BENGALURU NORTH UNIVERISTY

Curriculum for B Sc Degree & B Sc Honors with Mathematics as a Major/ Minor Subject

Framed According to the National Education Policy (NEP 2020)

B. Sc., MATHEMATICS SYLLABUS
(I,II,III & IV Semesters)

DEPARTMENT OF MATHEMATICS
Bengaluru North University
Tamaka, Near NH 75 in Kolar
KARNATAKA

AUGUST - 2022

BENGALURU NORTH UNIVERSITY
Department of Mathematics

Date: 27-08-2022

PROCEEDING OF THE BOS (UG) MATHEMATICS

The meeting of the Board of Studies in UG Mathematics for the year 2022-23 was held on Saturday, **27th August 2022** at 11.00am in the Department of Mathematics, Jnanabharathi Campus, Bengaluru University, Bengaluru-56. The following members attended the meeting:

1.	Dr. B. Chaluvaraju	Chairman	B. Ch
2.	Prof. Madhulatha Moses	Member	Madhulatha Moses
3.	Dr. Shivasharanappa Sigarkanti	Member	
4.	Prof. Nagaraddi B. Y.	Member	
5.	Prof. Mariya Khibthiya	Member	Mariya Khibthiya
6.	Prof. Kemparaju R.	Member	
7.	Dr. Abraham V. M	Member	
8.	Dr. Kemparaju S	Member	S.
9.	Prof. Suguna H. G.	Member	

Agenda and Resolution:

1. Final draft of the BNU-NEP-UG-Mathematics (III & IV Semester B. Sc.,) was checked and discussion held. The suggestions given by the BOS members and subject experts were incorporated.
2. The syllabus framed as per NEP-2020 and Karnataka State Higher Education Council guidelines. The syllabus prepared by teachers with a practical component (Mathematics practical with FOSS tools for programming). The BOS also resolved to change the list of practical experiments each year. Finally, the syllabus was approved by all the members.
3. The committee approved the updated panel examiners of UG (Mathematics).

The Chairman thanked the members for their cooperation.

B. Ch 27/08/2022
[Dr. B. CHALUVARAJU]
CHAIRMAN
BNU-BOS in UG-Mathematics

Dr. B. CHALUVARAJU M.Sc. Ph.D
Professor
Department of Mathematics
Bangalore University, Jnanabharathi
BENGALURU - 560 056.

Copy to:

1. The Registrar, Bengaluru North University, Bengaluru
2. The PS to the Vice-Chancellor, Bengaluru North University, Bengaluru

ASSESSMENT

Weightage for the Assessments (in percentage)

Type of Course	**Formative Assessment/ I.A.**	**Summative Assessment (S.A.)**
Theory	40%	60%
Practical	50%	50 %
Projects	40%	60%
Experiential Learning (Internship etc.)	--	--

Contents of B.Sc., (Basic/ Honors) with Mathematics as Major Subject (Model IIA)

Semester	Course No.	Theory/ Practical	Credits	Paper Title	Marks	
					S.A.	I.A.
I	MATDSCT1.1	Theory	4	Algebra - I and Calculus - I	60	40
	MATDSCP1.1	Practical	2	Theory based Practical's on Algebra -I and Calculus - I	25	25
	MATOET1.1	Theory	3	(A) Mathematics – I (B) Business Mathematics – I	60	40
II	MATDSCT2.1	Theory	4	Algebra - II and Calculus - II	60	40
	MATDSCP2.1	Practical	2	Theory based Practical's on Algebra - II and Calculus - II	25	25
	MATOET2.1	Theory	3	(A) Mathematics – II (B) Business Mathematics-II	60	40
Exit Option with Certificate						
III	MATDSCT3.1	Theory	4	Ordinary Differential Equations and Real Analysis-I	60	40
	MATDSCP3.1	Practical	2	Theory based Practical's on Ordinary Differential Equations and Real Analysis-I	25	25
	MATOET3.1	Theory	3	(A) Ordinary DifferentialEquations (B) Quantitative Mathematics (C) Vedic Mathematics	60	40
IV	MATDSCT4.1	Theory	4	Partial Differential Equations and Integral Transforms	60	40
	MATDSCP4.1	Practical	2	Theory based Practical's on Partial Differential Equations and Integral Transforms	25	25
	MATOET4.1	Theory	3	(A) Partial Differential Equations (B) Mathematical Finance (C) Mathematics for Social Sciences	60	40
Exit Option with Diploma						
V	MATDSCT5.1	Theory	3	Real Analysis and Complex Analysis	60	40
	MATDSCP5.1	Practical	2	Theory based Practical's on Real Analysis and Complex Analysis	25	25
	MATDSCT5.2	Theory	3	Ring Theory	60	40
	MATDSCP5.2	Practical	2	Theory based Practical's on Ring Theory	25	25

