

B.Sc. Mathematics

Syllabus

AFFILIATED COLLEGES

Program Code: 22A

2025 – 2026 onwards

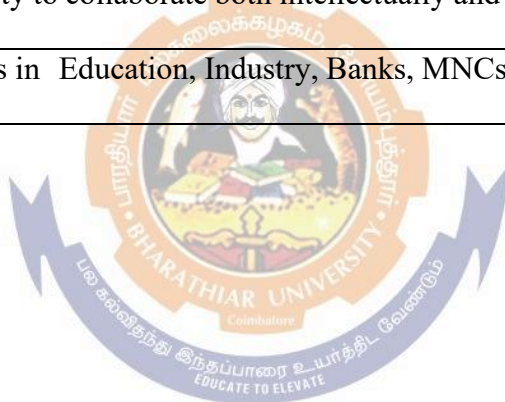


BHARATHIAR UNIVERSITY

(A State University, Accredited with “A++” Grade by NAAC,
Ranked 21st among Indian Universities by MHRD-NIRF)

Coimbatore - 641 046, Tamil Nadu, India

Program Educational Objectives (PEOs)	
The B. Sc. Mathematics program describe accomplishments that graduates are expected to attain within five to seven years after graduation	
PEO1	Acquire knowledge in functional areas of Mathematics and apply in all the fields of learning.
PEO2	Recognise the need for life long learning and demonstrate the ability to explore some mathematical content independently.
PEO3	Employ mathematical ideas encompassing logical reasoning, analytical, numerical ability, theoretical skills to model real-world problems and solve them.
PEO4	Develop critical thinking, creative thinking, self-confidence for eventual success in career.
PEO5	Analyze, interpret solutions and to enhance their Entrepreneurial skills, Managerial skill and leadership
PEO6	To prepare the students to communicate mathematical ideas effectively and develop their ability to collaborate both intellectually and creatively in diverse contexts.
PEO7	Rewarding careers in Education, Industry, Banks, MNCs and pursue higher studies



Program Specific Outcomes (PSOs)	
After the successful completion of B. Sc. Mathematics program, the students are expected to	
PSO1	Maintain a core of mathematical and technical knowledge that is adaptable to changing technologies and provides a solid foundation for extended learning.
PSO2	Identify the applications of Mathematics in other disciplines and society.
PSO3	Develop an in-depth knowledge in Mathematics appreciating the connections between theory and its applications .
PSO4	Demonstrate their mathematical modeling ability, problem solving skills, creative talent and power of communication necessary for various kinds of employment.
PSO5	Develop mathematical aptitude and the ability to think abstractly.
PSO6	Learn independently and improve ones performance.
PSO7	Students are equipped to appear competitive examinations.



Program Outcomes (POs)	
On successful completion of the B. Sc. Mathematics program	
PO1	Students are empowered with analytical and logical skills-to formulate results and construct mathematical argument.
PO2	Ability to organize, analyze and interpret data accurately in both academic and non -academic context.
PO3	Demonstrate effective communication of mathematical ideas and creative thinking skills to facilitate solving real world problems as a team and independently.
PO4	Appreciate and identify the connections between Mathematics and other disciplines.
PO5	Competency to obtain employment in education, public and private sectors..
PO6	Identify the area of interest for extended learning from the understanding gained from the domain and allied areas of Mathematics.
PO7	Develop mathematical aptitude and make critical observations.
PO8	Garner innovative ideas to face global challenges.
PO9	Instill a sense of responsibility in tackling professional and social issues ethically.
PO10	Trigger their passion for research in unexplored areas of Mathematics.



BHARATHIAR UNIVERSITY: COIMBATORE 641 046

**B. Sc. Mathematics Curriculum (Affiliated Colleges)
(CBCS PATTERN)**

(For the students admitted from the academic year 2025-2026 and onwards)

Scheme of Examination

Part	Title of the Course	Hours/ Week	Examination				Credits
			Duration in Hours	Maximum Marks			
				CIA	CEE	Total	
	Semester I						
I	Language - I	6	3	25	75	100	4
II	English - I	6	3	25	75	100	4
III	Core Paper I - Classical Algebra	4	3	25	75	100	4
III	Core Paper II-Calculus	5	3	25	75	100	4
III	Allied A : Paper I Chosen by the college	7	3	25	75	100	4
IV	Environmental Studies*	2	3	-	50	50	2
	Total	30		125	425	550	22
	Semester II						
I	Language – II	6	3	25	75	100	4
II	English – II	4	3	25	25	50@@	2
II	Effective English :Language Proficiency for Employability http://kb.naanmudhalvan.in/Special:Filepath/Cambridge_Course_Details.pdf	2	-	25	25	50##	2
III	Core Paper III - Analytical Geometry	4	3	25	75	100	4
III	Core Paper IV-Trigonometry, Vector Calculus and Fourier Series	5	3	25	75	100	4
III	Allied A: Paper II Chosen by the College	7	3	25	75	100	4
IV	Value Education – Human Rights*	2	3	-	50	50	2
	Total	30		150	400	550	22
	Semester III						
I	Language – III	6	3	25	75	100	4
II	English – III	5	3	25	75	100	4
III	Core Paper V- Differential Equations and Laplace Transforms.	3	3	25	75	100	4

III	Core Paper VI- Statics	3	3	25	75	100	4
III	Allied B : Paper I – Chosen by the college	5	3	20	55	75	3
IV	#Skill based Subject – Programming in C	2	3	20	55	75	3
IV	#Skill based Subject – Programming in C Practical	1	3	10	15	25	1
IV	Naan Mudhalvan course	2	-	25	25	50 ^{##}	2
IV	Tamil** / Advanced Tamil* (OR) Non-major elective - I (Yoga for Human Excellence)* / Women's Rights*	2	3	-	50	50	2
v	#Health and Wellness	1	-	25		25	1
	Total	30		200	500	700	28
Semester IV							
I	Language – IV	6	3	25	75	100	4
II	English – IV	5	3	25	75	100	4
III	Core Paper VII-Dynamics	3	3	25	75	100	4
III	Core Paper VIII – Numerical Methods	3	3	25	75	100	4
III	Allied B - Paper II Chosen by the college	4	3	20	55	75	3
III	Allied B – Paper II Chosen by the college (For Practical Paper)	2	3	20	30	50	2
IV	Skill based Subject – Data Structure	3	3	25	75	100	4
IV	Naan mudhalvan course:	2	-	25	25	50 ^{##}	2
IV	Tamil**/Advanced Tamil* (OR) Non-major elective -II (General Awareness*)	2	3	-	50	50	2
	Total	30		190	535	725	29
Semester V							
III	Core Paper IX-Real Analysis-I	5	3	25	75	100	4
III	Core Paper X- Complex Analysis-I	5	3	25	75	100	4
III	Core Paper XI- Modern Algebra-I	5	3	25	75	100	4
III	Core Paper XII- Discrete Mathematics	5	3	25	75	100	4
III	Elective I	5	3	20	55	75	3
IV	# Skill based Subject – R Programming	2	3	20	55	75	3
IV	# Skill based Subject – R Programming- Practical	1	3	10	15	25	1
IV	Naan mudhalvan course:	2	-	25	25	50 ^{##}	2
	Total	30		175	450	625	25

	Semester VI						
III	Core Paper XIII - Real Analysis- II	5	3	25	75	100	4
III	Core Paper XIV - Complex Analysis-II	5	3	25	75	100	4
III	Core Paper XV -Modern Algebra-II	5	3	25	75	100	4
III	Elective II	5	3	20	55	75	3
III	Elective III	5	3	25	75	100	4
IV	#Skill Based Subject – Python Programming	2	3	20	55	75	3
IV	#Python Programming- Practical	1	3	10	15	25	1
IV	Naan Mudhalvan course	2	-	25	25	50 ^{##}	2
V	Extension Activities ** / Swachh Bharath @			25		25	1
	Total	30		200	450	650	26
	Grand Total	180		1040	2760	3800	152
# All computer papers have theory and practical exams							
	Theory			20	55	75	100
	Practicals			10	15	25	
Note							
^{##} Naan Mudhalvan –Courses- external 25 marks will be assessed by Industry and internal will be offered by respective course teacher.							
* No Continuous Internal Assessment (CIA). Only University Examinations							
** No University Examinations. Only Continuous Internal Assessment (CIA).							
@ Swachh Bharath Internship Scheme (SBIS) is to be added for 2 credits in the extension activities.							
@@ University semester examination will be conducted for 50 marks (As per existing pattern of Examination) and it will be converted for 25 marks.							
# New Course /Modified course							
Allied Subjects(Colleges can choose any two subjects)							
1.Physics 2. Chemistry 3.Accountancy 4.Statistics.							
List of Elective papers							
(Colleges can choose any one of the paper as electives)							
Elective – I	A	Astronomy- I					
	B	Operations Research-I					
Elective – II	A	Astronomy—II					
	B	Operations Research -II					

Elective – III	A	Graph Theory
	B	Automata Theory & Formal Languages
	C	Programming in C++ #
	D	Number Theory
	E	Introduction to Big Data





First Semester

Course code		CLASSICAL ALGEBRA	L	T	P	C
Core/Elective/Supportive		Core Paper – I	4	-	-	4
Pre-requisite		Knowledge of Convergence of Series and roots of equations	Syllabus Version		2025 - 2026	
Course Objectives:						
1.To enable the students to learn Binomial, Exponential, Logarithmic series and their application to summation of series.						
2.To study intensively the convergence and divergence of different types of series.						
3. To demonstrate the standard methods to solve both polynomial and transcendental type equations.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Know the concept of Binomial, Exponential, Logarithmic series and their application to summation of series.					K1
2	Acquire a clear knowledge regarding methods to find an approximate root of the equations.					K2
3	Apply the appropriate tests to find the convergence or divergence of an infinite series.					K3
4	Apply Descartes's rule of signs to find the number of positive and negative roots if any in a polynomial equation.					K3
5	Analyze the relation between roots and coefficients of the polynomial equations.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1	Summation Of Series Using Binomial And Exponential Theorem					12 hours
Binomial, exponential theorems - their statements only- their immediate application to summation and approximation only.						
Unit:2	Logarithmic Series					12 hours
Logarithmic series theorem - statement and proof - Immediate application to summation and approximation only.						
Unit:3	Convergence And Divergence Of Series					12 hours
Convergency and divergency of series –definitions, elementary results- comparison tests- De - Alembert’s and Cauchy’s tests.						
Unit:4	Theory Of Equations					12 hours
Roots of an equation- Relations connecting the roots and coefficients- transformations of equations – Reciprocal Equations- Descarte’s rule of signs.						

