Duration of ESA: 02 hrs.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">Course Learning Outcomes: This course will enable the students to
• Solve the Partial Differential Equations of the first order and second order
• Formulate, classify and transform partial differential equations into canonical form.
• Solve linear and non-linear partial differential equations using various methods; and apply these methods to solving some physical problems.
• Able to take more courses on wave equation, heat equation, and Laplace equation.
• Solve PDE by Laplace Transforms and Fourier Transforms</td></tr>
<tr><td>Unit No.</td><td colspan="4">Course Content</td><td>Hours</td></tr>
<tr><td>Unit I</td><td colspan="4">Basic concepts–Formation of a partial differential equations by elimination of arbitrary constants and functions, Solution of partial differential equations – Solution by Direct integration, Lagrange’s linear equations of the form Pp + Qq = R , Standard types of first order non-linear partial differential equations, The integrals of the non-linear equation by Charpit’s method.</td><td>14</td></tr>
<tr><td>Unit II</td><td colspan="4">Homogeneous linear partial differential equations with constant coefficients. Partial differential equations of the second order. Classification of second-order partial differential equations, canonical forms. Classification of second order linear equations as hyperbolic, parabolic, and elliptic. Solutions of the Heat equation, Laplace equation and Wave equation (using separation of variables).</td><td>14</td></tr>
<tr><td>Unit III</td><td colspan="4">Laplace Transforms: Definition, Basic Properties. Laplace transforms of some standard functions. Laplace transform of Periodic functions. Laplace transform of derivative and integral of a function. Heaviside function. Dirac-delta function. Convolution theorem. Inverse Laplace transforms and its properties. Solution of differential equations by using Laplace transforms.</td><td>14</td></tr>
</table>

Unit IV	**Fourier Series and Transforms:** Periodic functions. Fourier Coefficients. Fourier series of functions with period 2π and period $2L$. Fourier series of even and odd functions. Half range Cosine and Sine series. Fourier Transforms - Finite Fourier Cosine and Sine transform. Transforms of derivates**.** Applications of Fourier Transforms**.**	**14**
Recommended Leaning Resources		
Print Resources	**References:** 1. D. A. Murray, Introductory Course in Differential Equations, Orient and Longman 2. H. T. H.Piaggio, Elementary Treatise on Differential Equations and their Applications, CBS Publisher & Distributors, Delhi,1985. 3. G. F. Simmons, Differential Equations, Tata McGraw Hill. 4. S. L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, India, 2004. 5. M. D. Raisinghania, Ordinary Differential Equations & Partial Differential Equations, S. Chand & Company, New Delhi. 6. K.Sankara Rao, Introduction to Partial Differential Equations: PHI, Third Edition, 2015. 7. I. N. Sneddean, Elements of Partial differential equations, McGraw-Hill International Editions, 1986. 8. R. Murray and L. Spiegal (Schaum's Series), Laplace Transforms 9. Goel and Gupta, Laplace Transform. 10. Sudhir Kumar, Integral Transform Methods in Science & Engineering, CBS Engineering Series, 2017. 11. Murray R. Spiegal L, Fourier Transforms, Schaum' Series, 12. Earl David Rainville and Philip Edward Bedient–A short course in Differential Equations, Prentice Hall College Div; 6th Edition. 13. Sathya Prakash, Mathematical Physics, S Chand and Sons, New Delhi.	

Practicals

Year	II	**Course Code:** 126BSC04MATDSC08L **Course Title: Practical's on Partial Differential Equations and Integral Transforms**	**Credits**	02
Sem.	IV		**Hours**	56

Course Prerequisites, if any:	NA	
Formative Assessment Marks: 25	Summative Assessment Marks: 25	Duration of ESA: 03 hrs.

Course Outcomes	**Course Learning Outcomes**: This course will enable the students to • Learn Free and Open Source software (FOSS) tools or computer programming. • Solve problems on Partial Differential Equations and Integral Forms • To find Laplace transform of various functions. • To find the Fourier Transform of periodic functions. • To solve differential equations by using Integral transforms.

Course Content	**Hours**
Practicals/Lab Work to be performed in Computer Lab Programs using Scilab/Maxima/Python: Elements of Partial differential equations and Integral transforms using FOSS 1. Solutions of Linear Partial differential equations of type-1 to type-4 and Lagrange's method 2. Solutions of partial differential equation using Charpit's method. 3. Solutions of Second order homogenous partial differential equation with constant coefficients. 4. Solutions to the partial differential equations using separation of variables method (Heat/ Wave/Laplace). 5. Finding the Laplace transforms of some standard and periodic functions. 6. Finding the inverse Laplace transform of simple functions. 7. Verification of Convolution Theorem. 8. To solve ordinary linear differential equation using Laplace transform. 9. To solve Integral equation using Laplace transform. 10. To find full range Fourier series of some simple functions with period 2π and $2L$. 11. To find Half range sine and cosine series of some simple functions and plotting them. 12. To find Cosine Fourier transforms. 13. To find Sine Fourier transforms.	56

ASSESSMENT METHODS

Evaluation Scheme for Internal Assessment:

Theory:

Assessment Criteria	Marks
1st Internal Assessment Test for 30 marks of duration 1 hr after 8 weeks and 2nd Internal Assessment Test for 30 marks 1 hr after 15 weeks. Average of two tests should be considered.	30
Assignment	10
Total	**40**

Practical:

Assessment Criteria	Marks
Semester End Internal Assessment Test for 20 marks of duration 3 hrs.	20
Journal (Practical Record)	5
Total	**25**