	MATDSET5.1	Theory	3	(A) Vector Calculus (B) Mechanics (C) Mathematical Logic	60	40
VI	MATDSCT6.1	Theory	3	Linear Algebra	60	40
	MATDSCP6.1	Practical	2	Theory based Practical's on Linear Algebra	25	25
	MATDSCT6.2	Theory	3	Numerical Analysis	60	40
	MATDSCP6.2	Practical	2	Theory based Practical's on Numerical Analysis	25	25
	MATDSET6.1	Theory	3	(A) Analytical Geometry in 3D (B) Number Theory (C) Special Functions (D) History of Bhârtîya Gaṇita	60	40
Exit Option with Bachelor of Arts, B.A./ Bachelor of Science, B.Sc. Degree						
VII	MATDSCT7.1	Theory	3	Discrete Mathematics	60	40
	MATDSCP7.1	Practical	2	Theory based Practical's on Discrete Mathematics	25	25
	MATDSCT7.2	Theory	3	Advanced Ordinary Differential Equations	60	40
	MATDSCP7.2	Practical	2	Theory based Practical's on Advanced Ordinary Differential Equations	25	25
	MATDSCT7.3	Theory	4	Advanced Analysis	60	40
	MATDSET 7.1	Theory	3	(A) Graph Theory (B) Entire and Meromorphic Functions (C) General Topology (D) Bhâratîya Trikoṇmiti Śâstra	60	40
	MATDSET 7.2	Theory	3	Research Methodology in Mathematics	60	40
VIII	MATDSCT8.1	Theory	4	Advanced Complex Analysis	60	40
	MATDSCT8.2	Theory	4	Advanced Partial Differential Equations	60	40
	MATDSCT8.3	Theory	3	Fuzzy Sets and Fuzzy Systems	60	40
	MATDSET 8.1	Theory	3	(A) Operations Research (B) Lattice theory and Boolean Algebra (C) Mathematical Modelling *(D) Aṅkapâśa (Combinatorics)*	60	40
	MATDSET 8.2	Research Project	6(3+3)	Research Project* OR Any Two of the following electives (A) Finite Element Methods	120 OR 60	80 OR 40

				(B) Cryptography (C) Information Theory and Coding (D) Graph Theory and Networking	60	40

Award of Bachelor of Science (B.Sc.,) Honors Degree in Mathematics

Credit Distribution for B.Sc., (Basic/Honors) with Mathematics as Major in the 3rd Year (For Model IIA)