Unit:5	Multiple Roots	12 hours
Multiple roots - Rolle's theorem - position of real roots of $f(x) = 0$ – Horner's method.		
	Total Lecture hours	60 hours
Text Book(s)		
1	Algebra -T.K .Manicavachasam Pillai, T.Natarajan& K.S Ganapathy, (S.Viswanatham Printers & Publishers Private Ltd-2006)	
Reference Books		
1	Mathematics for B.Sc. Branch I -Vol. I- P. Kandasamy and K.Thilagavathy (For B.Sc-I semester) (S. Chand and Company Ltd, New Delhi, 2004.)	
2	Algebra - N.P.Bali(Publisher: Laxmi Publications-New Delhi Edition 2010) .	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://www.brainkart.com/article/Introduction-to-Binomial,-Exponential-and-Logarithmic-series_35107/	
2	http://www.ijernigan.com/172/ConvergenceDivergenceNotes.pdf	
3	http://home.iitk.ac.in/~psraj/mth101/lecture_notes/Lecture11-13.pdf https://maths4uem.files.wordpress.com/2015/09/1028-infinite-series.pdf https://ocw.mit.edu/high-school/mathematics/exam-prep/concept-of-series/series-convergence-divergence/	
Course Designed By: 1.Dr.A.Manonmani 2.Dr. E..Tamilmani		

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	S	S	S	M	S	S
CO2	S	M	M	M	S	S	S	M	M	S
CO3	S	M	S	S	S	S	S	S	S	S
CO4	S	M	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

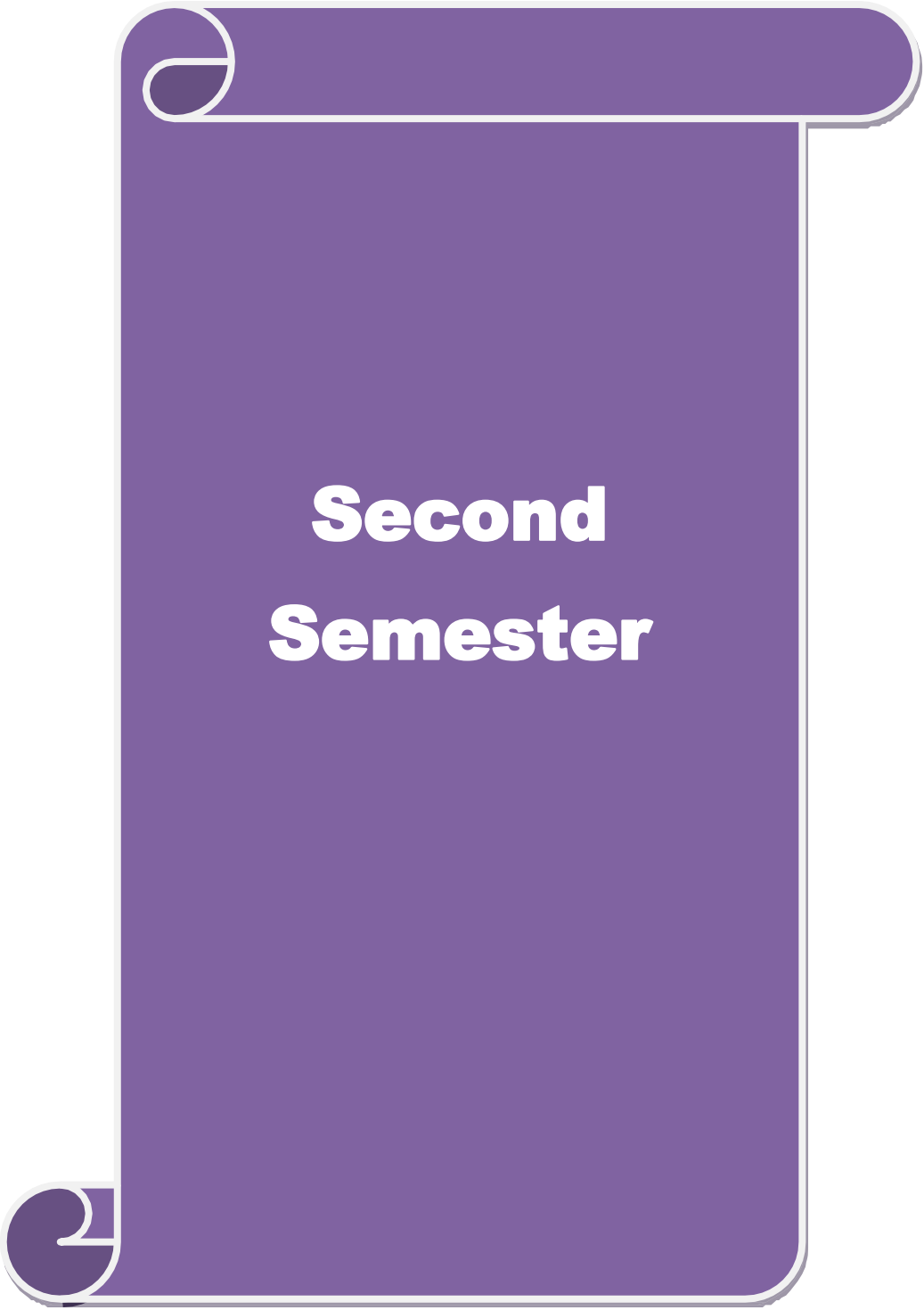
*S-Strong; M-Medium; L-Low

Course code		CALCULUS	L	T	P	C
Core/Elective/Supportive		Core Paper – II	5	-	-	4
Pre-requisite		Basic Mathematics	Syllabus Version		2025 - 2026	
Course Objectives:						
To orient the students to get an idea of curvatures, Integration of different types of functions, its geometrical applications, double, triple and improper integrals.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Identify areas in Mathematics and other fields where Calculus is useful.					K1
2	Understand the concepts of Evolutes and Envelopes, methods to find curvature and evolutes.					K2
3	Apply the concept of change of variables in double and triple integrals.					K3
4	Apply double, triple integral to find the area and volume respectively.					K3
5	Apply the Beta and gamma function to solve the multiple integrals.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1						
Curvature			15 hours			
Curvature-radius of curvature in Cartesian and polar forms-evolutes and envelopes - total differentiation.						
Unit:2						
Reduction formulae and multiple integrals			15 hours			
Reduction formulae- problems- evaluation of double integral						
Unit:3						
Multiple Integrals			15 hours			
Triple integrals- applications to calculations of areas and volumes-areas in polar coordinates -						
Unit:4						
Change Of Variables In Double And Triple Integrals			15 hours			
Change of order of integration in double integral -Jacobians- Change of variables in double and triple integrals.						
Unit:5						
Beta And Gamma Functions			15 hours			
Beta and Gamma integrals-their properties, relation between them- evaluation of multiple integrals using Beta and Gamma functions.						
Total Lecture hours			75 hours			
Text Book(s)						
1	Calculus Vol 1 - S. Narayanan and T.K.M. Pillai. (Viswanathan Publishers 2008)					
2	Calculus Vol 2- S. Narayanan and T.K.M. Pillai.(Viswanathan Publishers 2008)					

Reference Books	
1	Mathematics for BSc – Vol I and. II - P. Kandasamy &K.Thilagarathy(S.Chand and Co-2004)
2	A Text book of calculus- Shanthi Narayanan &J.N.Kapoor(S.Chand& Co.2014)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://ocw.mit.edu/resources/res-18-006-calculus-revisited-single-variable-calculus-fall-2010/study-materials/ https://www.whitman.edu/mathematics/calculus_online/chapter15.html
2	https://www.khanacademy.org/math/calculus-home
3	https://www.sac.edu/FacultyStaff/HomePages/MajidKashi/PDF/MATH_150/Bus_Calculus.pdf
4	http://nptel.ac.in/courses/111104085/29
5	http://www.math.odu.edu/~jhj/Volume-1.PDF http://www.math.odu.edu/~jhj/Volume-2.PDF https://www.math.cmu.edu/~wn0g/2ch6a.pdf
6	https://nptel.ac.in/courses/111/105/111105122/http://www.staff.ttu.ee/~lpallas/multipleintegrals.pdf
Course Designed By: 1.Dr. S. Nareshkumar 2.Dr. A. Prasanna	

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	S	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	M	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	M	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low



Second Semester

Course code		ANALYTICAL GEOMETRY	L	T	P	C
Core/Elective/Supportive		Core Paper – III	4	-	-	4
Pre-requisite		Basic Knowledge In Trigonometry & Vector Algebra.	Syllabus Version	2025 - 2026		
Course Objectives:						
Emphasis to enhance student knowledge in three dimensional analytical geometry and the geometrical aspects of three dimensional figs, viz, sphere, cone and cylinder.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Gain knowledge about the regular geometrical figures and their properties.					K1
2	Describe the geometric concepts.					K2
3	Find equation to tangent, normal at a point on a conic					K3
4	Analyze condition of tangency and find the tangent plane to the central conicoid					K4
5	Analyze conics to explain natural phenomenon					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1						
Straight Lines			12 hours			
Analytical Geometry 3D-Straight lines-coplanarity of straight line-shortest distance (S.D) and equation of S.D between two lines-simple problems.						
Unit:2						
Sphere			12 hours			
Sphere: standard equation of sphere-results based on the properties of a sphere-tangent plane to a sphere- equation of a circle.						
Unit:3						
Cone			12 hours			
Cone whose vertex is at the origin- envelope cone of a sphere-right circular cone-basic problems.						
Unit:4						
Cylinder			12 hours			
Equation of a cylinder- envelope cone of a cylinder-right circular cylinder-basic problems.						
Unit:5						
Conicoid			12 hours			
Nature of a conicoid- standard equation of central conicoid –enveloping cone- tangent plane- condition for tangency.						
Total Lecture hours			60 hours			
Text Book(s)						
1	Analytical Geometry - P. Durai Pandian & others (Emerald Publishers 1998).					