Subject	Semester	Major/ Minor in the 3rd Year	Credits					
			Discipline Specific Core (DSC)	**Open Elective (OE)**	**Discipline Specific Elective (DSE)**	**AECC & Languages**	**Skill Enhancement Courses (SEC)**	**Total Credits**
Mathematics	I - IV	Major	4 Courses (4+2)x 4=24	4 Courses 3 x 4 = 12	---	(4+4=8) Courses 8x(3+1)=32	2 Courses 2x(1+1)= 4	72
Other Subject		Minor	24	--	--	--	--	24
								96
Mathematics	V & VI	Major	4 Courses 4x(3+2)=20	-----	2 Courses 2 x 3 = 06	---	2 Courses 2 x 2 = 4	30
Other Subject		Minor	10	--	--	--	--	10
								(96+40)**=136**
Mathematics	VII & VIII	Major	2 Courses 2x(3+2)=10 3 Courses 3 x 4 = 12 1 Course 1 x 3 = 3 Total=25	-----	2 Courses 2 x 3 = 6 Res.Meth 1 x 3 = 3 2 Courses 2 x 3 = 6 Total= 15	----	-----	40
Total No. of Courses			14	04	07	08	04	
								136+40**=176**

Syllabus for B.Sc., (Basic/ Honors) with Mathematics as Major & Minor Subject

SEMESTER – I

MATDSCT 1.1: Algebra - I and Calculus - I	
Teaching Hours: 4 Hours/Week	**Credits: 4**
Total Teaching Hours: 56 Hours	**Max. Marks: 100** **(S.A.-60 + I.A. – 40)**

Course Learning Outcomes: This course will enable the students to

- Learn to solve system of linear equations.
- Solve the system of homogeneous and non-homogeneous linear of m equations in n variables by using concept of rank of matrix, finding Eigen values and eigenvectors.
- Sketch curves in Cartesian, polar and pedal equations.
- Students will be familiar with the techniques of integration and differentiation of function with real variables.
- Identify and apply the intermediate value theorems and L'Hospital rule.

Unit-I: Matrix

Elementary row and column transformations (operations). Equivalent matrices, theorems on it. Row-reduced echelon form of a matrix. Rank of matrix, Problems.

Homogeneous and non-homogeneous system of m linear equations in n unknowns consistency criterion-criterion for uniqueness of solutions.

Eigen values and Eigen vectors of square matrix of order 2 and 3 standard properties, Matrix polynomial, Cayley-Hamilton theorem (with proof). Find A^{-1}, A^{-2} and A^2, A^3, A^4.

14 Hours

Unit-II: Differential Calculus-I

Limits, Continuity, Differentiability and properties. Properties of continuous functions. Intermediate value theorem, Rolle's Theorem, Lagrange's Mean Value theorem, Cauchy's Mean value theorem and examples. Taylor's theorem, Maclaurin's series (without proof), Indeterminate forms and evaluation of limits using L'Hospital rule.

Unit-III: Polar Co-ordinates

Polar coordinates, angle between the radius vector and tangent. Angle of intersection of two curves (polar forms), length of perpendicular from pole to the tangent, pedal equations. Derivative of an arc in Cartesian, parametric and polar forms, curvature of plane curve-radius of curvature formula in Cartesian, parametric, polar, and pedal forms- center of curvatureand asymptotes. **14 Hours**

Unit-IV: Successive Differentiation

n[th] Derivatives of Standard functions e^{ax+b}, $(ax+b)^n$, $\log(ax+b)$, $\sin(ax+b)$, $\cos(ax+b)$, $e^{ax}\sin(bx+c)$,$e^{ax}\cos(bx+c)$,Leibnitz theorem and its applications.

Extended polar co-ordinates-Singular and Multiple points.Tracing of curves (standardcurves).

14 Hours

Reference Books:

1. University Algebra - N.S. Gopala Krishnan, New Age International (P) Limited, 1986.
2. Theory of Matrices - B S Vatsa, New Age International Publishers, 2005.
3. Matrices - A R Vasista, Krishna Prakashana Mandir, 2003.
4. Differential Calculus - Shanti Narayan, S. Chand & Company, New Delhi, 2005.
5. Applications of Calculus, Debasish Sengupta, Books and Allied (P) Ltd., 2019.
6. Calculus – Lipman Bers, Holt, Rinehart & Winston, 1969.
7. Calculus - S Narayanan & T. K. Manicavachogam Pillay, S. Viswanathan Pvt. Ltd., vol. I & II, 1996.
8. Schaum's Outline of Calculus - Frank Ayres and Elliott Mendelson, 5th ed. USA: Mc. Graw Hill., 2008.
9. Text Book of B.Sc. Mathematics, G K Ranganath, S Chand & Company, 2018
10. Text Book of B.Sc . Mathematics G B Gururajachar, Academic Excellence series, 2019

Web Resources:

1. http://www.nptelvideos.in/2012/11/mathematics.html
2. https://www.my-mooc.com/en/categorie/mathematics
3. http://ocw.mit.edu/courses/mathematics/

MATDSCP 1.1: Practical's on Algebra - I and Calculus – I	
Practical Hours : 4 Hours/Week	**Credits: 2**
Total Practical Hours: 56 Hours	**Max. Marks: 50** **(S.A.-25 + I.A. – 25)**

Course Learning Outcomes: This course will enable the students to

1.Learn Free and Open Source Software (FOSS) tools for computer programming

2.Solve problem on algebra and calculus theory studied in MATDSCT 1.1 by using FOSS software's.

3.Acquire knowledge of applications of algebra and calculus through FOSS.

Practical/Lab Work to be performed in Computer Lab (FOSS)

Suggested Software's: Maxima/Python

1. Introduction to Python/Maxima.
2. Commands in Python/ Maxima.
3. Simple programs in Python/ Maxima
4. Matrices –Algebra of matrices.
5. Computation of rank of matrix.
6. Solving the system of homogeneous and non-homogeneous linear algebraic equations.
7. Computation of inverse of matrix using Cayley-Hamilton theorems.
8. Finding the angle between the radius vector and tangent and angle between two curves.
9. Finding the radius of curvature of the given curve.
10. Verification of mean value theorems.
11. Find the Taylor's and Maclaurin's expansion of the given function.
12. Indeterminate forms and evaluation of limits using L-Hospital Rule.
13. Finding the n^{th}derivative.
14. Tracing of standard curves.

SEMESTER – II

MATDSCT 2.1: Algebra - II and Calculus - II	
Teaching Hours : 4 Hours/Week	**Credits: 4**
Total Teaching Hours: 56 Hours	**Max. Marks: 100** **(S.A.-60 + I.A. – 40)**

Course Learning Outcomes: This course will enable the students to

- Recognize the mathematical objects called Groups.
- Link the fundamental concepts of groups and symmetries of geometrical objects.
- Explain the significance of the notions of Cosets, subgroups and cyclic groups
- Understand the concept of differentiation and fundamental theorems in differentiation and various rules.
- Find the extreme values of functions of two variables.
- Understand the concept of integral calculus and their significance.

Unit-I: Groups

Definition of a group with examples and properties. Subgroups, center of groups, order of an element of a group and its related theorems, cyclic groups, Coset decomposition, Factor groups, Lagrange's theorem and its consequences. Fundamental of Congruence, Fermat's theorem and Euler's ϕfunction.

14 hours

Unit-II: Partial Derivatives

Functions of two or more variables-explicit and implicit functions, partial derivatives. Homogeneous functions- Euler's theorem, total derivatives, differentiation of implicit and composite functions, Jacobians and standard properties and illustrative examples. Taylor's and Maclaurin's series for functions of two variables, Maxima-Minima of functions of two variables.

14 hours

Unit-III: Integral Calculus-I

Reduction formulae for $\int \sin^n x\ dx$, $\int \cos^n x\ dx$, $\int \tan^n x\ dx$, $\int \cot^n x\ dx$, $\int \sec^n x\ dx$, $\int \operatorname{cosec}^n x\ dx$, $\int \sin^m x \cos^n x\ dx$ with define limit –Problems. Application of integral Calculus: Computation of length of arc, plane area and surface area and volume of solids of revolutions for standard curves in Cartesian and polar forms.