Reference Books	
1	Solid Geometry- N.P. Bali (Laxmi Publications (P) Ltd,2015)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	http://www.brainkart.com/article/Three-Dimensional-Analytical-Geometry_6453/
2	http://egyankosh.ac.in/bitstream/123456789/11990/1/Unit-2.pdf
Course Designed By: 1.Dr. I. Mohammed Ali Jaffer 2.Dr. P.Karthikeyan	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	S	M	S	S	S	S	S
CO2	S	M	S	S	S	S	S	M	S	S
CO3	S	M	S	M	M	M	S	S	S	S
CO4	S	M	S	S	M	S	M	S	S	S
CO5	S	S	S	S	M	S	S	S	S	S

*S-Strong; M-Medium; L-Low

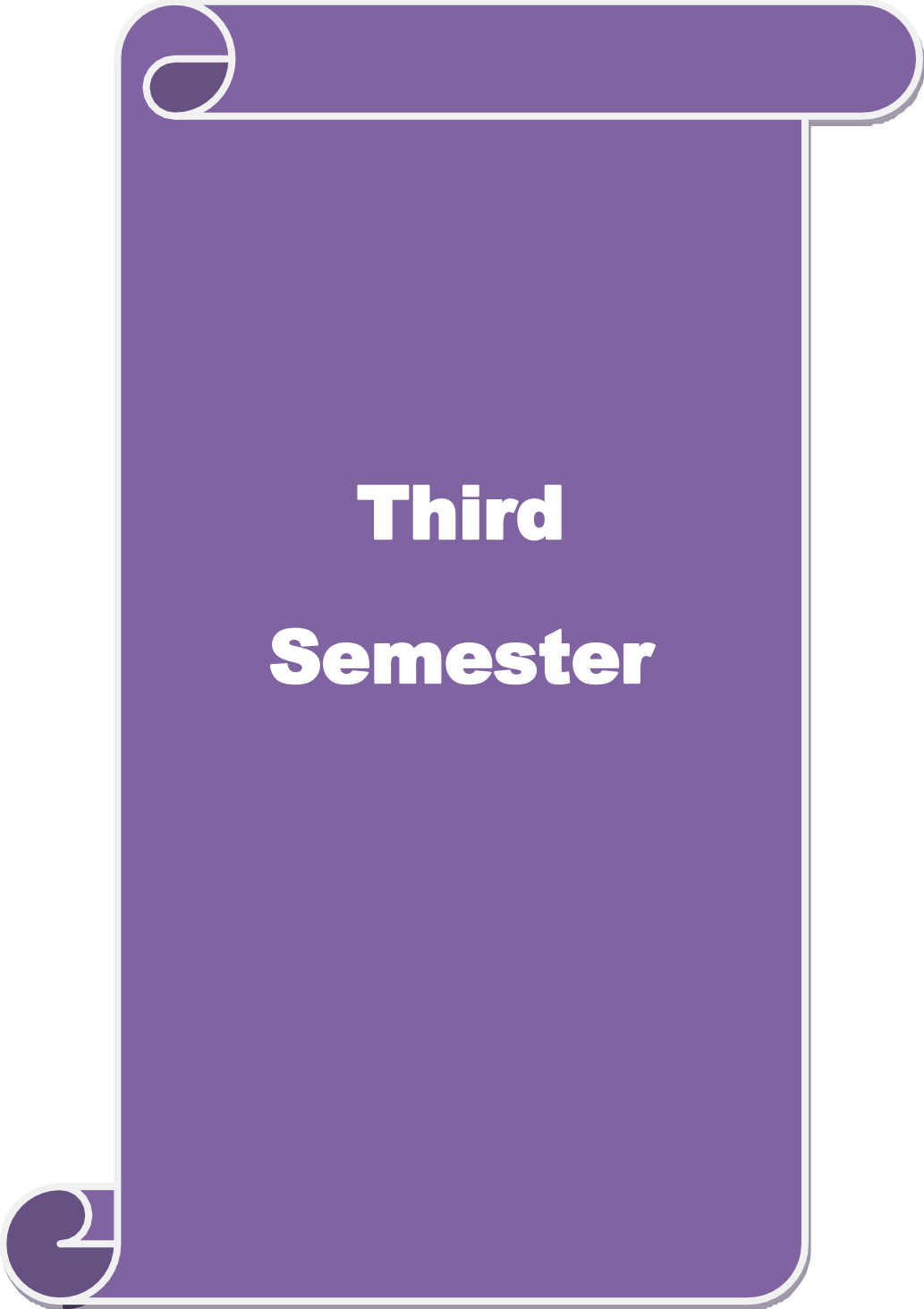


Course code		TRIGONOMETRY, VECTOR CALCULUS AND FOURIER SERIES	L	T	P	C
Core/Elective/Supportive		Core Paper – IV	5	-	-	4
Pre-requisite		Knowledge In Vector Algebra, Differentiation, Integration	Syllabus Version	2025 - 2026		
Course Objectives:						
To enable the students to learn about the expansion of trigonometric, hyperbolic functions, vector calculus and the expansions of Fourier series.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Know the expansion of trigonometric functions and hyperbolic functions.					K1
2	Acquire the basic knowledge of vector differentiation and vector integration.					K2
3	Determine and apply the important quantities associated with vector fields such as the divergence, curl and scalar potential.					K3
4	Understand and find Fourier series of a given periodic function.					K3
5	Examine line integral, surface integral, volume integral and inter-relations among them.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1	Expansion In Series				15 hours	
Expansion in Series – Expansion of $\cos \theta$, $\sin \theta$ in a series of cosines and sines of multiples of θ – Expansions of $\cos n\theta$, $\sin n\theta$ and $\tan n\theta$ in powers of sines, cosines and tangents – Expansion of $\sin \theta$, $\cos \theta$ and $\tan \theta$ in powers of θ – hyperbolic functions and inverse hyperbolic functions.						
Unit:2	Logarithm Of Complex Quantities And Summation Of Series				15 hours	
Logarithm of complex quantities - summation of series – when angles are in arithmetic progression – $C + iS$ - method of summation – method of differences.						
Unit:3	Vector Differentiation				15 hours	
Scalar and vector fields –Differentiation of vectors – Gradient, Divergence and Curl-Solenoidal and irrotational vectors-Laplacian Operator.						
Unit:4	Vector Integration				15 hours	
Integration of vectors – line integral – surface integral – Green’s theorem in the plane – Gauss divergence theorem – Stoke’s theorem – (Statements only) - verification of the above said theorems.						
Unit:5	Fourier Series				15 hours	
Periodic functions – Fourier series of periodicity 2π – half range series.						

	Total Lecture hours	75 hours
Text Book		
1	Mathematics for B.Sc. Branch I, Volume I, II and IV - P.Kandasamy&K.Thilagavathi(S.Chand and Company Ltd, New Delhi, 2004.)	
Reference Books		
1	Vector Analysis -P. Duraipandian, Laxmiduraipandian (Revised Edition-Reprint 2005 Emerald Publishers)	
2	Trigonometry -T.K. Manichavasagam Pillai and S.Narayanan(Viswanathan Publishers and Printers Pvt. Ltd 2009.)	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	http://www.math.odu.edu/~jhh/Volume-2.PDF http://www-math.mit.edu/~djkl/18_01/chapter20/section03.html https://www.whitman.edu/mathematics/calculus_online/chapter16.html http://www.mecmath.net/calc3book.pdf	
2	http://www.nptelvideos.in/2012/11/mathematics-iii.html	
3	https://nptel.ac.in/courses/111107108/1	
Course Designed By 1.Dr.C.Janaki 2. Ms. S.Sobia		

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	M	S	S	M	M	S	S
CO2	S	M	S	S	M	M	M	S	M	S
CO3	S	M	S	S	M	M	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	M
CO5	S	S	S	S	M	S	S	S	S	S

*S-Strong; M-Medium; L-Low



Third Semester

Course code		DIFFERENTIAL EQUATIONS AND LAPLACE TRANSFORMS	L	T	P	C
Core/Elective/Supportive		Core Paper – V	3	-	-	4
Pre-requisite		Knowledge of Ordinary and Partial Derivatives	Syllabus Version			2025-2026
Course Objectives:						
To impart knowledge on the method of solving ordinary differential Equations of First Order and Second Order, Partial Differential equations, Laplace Transforms, its inverse and application of Laplace Transform to solve the first and second Order Differential Equations with constant coefficients.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Acquire knowledge to solve Differential and Partial Differential Equations.					K1
2	Solve higher order linear differential equations.					K2
3	Expose differential equation as a powerful tool in solving problems in Physical and Social sciences.					K3
4	Demonstrate competency to solve linear PDE by Lagrange's method					K3
5	Analyze the concepts of Laplace transform and inverse Laplace transforms to solve ODE with constant coefficients.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1 Differential Equation of First Order and Higher Degree. 9 hours						
Ordinary Differential Equations: Equations of First Order and of Degree Higher than one – Solvable for p, x, y— Simultaneous Differential Equations with constant coefficients of the form i) $f_1(D)x + g_1(D)y = \phi_1(t)$ ii) $f_2(D)x + g_2(D)y = \phi_2(t)$ where f_1, g_1, f_2 and g_2 are rational functions of $D=d/dt$ with constant coefficients and ϕ_1, ϕ_2 are explicit functions of t.						
Unit:2 Higher Order Linear Differential Equation 9 hours						
Finding the solution of Second and Higher Order with constant coefficients with Right Hand Side is of the form Ve^{ax} where V is a function of x – Euler's Homogeneous Linear Differential Equations.						
Unit:3 Partial Differential Equations 9 hours						
Partial Differential Equations: Formation of equations by eliminating arbitrary constants and arbitrary functions – Solutions of P.D Equations – Solutions of Partial Differential Equations by direct integration – Methods to solve the first order P.D. Equations in the standard forms.						
Unit:4 Laplace Transforms 9 hours						
Laplace Transforms: Definition – Laplace Transforms of standard functions – Linearity property – First Shifting Theorem – Transform of $tf(t), f(t)/t, f'(t), f''(t)$.						

Unit:5	Inverse Laplace Transforms	9 hours
Inverse Laplace Transforms – Applications to solutions of First Order and Second Order Differential Equations with constant coefficients.		
	Total Lecture hours	45 hours
Text Book		
1	Mathematics for B.Sc – Branch – I Volume III- P.Kandasamy & K.Thilagavathy (S. Chand and Company Ltd, New Delhi, 2004.)	
Reference Books		
1	Calculus Vol III -S. Narayanan and T.K. Manickavasagam Pillay, (S. Viswanathan Printers and Publishers Pvt. Ltd, Chennai 1991)	
2	Differential Equations -N.P. Bali (Laxmi Publication Ltd, New Delhi, 2004)	
3	Laplace and Fourier Transforms-Dr. J. K. Goyal and K.P. Gupta (Pragati Prakashan Publishers, Meerut, 2000)	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://nptel.ac.in/courses/111105035/	
2	http://www.nptelvideos.in/2012/11/mathematics-iii.html https://www.digimat.in/nptel/courses/video/111108081/L02.html	
3	https://www.math.ust.hk/~machas/differential_equations.pdf . https://www.ijsr.net/archive/v2i1/ijsron2013331.pdf https://www.whitman.edu/mathematics/calculus_online/chapter17.html	
Course Designed By: 1.Dr.E.Rameshkumar 2.Ms.S.Kavunthi		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	S	S	M	S	M	M	S	S
CO2	S	M	S	S	S	S	M	M	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	M	S	S	S	S	M	S	S	S
CO5	S	S	S	S	S	S	S	S	S	M

*S-Strong; M-Medium; L-Low

Course code	STATICS			L	T	P	C
Core/Elective/Supportive	Core Paper – VI			3	-		4
Pre-requisite	Basic Knowledge in Vector Algebra & Trigonometric Functions			Syllabus Version	2025-2026		
Course Objectives:							
1.To enable the students to realize the nature of forces and resultant forces when more than one force acts on a particle.							
2.To know about the conditions of equilibrium of couples and coplanar forces.							
Expected Course Outcomes:							
On the successful completion of the course, student will be able to:							
1	Remember the various laws.						K1
2	Understand the concepts of forces and moments.						K2
3	Understand the concepts of equilibrium.						K2
4	Apply the concepts of forces and moments.						K3
5	Analyze the basics of coplanar forces, equilibrium of forces acting on a rigid body and solve the problems.						K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create							
Unit:1		Law of Forces				9 hours	
Forces acting at a point – Parallelogram law-triangle law –Converse of Triangle law- Polygon Law of Forces- Lami’s Theorem							
Unit:2		Resolution and Components of Forces				9 hours	
(λ- μ) theorem –Resolution of forces- Components of a force- Resultant of any number of Coplanar forces acting at a point- Conditions of equilibrium-							
Unit:3		Parallel Forces, Moment and Couple				9 hours	
Parallel Forces and Moments –Resultant of two parallel forces (Like and unlike)-Conditions of equilibrium of three coplanar parallel forces- Moment of a force- Geometrical representation- Sign of the moment- Unit of moment – Varigon’s Theorem on moment.							
Unit:4		Forces Acting on A Rigid Body				9 hours	
Couples – Equilibrium of two couples- Equivalence of two couples = couples in parallel planes- resultant of coplanar couples - resultant of couples and a force.							
Unit:5		Centre of Gravity				9 hours	
Definition – CG of a thin uniform rod – CG of uniform triangular lamina – CG of three rods forming a triangle – general formulae for determination of CG – problems- CG by integration (CG means centre of Gravity)							
				Total Lecture hours		45 hours	

Text Book	
1	Statics -M.K.Venkataraman (Agasthiar Publications, Trichy, 1999.)
Reference Books	
1	Statics -A.V.Dharmapadam.(S.Viswanathan Printers and Publishing Pvt., Ltd, 1993.)
2	Mechanics -P.Duraipandian and Laxmi Duraipandian.(S.Chand and Company Ltd, Ram Nagar, New Delhi -55, 1985.)
3	Statics -Dr.P.P.Gupta (Kedal Nath Ram Nath, Meerut, 1983-84)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/112/105/112105164/
2	https://nptel.ac.in/courses/122/102/122102004/
3	https://www.khanacademy.org/science/ap-physics-1
Course Designed By: 1.Ms.A.Karpagam 2.Dr.P.Rajarajeswari	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	M	S	S	M	M	S	S
CO2	S	M	S	S	M	M	M	M	M	S
CO3	S	M	S	S	M	M	M	S	S	S
CO4	S	S	S	S	S	S	S	M	S	S
CO5	S	S	S	S	M	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		PROGRAMMING IN C	L	T	P	C
Core/Elective/Supportive		Skill Based Subject - I	2	-	-	3
Pre-requisite		Higher Secondary Level Mathematics	Syllabus Version	2025 – 2026		
Course Objectives:						
To impart the importance of C language, its structure, Data types, Operators of C, Various control statements, Arrays, different types of functions and practical problems.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Remember the importance of C language and datatypes.					K1
2	Understand the basic structure, operators and statements of C language.					K2
3	Understand decision control statements, loop control statements.					K2
4	Apply the concepts of data types, operators, expressions, control statements, arrays, character arrays and strings to write the C code for a given algorithm.					K3
5	Read, understand and trace the execution of programs written in C language.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1	Constants, Variables and Data Types				6 hours	
Introduction – Importance of C- Basic structure of C programme - Character set -Constants – Keywords and identifiers – Variables Data types – Declaration of variables – Assigning values to variables –Defining symbolic constants.						
Unit:2	Operators and Expressions				6 hours	
Arithmetic operators - Relational operators - logical operators – assignment operators – increment and decrement operators –Conditional operators – Special operators – Arithmetic expressions – Evaluation of expressions –Precedence of arithmetic operators – Some computational problems – Type conversion in expressions – operator precedence and associating mathematical functions.						
Unit:3	Managing Input -Output Operations, Decision Making and Branching				6 hours	
Reading and Writing character – formatted input and output. Decision making with IF statement – Simple IF statement – The IF ELSE statement - Nesting of IF ELSE statement – The ELSE IF ladder. The Switch statement –The ? Operator –The GOTO statement.						

Unit:4	Decision Making and Looping	6 hours
The WHILE statement - the DO statement - the FOR statement –Jumps in loops		
Unit:5	Arrays and Strings	6 hours
One, Two dimensional arrays – initializing two dimensional arrays – Multidimensional arrays – Declaring and initializing string variables – reading strings from terminal – Writing strings on the screen – Arithmetic operations on characters.		
	Total Lecture hours	30 hours
Text Book		
1	Programming in ANSI C -E.Balagurusamy (Tata McGraw –Hill Publishing Company limited, New Delhi, Fifth Edition,2008)	
Reference Books		
1	Programming with C (Schaum’s outline series)- Byron Gottfried (Tata McGraw Hill publishing company -1998.)	
2	Programming with ANSI and Turbo C -Ashok N.Kamthane (Pearson Education publishers, 2002)	
3	The spirit of ‘C’ -Henry Mullish and Herbert L cooper (Jaico publisher, 1996.)	
4	The ANSI C- Brian W.Kernighan,Dennis M.Ritchie (Published by Prentice- Hall of India Private Limited, M-97, New Delhi- 110001, Second edition,Ocober 1992)	
5	ANSI C: With Microsoft C 5.1 and Quick C 2.0 -C. Balasubramanian. (Tata McGraw-Hill Publishing company limited, New Delhi.)	
6	Programming In C - Kris A.Jamsa (Galgotia Publications Pvt.ltd. 1992)	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://nptel.ac.in/courses/106/104/106104128/	
2	https://nptel.ac.in/courses/106/105/106105171/	
Course Designed By: 1. Dr. S. Nareshkumar & 2. Dr. A. Prasanna		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	S	M	M	M	S	S
CO2	S	S	M	M	S	M	M	S	M	S
CO3	S	M	M	M	S	S	M	S	S	S
CO4	S	S	S	S	S	M	S	S	S	M
CO5	S	S	S	S	S	M	S	S	S	S

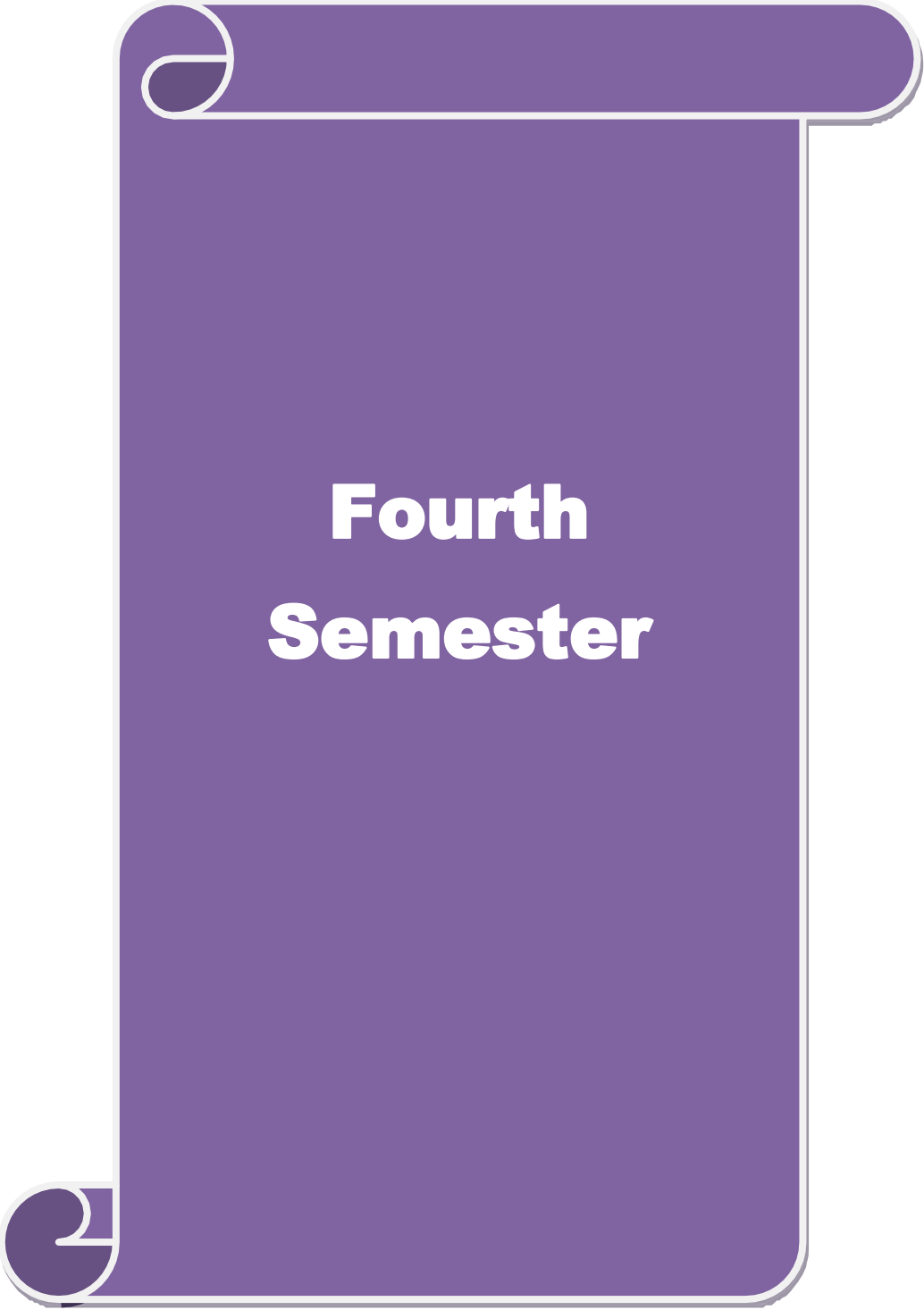
*S-Strong; M-Medium; L-Low

Coursecode		PROGRAMMING IN C-(PRACTICAL)	L	T	P	C
Core/Elective/Supportive		Skill Based subject I (Practical)	-	-	1	1
Pre-requisite		Knowledge in C	Syllabus Version		2025-2026	

PRACTICAL LIST

1. Write a C program to generate 'N' Fibonacci number.
2. Write a C program to print all possible roots for a given quadratic equation.
3. Write a C program to calculate the statistical values of mean, median.
4. Write a C program to calculate the statistical values of Standard Deviation and variance of the given data.
5. Write a C program to sort a set of numbers.
6. Write a C program to sort the given set of names.
7. Write a C program to find factorial value of a given number 'N' using recursive function call.
8. Write a C program to find the product of two given matrix