14 hours

Unit-IV: Integral Calculus-II

Line integral: Definition of line integral and basic properties, examples on evaluation of line integrals. Double integral: Definition of Double integrals and basic properties, examples on evaluation of double integrals. Triple Integrals: Definition of triple integrals and basic properties, examples on evaluation of triple integral.

14 hours

Reference Books:

1. Topics in Algebra, I N Herstein, Wiley Eastern Ltd., New Delhi, 1991.
2. Higher algebra, Bernard & Child, Arihant, 1959.
3. Modern Algebra, Sharma and Vasista, Krishna Prakashan Mandir, Meerut, U.P., 2013.
4. Differential Calculus, Shanti Narayan, S. Chand & Company, New Delhi, 1962.
5. Integral Calculus, Shanti Narayan and P K Mittal, S. Chand and Co. Pvt. Ltd., 2013.
6. Schaum's Outline Series, Frank Ayres and Elliott Mendelson, 5th ed. USA: Mc. Graw Hill., 2008.
7. A Course in Abstract Algebra, Vijay K Khanna and S K Bhambri, Vikas Publications.
8. Text Book of B.Sc. Mathematics, G K Ranganath, S Chand & Company, 2018
9. Text Book of B.Sc . Mathematics G B Gururajachar, Academic Excellence series, 2019

Web Resources:

1. http://www.nptelvideos.in/2012/11/mathematics.html
2. https://www.my-mooc.com/en/categorie/mathematics
3. http://ocw.mit.edu/courses/mathematics/

PRACTICAL

MATDSCP 2.1: On Algebra -II and Calculus – II	
Practical Hours : 4 Hours/Week	**Credits: 2**
Total Practical Hours: 56 Hours	**Max. Marks: 50 (S.A.-25 + I.A. – 25)**

Course Learning Outcomes: This course will enable the students to

- Learn Free and Open Source Software (FOSS) tools for computer programming
- Solve problem on algebra and calculus by using FOSS software's.
- Acquire knowledge of applications of algebra and calculus through FOSS

Practical/Lab Work to be performed in Computer Lab

Suggested Software's: Maxima/Python.

1. Program to construct Cayley's table and test abelian for given finite set.
2. Program to find all possible cosets of the given finite group.
3. Program to find generators and corresponding possible subgroups of a cyclic group.
4. Programs to verification of Lagrange's theorem with suitable examples.
5. Program to verify the Euler's ϕfunction for a given finite group.
6. Program to verify the Euler's theorem and its extension.
7. Program to find Jacobian.
8. Programs to construct series using Maclaurin's expansion for functions of two variables.
9. Program to verify the given Reduction formula with or without limits.
10. Program to evaluate the Surface area, volume of solid of revolutions for standard curves
11. Program to evaluate the line integrals with constant and variable limits.
12. Program to evaluate the Double integrals with constant and variable limits.
13. Program to evaluate the Triple integrals with constant and variable limits.

Syllabus for B.Sc. with Mathematics as Major Subject &B.Sc. (Hons) Mathematics as Minor Subject

SEMESTER–III

(2022-23 onwards)

MATDSCT 3.1: Ordinary Differential Equations and RealAnalysis–I	
Teaching Hours: 4Hours/Week	**Credits:4**
Total Teaching Hours: 56Hours	**Max. Marks:100 (SEE−60+I.A.−40)**

Course Learning Outcomes: This course will enable the students to:

- To model problems in nature using Ordinary Differential Equations.
- Formulate differential equations for various mathematical models / methods.
- Apply these techniques to solve and analyze various mathematical models.
- Understand the fundamental properties of the real numbers that lead to definesequence and series, the formal development to real analysis.
- Learn the concept of Convergence and Divergence of a sequence and series.