Fourth Semester

Course code		DYNAMICS	L	T	P	C
Core/Elective/Supportive		Core Paper-VII	3	-	-	4
Pre-requisite		Knowledge in Forces and Vector Algebra	Syllabus Version	2025-2026		
Course Objectives:						
To impart knowledge about the projectile, Simple Harmonic Motion and understanding the notions of impact between two smooth spheres.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Remember the basic kinematics and dynamic concepts.					K1
2	Describe the differential equation of Central Orbits.					K2
3	Apply the concepts of projectiles to solve problems relating to the motion of a projectile.					K3
4	To understand & apply the concepts of composition of simple harmonic motion in two directions.					K3
5	Understand impulsive forces and analyze loss of K.E due to direct and oblique impact.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1	Projectiles				9 hours	
Path of a projectile-Greatest height-time of flight – Range -range on an inclined plane through the point of projection-Maximum range						
Unit:2	Central Orbits				9 hours	
Radial and transverse components of velocity and acceleration – areal velocity of central orbits - Differential equation of central orbit in polar coordinates only						
Unit:3	Simple Harmonic Motion				9 hours	
Amplitude, periodic time, phase-composition of two simple harmonic motions of the same period in a straight line and in two perpendicular lines						
Unit:4	Collision of Elastic Bodies-Direct Impact of Spheres				9 hours	
Impulsive force – Newton’s experimental law- Principle of conservation of momentum- Direct Impact on a smooth fixed plane -Direct impact of two smooth spheres- loss of kinetic energy during direct impact						
Unit:5	Oblique Impact of Spheres				9 hours	
Oblique impact of a smooth sphere on fixed smooth plane – oblique impact of two smooth spheres - Loss of Kinetic energy during oblique impact						

	Total Lecture hours	45 hours
Text Book		
1	Dynamics -M.K.Venkataraman (11th Ed. Agasthiar Publications, Trichy, 1994.)	
Reference Books		
1	Dynamics -A.V.Dharamapadam (S.Viswanathan Printers and Publishers Pvt., Ltd, Chennai, 1998)	
2	Dynamics -K.Viswanatha Naik and M.S.Kasi (Emerald Publishers, 1992)	
3	Dynamics -Naryanamurthi (National Publishers, New Delhi, 1991)	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://nptel.ac.in/courses/115/106/115106119/	
2	https://www.askiitians.com/iit-jee-physics/mechanics/motion-of-projectile.aspx	
Course Designed By: 1. Dr.T.Nandhagopal 2. Mr.M.Balasankar		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	M	M	S	S	S	S	S
CO2	M	M	M	M	M	S	M	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	M	M	M	M	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	M

*S-Strong; M-Medium; L-Low

Course code	NUMERICAL METHODS		L	T	P	C
Core/Elective/Supportive	Core Paper -VIII		3	-	-	4
Pre-requisite	Knowledge in computational Mathematics		Syllabus Version		2025-2026	
Course Objectives:						
It exposes the students to study numerical techniques to find solutions of numerical, algebraic transcendental equations, solution of simultaneous linear algebraic equations, interpolation, numerical differentiation and integration, numerical solutions to ordinary differential equations.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Remember the concepts of simultaneous linear equations					K1
2	Obtain numerical solutions of algebraic and transcendental equations.					K2
3	Apply the finite difference and interpolation concepts.					K3
4	Develop skills in solving problems under numerical differentiation and numerical integration					K4
5	Analyze the efficiency of iteration methods.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1		The Solution of Numerical Algebraic and Transcendental Equations			9 hours	
Bisection method – Iteration Method – Convergence condition – Regula Falsi Method – Newton – Raphson method - Convergence Criteria – Order of Convergence.						
Unit:2		Solution of Simultaneous Linear Algebraic Equations			9 hours	
Gauss elimination method – Gauss Jordan method – Method of Triangularization – Gauss Jacobi method – Gauss Seidel method.						
Unit:3		Interpolation (for equal and unequal intervals)			9 hours	
Differences – operators – forward and backward difference tables – Newton’s forward and backward formulae– Central differences and central difference table – Gauss forward and backward formulae - Lagrange’s formula						
Unit:4		Numerical Differentiation and Integration			9 hours	
Numerical Differentiation: Newton’s forward and backward formulae to compute the derivatives – Derivative using Stirling’s formulae Numerical Integration: Trapezoidal rule – Simpson’s 1/3 rd and 3/8 th rules.						
Unit:5		Numerical Solution Of O.D.E			9 hours	
TEuler’s method – improved and modified Euler method – Runge Kutta method (fourth order only)						
Total Lecture hours					45 hours	
Text Books						

1	Numerical methods -Kandasamy. P, Thilagavathy. K and Gunavathy. K (S. Chand and Company Ltd, New Delhi – Revised Edition 2007.)(Chapters: 3,4,5,6,7 and 8)
2	Introductory Methods of Numerical Analysis-S.S. Sastry (Prentice Hall of India Pvt. Ltd.New Delhi-110001Fourth Edition,2006)
Reference Books	
1	Numerical Methods in Science and Engineering -Venkataraman M. K.(National Publishing company V Edition 1999.)
2	Numerical Methods for Scientists and Engineers -Sankara Rao K. (2 nd Edition Prentice Hall India 2004.)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	
2	http://jupiter.math.nctu.edu.tw/~smchang/9602/NA_lecture_note.pdf http://www.iosrjournals.org/iosr-jm/papers/Vol6-issue6/J0665862.pdf
3	http://nptel.ac.in/courses/104101002/downloads/lecturenotes/module1/chapter6.pdf https://www.britannica.com/science/difference-equation
Course Designed By: 1. Dr.A.Manonmani 2. Dr.S.Nareshkumar	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	M	M	M	M	M	S	S
CO2	M	M	S	M	M	S	M	M	M	S
CO3	M	M	S	S	S	S	M	S	S	S
CO4	S	M	S	S	S	S	M	S	S	S
CO5	S	M	S	S	M	S	M	S	S	S

*S-Strong; M-Medium; L-Low

Course Code		DATA STRUCTURES	L	T	P	C
Core/elective/Supportive		Skill Based subject II	3	0	0	4
Pre- requisite		Basic knowledge of Programming Constructs	Syllabus version		2025-2026	
Course Objectives						
- To introduce the concept of data structures and the types of data structures - To demonstrate how various data structures can be implemented and used in various applications						
Expected Course Outcomes						
1	Define the concept of Data structure and list the various classifications of data Structures.					K1
2	Demonstrate how arrays, stacks, queues, linked lists, trees, heaps, Graphs and Hash Tables are represented in the main memory and various operations are performed on those data structures.					K2
3	Illustrate the various file organizations like Sequential, Random and Linked Organizations.					K2
4	Discover the real time applications of the various data structures					K3
5	Design algorithms for various sorting and searching techniques					K4
K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create						
UNIT I	ARRAYS					9 hours
Introduction: Introduction of Algorithms, Analyzing Algorithms. Arrays: Axiomatization – Ordered list-Sparse Matrices-Representation of Arrays. Chaper 1: Sections 1.1 to 1.4 Chapter 2: Sections 2.1 to 2.4						
UNIT II	LINKED LIST					9 hours
Stacks and Queues- Fundamentals-A Mazing problem – Evaluation of Expression- Multiple Stacks and Queues Linked List: Singly Linked List - Linked Stacks and Queues - Polynomial Addition - More on Linked Lists-Equivalence relations- Sparse Matrices. Chapter 3: Sections 3.1 to 3.4 Chapter 4: Sections 4.1 to 4.7						
UNIT III	TREES and GRAPHS					9 hours
Trees: Basic Terminology - Binary Trees - Binary Tree Representations - Binary Trees Traversal -More on Binary Trees - Threaded Binary Trees - Binary Tree Representation of Trees – Applications of Trees-Counting Binary Trees. Chapter 5: Sections 5.1 to 5.9						

UNITIV	INTERNAL and EXTERNAL SORTING	9 hours
Internal Sorting: Searching-Insertion Sort-QuickSort-2Way Merge Sort-Heap Sort-Shell Sort-Sorting on Several Keys – Practical conservations for internal sorting. Chapter 7 : Sections 7.1 to 7.8		
UNITV	SYMBOL TABLES and FILES	9 hours
External Sorting: Storage Devices -Sorting with Disks - Sorting with Tapes` Files: Files, Queries and Sequential organizations - Index Techniques - File Organizations-Storage management Chapter 8: Sections 8.1 to 8.3 Chapters 10: Sections 10.1 to 10.4		

Total Hours	45 hours
Text Book(s)	
1	Ellis Horowitz ,Sartaj Shani, Fundamentals of Data Structures, Computer Science Press.
Reference Book(s)	
1	EllisHorowitz,SartajShani,SanguthevarRajasekaran,ComputerAlgorithms, Galgotia Publication.
Related Online Contents (MOOC,SWAYAM,NPTEL,Websitesetc)	
1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview
2	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview
Course Designed by : Dr P. Karthikeyan and Dr I. Mohammed Ali Jaffer	

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	M	L	L	L	L	L	L	L	L
CO5	S	M	M	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

A purple notebook with a white spiral binding on the left side. The text "Fifth Semester" is written in white on the cover.

Fifth Semester

Course code		REAL ANALYSIS - I	L	T	P	C
Core/Elective/Supportive		Core Paper – IX	5	-	-	4
Pre-requisite		Knowledge in the basic properties of real numbers	Syllabus Version	2025 - 2026		
Course Objectives:						
Aimed at exposing the real number systems that underpin the development of real analysis and in understanding various physical phenomena.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Remember the basic topological properties of subsets of the real numbers.					K1
2	Understand the fundamental properties of the real numbers and analyze the real number system.					K2
3	Learn the concept of limits, sequence, continuity, convergent sequence in metric spaces appreciating the abstract ideas and their applicability.					K2
4	Have the proficiency in the formulation and construction of proofs of basic results in real analysis.					K3
5	Demonstrate skills in communicating Mathematics and learn basic techniques and examples in analysis to be well prepared for extended learning.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1	The Real and Complex Number Systems				15 hours	
Introduction -the field axioms, the order axioms –integers –the unique Factorization theorem for integers –Rational numbers –Irrational numbers –Upper bounds, maximum Elements, least upper bound –the completeness axiom –some properties of the supremum –properties of the integers deduced from the completeness axiom- The Archimedean property of the real number system –Rational numbers with finite decimal representation of real numbers –absolute values and the triangle inequality –the Cauchy-Schwarz inequality –plus and minus infinity and the extended real number system.						
Unit:2	Basic Notions of a Set Theory.				15 hours	
Notations –ordered pairs –Cartesian product of two sets – Relations and functions – further terminology concerning functions –one–one functions and inverse –composite functions – sequences –similar sets-finite and infinite sets –countable and uncountable sets –uncountability of the real number system –set algebra –countable collection of countable sets.						

Unit:3	Elements of Point Set Topology	15 hours
Elements of point set topology: Euclidean space $\mathbb{R}^n$ –open balls and open sets in $\mathbb{R}^n$. The structure of open sets in $\mathbb{R}^n$ –closed sets and adherent points –The Bolzano –Weierstrass theorem –the Cantor Intersection Theorem		
Unit:4	Covering and Compactness	15 hours
Covering –Lindelof covering theorem –the Heine- Borel covering theorem –Compactness in $\mathbb{R}^n$ –Metric Spaces –point set topology in metric spaces –compact subsets of a metric space –Boundary of a set.		
Unit:5	Limits and Continuity in Metric Spaces	15 hours
Convergent sequences in a metric space –Cauchy sequences –Completeness sequences – complete metric Spaces. Limit of a function –Continuous functions –continuity of composite functions. Continuous complex valued and vector valued functions - Examples of continuous functions.		
Total Lecture hours		75 hours
Text Book		
1	Mathematical Analysis-T.M.Apostol (2nd ed., Narosa Publishing Company, Chennai, 1990.) Unit I : Chapter 1 Sections 1.2, 1.3, 1.6 to 1.16, 1.18 to 1.20 Unit II : Chapter 2 Sections 2.2 to 2.15 Unit III : Chapter 3 Sections 3.2 to 3.9 Unit IV : Chapter 3 Sections 3.10 to 3.16 Unit V : Chapter 4 Sections 4.2 to 4.5, 4.8 to 4.10	
Reference Books		
1	Methods of Real Analysis -R.R.Goldberg.(NY, John Wiley, New York 1976.)	
2	Introduction to Topology and Modern Analysis- G.F.Simmons. (McGraw – Hill, New York, 1963.)	
3	A survey of Modern Algebra (3rd Edition)-G.Birkhoff and MacLane.(Macmillan, New York, 1965.)	
4	Real Analysis -J.N.Sharma and A.R.Vasishtha.(Krishna Prakashan Media (P) Ltd, 1997)	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://nptel.ac.in/courses/111/105/111105069/#	
2	https://nptel.ac.in/courses/111/101/111101134/	
3	https://www.digimat.in/nptel/courses/video/111105098/	
4	https://nptel.ac.in/courses/111/106/111106053/	
Course Designed By: 1. Dr.S.Nareshkumar 2. Dr.A. Prasanna		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	M	M	M	M	M	S	S
CO2	S	S	M	M	M	S	S	M	S	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	M

*S-Strong; M-Medium; L-Low



Course code		COMPLEX ANALYSIS - I	L	T	P	C
Core/Elective/Supportive		Core Paper – X	5	-	-	4
Pre-requisite		Knowledge in Analysis	Syllabus Version	2025 – 2026		
Course Objectives:						
To equip the students with the understanding of the fundamental concepts of complex functions, analyticity ,power series and complex integration.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Learn techniques of complex analysis effectively to establish mathematical results.					K1
2	Recognize the simple and multiple connected domains.					K2
3	Investigate a function for its analyticity and find it series development.					K3
4	Examine the relationship between conformal mapping and analytic functions					K4
5	Compute contour integrals directly and by the fundamental theorem.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1						
Unit:1		Complex Plane	15 hours			
Complex number system –Field of Complex numbers – Scalar multiplication of a complex number –Field of real numbers – Expression of the number – Conjugation – Absolute value of a complex number – Inequalities in terms of moduli – Representation of complex number by points – nth roots of a complex number – Fixed points.						
Unit:2						
Unit:2		Analytic Functions	15 hours			
Complex Functions – Limit of a function – continuity – differentiability – necessary conditions for differentiability – sufficient conditions for differentiability – Cauchy-Riemann equation in polar coordinates.						
Unit:3						
Unit:3		Power Series and Elementary Functions	15 hours			
Power series – Absolute convergence – uniform convergence – Analyticity of the sum of power series – uniqueness of representation – Elementary function – Exponential function.						
Unit:4						
Unit:4		Elementary and Conformal Mapping	15 hours			
Bilinear Transformation – Transformation: $w = e^z$, $w = z^2$; $w = \log z$, $w = \sin z$; $w = \cos z$; $w = z + 1/z$. – conformal mapping – examples.						

Unit:5	Complex Integration	15 hours
Simple rectifiable oriented curves – Integration of complex function – simple integrals – definite integrals – interior and exterior of a closed curve – Simply connected regions – Cauchy’s Fundamental Theorem (Except Goursat’s lemma and Theorem 8.6) – Integral along an arc - Cauchy’s integral formula and formula for derivatives – Morera’s theorem.		
	Total Lecture hours	75 hours
Text Book		
1	Complex Analysis (For Undergraduate Students of Mathematics, Physics and Engineering) -P.Duraipandian and Kayalal Pachaiyappa (S Chand Publishing, S Chand And Company Limited ,Reprint 2022) Unit I : Chapter 1 Sections 1.1 to 1.9 Chapter 2 Sections 2.1,2.2, 2.9 Unit II : Chapter 4 Sections 4.1 to 4.8 Unit III : Chapter 6 Sections 6.1 to 6.7 Unit IV : Chapter 7 Sections 7.1, 7.4 to 7.10 Unit V : Chapter 8 Sections 8.1 to 8.9	
Reference Books		
1	Complex Variable and Applications -Churchill and Others.(Tata McGraw Hill Publishing Company Ltd, 1974.)	
2	Theory of functions of Complex Variable -Shanti Narayan (S.Chand and Company, Meerut, 1995.)	
3	Functions of Complex Variable -Tyagi B.S(17th Edition, Pragati Prakasham Publishing Company Ltd, Meerut, 1992-93)	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://nptel.ac.in/courses/111/103/111103070/	
2	https://nptel.ac.in/courses/111/107/111107056/	
3	https://nptel.ac.in/courses/122/103/122103012/	
Course Designed By 1.Dr.P.Karthikeyan 2.Dr.I. Mohammed Ali Jaffer		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	S	M	M	M	S	S
CO2	S	M	M	M	M	S	M	S	S	S
CO3	S	S	M	S	S	S	S	S	S	S
CO4	S	S	M	S	M	S	S	S	S	S
CO5	S	S	S	S	M	S	S	S	S	M

*S-Strong; M-Medium; L-Low



Course code		MODERN ALGEBRA - I	L	T	P	C
Core/Elective/Supportive		Core Paper – XI	5	-	-	4
Pre-requisite		Higher Secondary Level Mathematics	Syllabus Version	2025 - 2026		
Course Objectives:						
Focuses on the concepts of algebraic structures which is one of a pillar of modern Mathematics and emphasis on their properties and applications.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Recall the properties and extend group structure to finite permutation groups.					K1
2	Explain the concepts of homomorphism, isomorphism and automorphism.					K2
3	Demonstrate abstract thinking capacity and ability to prove theorems.					K3
4	Compare features of different algebraic structures.					K4
5	Examine the properties of algebraic structures and their role in applied contexts.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1						
Groups and its Basic Properties			15 hours			
Groups: Abelian group, Symmetric group Definitions and Examples – Basic properties.						
Unit:2						
Subgroups and Normal Subgroups			15 hours			
Subgroups – Cyclic subgroup - Index of a group – Order of an element – Fermat theorem - A Counting Principle - Normal Subgroups and Quotient Groups.						
Unit:3						
Automorphisms			15 hours			
Homomorphisms (Applications 1 and 2 are omitted) -Automorphisms – Inner automorphism – Cayley’s theorem, permutation groups.						
Unit:4						
Rings			15 hours			
Definition and Examples –Some Special Classes of Rings – Commutative ring – Field – Integral domain - Homomorphisms of Rings.						
Unit:5						
Ideals and Quotient Rings			15 hours			
Ideals and Quotient Rings – More Ideals and Quotient Rings – Maximal ideal - The field of Quotients of an Integral Domain.						
Total Lecture hours			75 hours			

Text Book

- | | |
|---|---|
| 1 | Topics in Algebra -I.N. Herstein (John Wiley & Sons, New York, 2003.)
Unit I : Chapter 2 Sections 2.1 to 2.3
Unit II : Chapter 2 Sections 2.4 to 2.6
Unit III : Chapter 2 Sections 2.7 to 2.10
Unit IV : Chapter 3 Sections 3.1 to 3.3
Unit V : Chapter 3 Sections 3.4 to 3.6. |
|---|---|

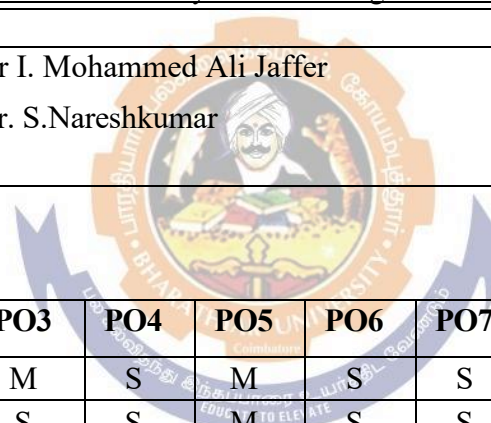
Reference Books

- | | |
|---|---|
| 1 | Modern Algebra -Surjeet Singh and Qazi Zameeruddin. (Vikas Publishing house, 1992.) |
| 2 | Modern Algebra- A.R.Vasishtha (Krishna Prakashan Mandir, Meerut, 1994 - 95.) |

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

- | | |
|---|---|
| 1 | https://nptel.ac.in/courses/106/104/106104149/ |
| 2 | https://nptel.ac.in/courses/111/106/111106113/ |
| 3 | https://www.classcentral.com/course/swayam-modern-algebra-14201 |

Course Designed By: 1. Dr I. Mohammed Ali Jaffer
2. Dr. S.Nareshkumar



COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	M	S	M	S	S	M	S	S
CO2	M	M	S	S	M	S	S	S	S	S
CO3	S	M	M	S	S	S	S	S	S	S
CO4	S	M	M	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		DISCRETE MATHEMATICS	L	T	P	C
Core/Elective/Supportive		Core paper XII	5	-	-	4
Pre-requisite		Higher Secondary Level Mathematics	Syllabus Version	2025-2026		
Course Objectives:						
Prepare students to develop mathematical foundations to understand, create mathematical arguments and focuses on the Formal languages, Automata, Lattices, Boolean Algebra and Graph Theory.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Assimilate various graph theoretic concepts and familiarize with their applications.					K1
2	Know and understand about partially ordered sets, Boolean algebra, lattices and their types.					K2
3	Apply Karnaugh map for simplifying the Boolean expression.					K3
4	Demonstrate the skill to construct simple mathematical proofs and to validate.					K4
5	To achieve greater accuracy, clarity of thought and language.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1	Relations and Functions				15 hours	
Relations- Composition of relations-Equivalence relation- functions- composition of function-Inverse functions, one-to- one, onto, one-to- one & onto functions.						
Unit:2	Mathematical logic				15 hours	
Connectives, well-formed formulas, Tautology, Equivalence of formulas, Tautological implications, Duality law, Normal forms, Predicates, Variables, Quantifiers, Free and bound Variables. Theory of inference for predicate calculus.						
Unit:3	Formal Languages and Automata				15 hours	
Regular expressions, Types of grammar, Regular grammar and finite state automata, Context free and sensitive grammars.						
Unit:4	Lattices and Boolean Algebra				15 hours	
Partial ordering, Poset, Lattices, Boolean algebra, Boolean functions, Theorems, Minimization of Boolean functions(Karnaugh Method only).						
Unit:5	Graph Theory				15 hours	
Directed and undirected graphs, Paths, Reachability, Connectedness, Matrix representation, Euler paths, Hamiltonian paths, Trees, Binary trees – theorems (statement only)						
Total Lecture hours			75 hours			