Ordinary Differential Equations:

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. 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. **14hrs**

Unit II: Linear differential equations of the n^{th} order with constant coefficients. Complementary function, Particular Integrals when the RHS is of the form e^{ax}, $sin(ax+b)$, $cos(ax+b)$, x^n, $e^{ax}\,V$ and $x\,V$, where V is a function of x. Cauchy – Euler equations, Method of variation of parameters. Second order ordinary linear differential equations with variable coefficients: (i) When a part of complementary function (CF) is given, **(ii)** Change of dependent variable, (iii) Change of independent variable, and (iv) Method of variation of parameters. Total and Simultaneous differential equations. **14hrs**

Real Analysis – I:

Unit III: Sequences: Sequences of real numbers, Supremum and infimum of a sequences. Bounded sequences. Limit of a sequence, convergent, divergent, and oscillatory sequences. Algebra of convergent sequences. Monotonic sequences and its properties. Nature of standard sequences. Cauchy's general principle for convergence of a sequence.

14Hrs

Unit IV: Infinite Series: Definition of convergent, divergent and oscillatory series. Series ofnon-negative terms. Geometric series, P-series (Harmonic series). Comparison tests for positive term series. D'Alembert's ratio test, Raabe's test, Cauchy's Root test. Alternating series. Leibnitz's theorem. Absolute convergence and conditional convergence of a series. Summation of series: Binomial, exponential and logarithmic. **14hrs**

Reference Books:

1. M. D. Raisinghania, Ordinary Differential Equations & Partial Differential Equations,
   S. Chand & Company, New Delhi, 2013.
2. J. Sinha Roy and S. Padhy: A course of Ordinary and Partial Differential Equation,Kalyani Publishers, New Delhi, 2018.
3. D. Murray and Daniel Alexander, Introductory Course in Differential Equations, Orient Blackswan, India, 1967.
4. W. T. Reid, Ordinary Differential Equations, John Wiley, New Delhi, 2010.
5. M. L. Khanna, Differential Equations, Jai Prakash Nath & Co. Meerut, 1997.
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, 3rdEd., John Wiley andSons (Asia) Pvt. Ltd., Singapore, 2000.
8. Gerald G. Bilodeau, Paul R. Thie, G. E. Keough, An Introduction to Analysis, 2ndEd.,Jones & Bartlett, 2010.
9. K. A. Ross, Elementary Analysis: The Theory of Calculus (2nd Ed), Springer, 2013.

Web Resources:

1. http://www.nptelvideos.in/2012/11/mathematics.html
2. https://www.my-mooc.com/en/categorie/mathematics

http://ocw.mit.edu/courses/mathematics/

PRACTICAL

MATDSCP3.1: Practical's on Ordinary Differential Equations and Real Analysis–I	
Teaching Hours:4Hours/Week	**Credits:2**
Total Teaching Hours:56Hours	**Max.Marks:50 (SEE-25+I.A.–25)**

Course Learning Outcomes: This course will enable the students to on experience of

- To model problems in nature using Ordinary Differential Equations.
- Solving exact differential equations.
- Plotting orthogonal trajectories.
- Finding complementary function and particular integral of linear and homogeneousdifferential equations.
- Acquire knowledge of applications of real analysis and differential equations.
- Verification of convergence/divergence of different types of series.

Practical's/Lab Work to be performed in Computer Lab: Use open-source software (FOSS) to executive the practical problems. Maxima/Scilab/MatLab/Mathematica/Python).

1.Fundamentals of Ordinary differential equations and Real analysis using FOSS.
2.Test for exactness of differential equation and solving.
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 complimentary function of linear homogeneous differential equations withconstant coefficients.
7.Finding the particular integral of linear homogeneous differential equations withconstant coefficients.
8.Solution of second order ordinary linear differential equations with variable coefficientsby the method of variation of parameters.
9.Test the convergence of sequences
10.Test the convergence of series using partial sums.
11.Test the convergence of series by using D'Alembert's ratio Test
12.Test the convergence of series by using Raabe's Test
13.Convergence of alternating series using Leibnitz's theorem.
14.Summation of series.

SEMESTER–IV

MATDSCT4.1:Partial Differential Equations and Integral Transforms	
Teaching Hours: 4Hours/Week	**Credits:4**
Total Teaching Hours:56Hours	**Max.Marks:100** **(SEE – 60+I.A.–40)**

Course Learning Outcomes: This course will enable the students to

- Solve the Partial Differential Equations (PDE) 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; andapply these methods to solving some physical problems.
- Able to take more courses on wave equation and heat equations.
- Solve PDE by Laplace Transforms and Fourier Transforms.

Partial Differential Equations:

Unit I: Basic concepts–Formation of a partial differential equations by elimination of arbitrary constants and functions, Solution of partial differential equations: Lagrange's linear equations of the form Pp + Qq = R , Standard types of first order non-linear partial differential equations, Charpit's method. **14Hrs**

Unit II: Homogeneous and non-homogeneous linear partial differential equations with constant coefficients, Partial differential equations of the second order. Classification of second-order partial differential equations, canonical forms. Solutions of the Heat equation and Wave equation (using Fourier series). **14 Hrs**

Integral Transforms:

UnitIII: 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**.,** **14Hrs**

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**.** **14Hrs**

Reference Books:

1. D. A. Murray, Introductory Course in Differential Equations, Franklin Classics Pub.,2018
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 Publishing Company, 1974
4. S. L. Ross, Differential Equations, 3rd Ed., John Wiley and Sons, India, 2007.
5. M. D. Raisinghania, Ordinary Differential Equations & Partial Differential Equations,20th Ed., S. Chand & Company, New Delhi, 2013.
6. K. Sankara Rao, Introduction to Partial Differential Equations: PHI, 3rd Edition, 2015.
7. I. N. Sneddean, Elements of Partial differential equations, McGraw-Hill InternationalEditions, 1986.
8. Murray R. Spiegall,, Laplace Transforms, Schaum's Series,1965.
9. J. K. Goyal and K. P. Gupta, Laplace Transform, Pragati Prakashan Meerut, 30th Ed., 2017.
10. Sudhir Kumar, Integral Transform Methods in Science and Engineering, CBSEngineering Series, 2017.
11. Murray R. Spiegel, Fourier Analysis, Schaum's Series, 1974.
12. Earl David Rainville and Philip Edward Bedient–A short course in DifferentialEquations, Prentice Hall College Div, 6thEdition, 1974.
13. Sathya Prakash, Mathematical Physics, Sultan Chand & Sons, New Delhi, 2021.

Web Resources:

1. http://www.nptelvideos.in/2012/11/mathematics.html
2. https://www.my-mooc.com/en/categorie/mathematics

http://ocw.mit.edu/courses/mathematics/

PRACTICALS

MATDSCP4.1:Practical's on Partial Differential Equations and Integral Transforms	
Practical Hours:4Hours/Week	**Credits: 2**
Total Teaching Hours:56Hours	**Max.Marks:50 (S.A.-25+I.A.–25)**

Mathematics practical with Free and open-Source Software (FOSS) tools for computerprograms:

Course Learning Outcomes: This course will enable the students to

- Learn Free and Open Sources of 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.

Programs using Scilab/Maxima/Python:

1. Elements of Partial differential equations and Integral transforms using FOSS.
2. Solutions of Linear Partial differential equations of Type-1 and Type-2.
3. Solutions of Linear Partial differential equations of Type-3 and Type-4.
4. Solution of Partial differential equation using Char pit's method.
5. Finding the complimentary function of second order homogenous partial differential equationwith constant coefficients.
6. Finding the particular integral of second order homogenous partial differential equation withconstant coefficients.
7. Solutions to Heat and Wave equations using Fourier series method
8. Finding the Laplace transform of some standard functions.
9. Finding the inverse Laplace transform of some simple functions.
10. Verification of Convolution Theorem.
11. To solve ordinary linear differential equation using Laplace transform.
12. To find the Fourier series of some simple functions with period 2π and 2L.
13. To find Cosine Fourier transforms
14. To find Sine Fourier transforms