Text Book		
1	Discrete Mathematical Structures with applications to computer science-J.P Tremblay and R.P Manohar (Mc.Graw Hill, 1975.) Unit I : Chapter 2- Sections - 2-3.5, 2-3.7, 2-4.2, 2-4.3, 2-4.6, Chapter 3- Sections-3-2, 3-5, 3-5.3, Unit II : Chapter 1. Sections - 1-2, 1-2.7, 1-2.9, 1-2.10, 1-2.11, 1-3, 1-5.1, 1-5.2, 1-5.4, 1-6.4 Unit III : Chapter 3- Sections 3-3.1, 3-3.2 Chapter 4- Section 4-6.2 Unit IV : Chapter 4- Section 4-1.1, 4-2, 4-3, 4-4.2 Unit V : Chapter 5- Section 5-1.1, 5-1.2, 5-1.3, 5-1.4	
Reference Book		
1	Discrete Mathematics-Oscar Levin (3 rd Edition,2016)	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://nptel.ac.in/courses/106/106/106106094/	
2	https://nptel.ac.in/courses/111/107/111107058/	
		
Course Designed By: 1. Dr. A. Manonmani 2. S. Naresh kumar		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	S	M	S	M	M	S	S
CO2	S	M	S	S	M	S	S	S	S	S
CO3	S	M	S	S	M	S	M	S	S	S
CO4	S	M	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course Code		R Programming (Theory)	L	T	P	C
Core/elective/Supportive		Skill Based Subject III	2	0	0	3
Pre- requisite			Syllabus version		2025-2026	
Course Objectives						
To expose the students to the fundamental concepts of R Programming						
Expected Course Outcomes						
1	Understand the basics in R programming in terms of constructs, control statements, String functions					K2
2	Understand the use of R for Big Data analytics					K2
3	Apply R programming for Text processing					K3
4	Appreciate and apply the R programming from a statistical perspective					K3
K1–Remember K2 –Understand K3 –applyK4-AnalyzeK5–evaluateK6–Create						
UNIT I	Vectors, Matrices and Arrays					6 hours
Introducing to R – Introduction to Function-Preview o some important R data structures-The help() function-The example() f function in R – Vectors – Scalars, vectors, Arrays, Matrices – Declarations –Recycling–Common Vector Operations–Using all () and any()–Vectorized operations – NA and NULL values–Filtering–Vectorized if-then- else– Vector Element names.						
Chapter 1: Sections 1.3 to 1.5, 1.7 Chapter 2: Sections 2.1 to 2.11						
UNIT II	Lists, Data Frames					6 hours
Creating matrices – Matrix Operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns-Vector/Matrix Distinction – Avoiding Dimension Reduction –Naming matrix rows and columns- Higher Dimensional arrays						
Creating Data Frames – Matrix-like operations in frames – merging data frames – Applying functions to data frames.						
Chapter 3: Sections 3.1 to 3.8 Chapter 5: Sections 5.1 to 5.4						
UNIT III	Factors and Tables, R Programming Structures, Math and Simulation in R,					6 hours
Factors and Tables – Factors and levels – Common functions used with factors - Working with tables – Other factors and table related functions.						
Control statements – Arithmetic and Boolean operators and values – Default Values for arguments – Returning Boolean Values – Functions are objects–Environment and scope issues – Writing Upstairs– Recursion–Replacement functions– Tools for Composing function code						
Chapter 6: Sections 6.1 to 6.4 Chapter 7: Sections 7.1 to 7.11						

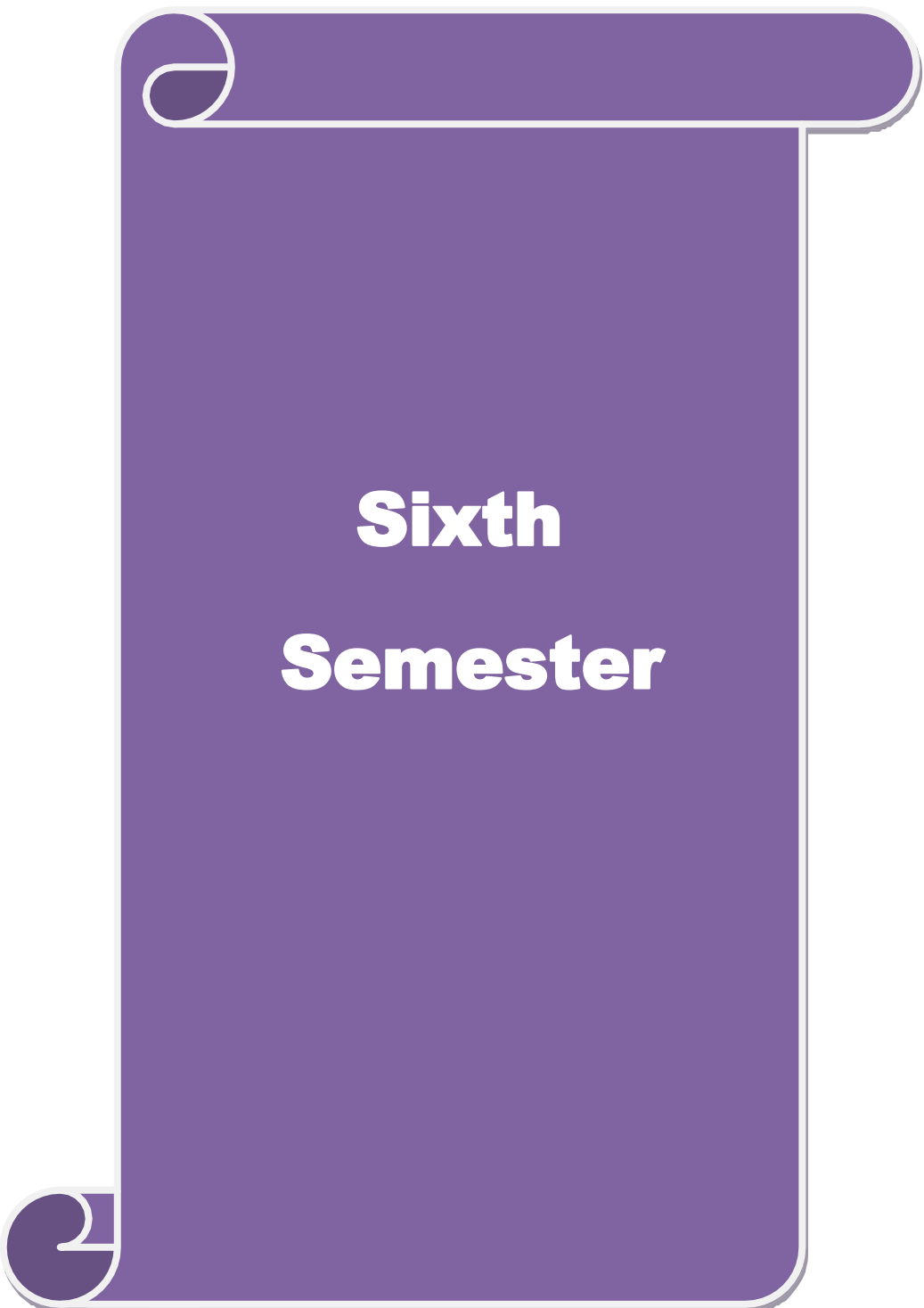
UNIT IV	Math functions	6 hours
Math functions-Functions for Statistical distributions- sorting-linear algebra operations on vectors and matrices-set operations - simulations programming in R. Chapter 8: Sections 8.1 to 8.6		
UNIT V	String Manipulation , Graphics and Modeling in R	6 hours
String Manipulation- String manipulation functions –regular expressions-use of strings utilities in the edtdbg debugging tool- Graphics –Creating Graphs –Customizing Graphs –Saving Graphs to files – Creating Three -Dimensional plots. Chapter 11: Sections 11.1 to 11.3 Chapter 12: Sections 12.1 to 12.4		
Total Lecture Hours		30 hours

Text Book		
1	Norman Matloff, “The Art of R Programming: A Tour of Statistical Software Design”, NoStarch Press,2011.	
Reference Book(s)		
1	MarkGardner, “Beginning R –The Statistical Programming Language”, Wiley,2013.	
2	RobertKnell,“IntroductoryR:ABeginner’sGuidetoDataVisualisation, Statistical Analysis and programming in R”,Amazon Digital South Asia ServicesInc,2013.Richard Cotton(2013). Learning R,O “ReillyMedia.	
3	Garret Grolemond(2014). Hands-on Programming with R. O”Reilly Media,Inc.	
4	Roger D. Peng(2018). R Programming for DataScience. LeanPublishing.	
5	Jared P. Lander, “R for Everyone :Advanced Analytics and Graphics”, Addison- WesleyData &AnalyticsSeries,2013.	
	Related Onlin Contents(MOOC, SWAYAM, NPTEL, Websites etc)	
1	https://onlinecourses.swayam2.ac.in/aic20_sp06/preview	
2	https://onlinecourses.swayam2.ac.in/arp19_ap79/preview	
Course Designed by: Dr P. Karthikeyan Dr I Mohammed Ali Jaffer		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

CourseCode		R Programming (Practical)	L	T	P	C
Core/elective/Supportive		Skill Based Subject III	0	0	1	1
Pre- requisite			Syllabus version		2025-2026	
Course Objectives						
To expose the students to the fundamental concepts of R Programming						
Expected Course Outcomes						
1	Understand the basics in R programming in terms of constructs, control statements, String functions					K2
2	Understand the use of R for Big Data analytics					K2
3	Apply R programming for Text processing					K3
4	Appreciate and apply the R programming from a statistical perspective					K3
K1–RememberK2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create						
List of Programs						
1. R Expressions and Data Structures 2. Manipulation of vectors and matrix 3. Operators on Factors in R 4. Data Frames in R 5. Graphs in R 6. 3D plots in R The logo of Bharathiar University is a circular emblem. It features a central figure of a man with a white turban and a mustache, wearing a white shirt and a white shawl. He is seated and appears to be reading or writing. The emblem is surrounded by a yellow border with text in Tamil and English. The English text reads "BHARATHIAR UNIVERSITY" and "Coimbatore". The Tamil text is "பாரதியார் பல்கலைக்கழகம்" and "கோயம்புத்தூர்".						



Sixth Semester

Course code		REAL ANALYSIS - II	L	T	P	C
Core/Elective/Supportive		Core Paper – XIII	5	-	-	4
Pre-requisite		Knowledge in Mappings and Properties of Real Numbers	Syllabus Version	2025-2026		
Course Objectives:						
To present a deeper and rigorous understanding of fundamental concepts like continuity, connectivity, derivative, monotonic functions with properties and Riemann - Stieltjes integral.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Demonstrate the understanding of continuity, uniform continuity, compactness, connectedness.					K1
2	Understand partitions and their refinement.					K2
3	Determine the Riemann integrability and the Riemann-Stieltjes integrability of a bounded function.					K2
4	Examine the derivatives of function.					K3
5	Acquire skills in writing and analyze the proofs that arise in the context of real analysis.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1	Topological Mappings				15 hours	
continuity and inverse images of open or closed sets – functions continuous on compact sets – Topological mappings –Bolzano’s theorem. .						
Unit:2	Monotonic Functions				15 hours	
Connectedness –components of a metric space – Uniform continuity - Uniform continuity and compact sets –fixed point theorem for contractions –monotonic functions.						
Unit:3	Derivatives				15 hours	
Definition of derivative –Derivative and continuity –Algebra of derivatives – the chain rule –one sided derivatives and infinite derivatives –functions with non-zero derivatives –zero derivatives and local extrema –Rolle’s theorem –The mean value theorem for derivatives – Taylor’s formula with remainder.						
Unit:4	Functions of Bounded Variation				15 hours	
Properties of monotonic functions –functions of bounded variation –total Variation –additive properties of total variation on (a, x) as a function of x – functions of bounded variation expressed as the difference of increasing functions –continuous functions of bounded variation.						
Unit:5	The Riemann-Stieltjes Integral				15 hours	
Introduction –Notation –The definition of Riemann –Stieltjes integral –linear properties – Integration by parts –change of variable in a Riemann –Stieltjes integral –Reduction to a Riemann integral.						

		Total Lecture hours	75 hours
Text Book			
1	Mathematical Analysis(2 nd ed)-Tom. M. APOSTOL(Addison-Wisely. Narosa Publishing Company, Chennai, 1990.)		
	Unit I : Chapter 4 Sections 4.11 to 4.15		
	Unit II : Chapter 4 Sections 4.16, 4.17, 4.19, 4.20, 4.21, 4.23		
	Unit III : Chapter 5 Sections 5.2 to 5.10 and 5.12		
	Unit IV : Chapter 6 Sections 6.2 to 6.8		
	Unit V : Chapter 7 Sections 7.1 to 7.7		
Reference Books			
1	Methods of Real Analysis -R.R.Goldberg (NY, John Wiley, New York 1976.)		
2	Introduction to Topology and Modern Analysis -G.F.Simmons (McGraw – Hill, New York, 1963.)		
3	A survey of Modern Algebra -G.Birkhoff and MacLane (3rd Edition, Macmillian, NewYork, 1965.)		
4	Real Analysis -J.N.Sharma and A.R.Vasistha.(Krishna Prakashan Media (P) Ltd, 1997.)		
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]			
1	https://nptel.ac.in/courses/111/106/111106053/		
2	https://www.math.ucdavis.edu/~emsilvia/math127/chapter7.pdf https://www.whitman.edu/Documents/Academics/Mathematics/grady.pdf		
3	https://nptel.ac.in/courses/122/101/122101003/		
Course Designed By: 1. Dr.A.Manonmani 2. Dr. S.Nareshkumar			

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	M	S	S	S	M	S	S
CO2	M	M	M	M	M	S	S	M	S	S
CO3	S	M	M	S	S	S	M	S	S	S
CO4	S	M	M	S	S	S	M	S	S	S
CO5	M	M	S	M	M	S	S	S	S	M

*S-Strong; M-Medium; L-Low

Course code		COMPLEX ANALYSIS - II	L	T	P	C
Core/Elective/Supportive		Core Paper – XIV	5	-	-	4
Pre-requisite		Knowledge in Analytic Functions, Complex Integration.	Syllabus Version	2025-2026		
Course Objectives:						
To familiarize the students with some fundamental theorems, singularity, residues in complex functions, integrations of complex functions, meromorphic functions and their applications.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	To recognize and apply the Liouville’s theorem, the mean-value property of a function and the maximum modulus principle.					K1
2	Demonstrate understanding and appreciation of deeper aspects of complex analysis.					K2
3	Apply residue theorem to compute integrals.					K3
4	Ability to think critically by proving mathematical conjectures and establishing theorems from complex analysis.					K4
5	Classify the nature of singularity, poles and residues.					K2
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1	Integral Theorems				15 hours	
Zeros of function – related integral theorems– Cauchy’s Inequality – Liouville’s theorem – Fundamental theorem of algebra – Maximum modulus theorem – Gauss’ mean value theorem – Poisson’s integral – examples.						
Unit:2	Taylor’s Series and Laurent’s Series				15 hours	
Taylor’s series – Laurent’s series – examples						
Unit:3	Singularities				15 hours	
Singularity – isolated singularity – removable singularity – pole – essential singularity – behavior of a function at an isolated singularity						
Unit:4	Residues				15 hours	
Residues – Calculation of residues – Real definite integrals – examples						

Unit:5	Meromorphic Functions	15 hours
Meromorphic function – function meromorphic in the extended plan – examples.		
	Total Lecture hours	75 hours
Text Book		
1	Complex Analysis (For Undergraduate Students of Mathematics, Physics and Engineering) -P. Duraipandian and Kayalal Pachaiyappa (S Chand Publishing, S Chand And Company Limited ,Reprint 2022) Unit I : Chapter 8 Sections 8.10, 8.11,8.13 Unit II : Chapter 9 Sections 9.1, 9.3, 9.13 Unit III : Chapter 9 Sections 9.5 – 9.10 Unit IV : Chapter 10 Sections 10.1 – 10.4 Unit V : Chapter 11 Sections 11.1 to 11.3 (Except theorems 11.5 and 11.6)	
Reference Books		
1	Complex Variable and Applications -Churchill and Others(Tata Mc-graw Hill Publishing Company Ltd, 1974.)	
2	Theory of functions of Complex Variable - Shanti Narayan (S.Chand and Company ,Meerut, 1995)	
3	Functions of Complex Variable (17 th Edition)- Tyagi B.S (Pragati Prakasham Publishing Company Ltd, Meerut, 1992-93.)	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://nptel.ac.in/courses/111/103/111103070/	
2	https://nptel.ac.in/courses/111/106/111106094/	
4	https://nptel.ac.in/courses/122/103/122103012/	
Course Designed By: 1.Dr.T.Narppasalai Arasu 2.Ms.S.Kavunthi		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	M	S	S	M	S	S
CO2	S	S	M	S	M	S	M	M	M	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	M	S	S	M	S	S	S	S	S
CO5	S	M	M	S	M	S	S	S	S	S

*S-Strong; M-Medium; L-Low

Course code		MODERN ALGEBRA - II	L	T	P	C
Core/Elective/Supportive		Core Paper – XV	5	-	-	4
Pre-requisite		Knowledge in Groups, Rings and Fields	Syllabus Version	2025-2026		
Course Objectives:						
To develop understanding in the domain of matrix theory, vector spaces, linear transformations as well as the principles underlying the subject.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Communicate and understand mathematical ideas and results with the correct use of mathematical definitions, terminology and symbols.					K1
2	Explain the concepts of base and dimension of Vector space.					K2
3	To apply the Gram-Schmidt process to construct an orthonormal set of vectors in an inner product space.					K3
4	Demonstrate competence with the basic ideas of Matrix theory, Vector spaces, Dual spaces, Linear transformation.					K3
5	Have an insight to analyze a real life problem and solve it.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1	Matrices				15 hours	
Introduction – Addition and Scalar Multiplication of Matrices – Product of Matrices –Transpose of a Matrix – Matrix Inverse – Symmetric and Skew - Symmetric Matrices.						
Unit:2	Special Matrices				15 hours	
Hermitian and Skew-Hermitian Matrices – Orthogonal and Unitary Matrices – Rank of a Matrix – Characteristic Roots and Characteristic Vectors of a Square Matrix.						
Unit:3	Vector Spaces				15 hours	
Elementary Basic Concepts – Subspace of a Vector space - Homomorphism – Isomorphism - Internal and External direct sums - Linear span - Linear Independence and Bases.						
Unit:4	Inner product Spaces				15 hours	
Inner Product Spaces – Norm of a Vector – Orthogonal Vectors - Orthogonal Complement of a subspace – Orthonormal set.						
Unit:5	Linear Transformations				15 hours	
Algebra of Linear Transformations – Regular, Singular Transformations – Range of T – Rank of T - Characteristic Roots – Characteristic Vectors – Matrices.						
Total Lecture hours			75 hours			

Text Books	
1	Modern Algebra -R.Balakrishnan and M. Ramabadrn.(Vikas Publishing House Pvt. Ltd, New Delhi, Second Revised Edition 1994) (For Units I & II) . Unit I : Chapter 1 Sections 1.1 to 1.3, 1.5 to 1.7 Unit II : Chapter 1 Sections 1.8 and 1.9 Chapter 2 Section 2.9 Chapter 3 Section 3.9
2	Topics in Algebra -I.N. Herstein.(John Wiley & Sons, New York, 2003.) (For Units III, IV & V) Unit III : Chapter 4 Sections 4.1 and 4.2 Unit IV : Chapter 4 Sections 4.3 and 4.4 Unit V : Chapter 6 Sections 6.1, 6.2 and 6.3
Reference Books	
1	Modern Algebra -Surjeet Singh and Qazi Zameeruddin (Vikas Publishing house, 1992.)
2	Modern Algebra -A.R.Vasishtha (Krishna Prakashan Mandir, Meerut, 1994 – 95.)
3	Linear Algebra -Seymour Lipschutz and Marc Lipson (3rd Edition, McGraw Hill, 2001.)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/111/106/111106135/
2	https://nptel.ac.in/courses/115/105/115105097/
3	https://nptel.ac.in/courses/111/101/111101115/
4	https://nptel.ac.in/courses/111/108/111108066/
Course Designed By: 1.Dr.E.Tamilmani 2. Dr. P. Karthikeyan	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	M	M	S	S	M	S	S
CO2	M	M	S	S	M	S	M	M	S	S
CO3	S	M	S	S	M	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	M

*S-Strong; M-Medium; L-Low

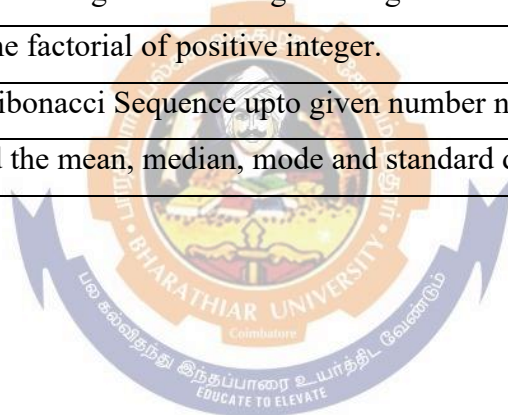
Course Code		Python Programming (Theory)	L	T	P	C
Core/elective/Supportive		Skill Based Subject IV	2	0	0	3
Pre- requisite		Knowledge in Basics of Object Oriented Programming	Syllabus version		2025-2026	
Course Objectives						
To introduce the concepts of the various programming constructs of Python programming						
Expected Course Outcomes						
1	Apply the various basic programming constructs like operators, expressions, decision Making statements and Looping statements					K2
2	Summarize the concept of lists, tuples, function sand error handling					K2
3	Apply the concept of Decision making statements, looping constructs, functions for Solving basic programs					K3
4	Analyze the concepts of Lists, tuples and error handling mechanisms					K4
5	Evaluate a program incorporating all the python language constructs					K5
K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create						
UNIT I						
Introduction- Identifiers- Statements and expressions-Variables-Operators—Precedence and associativity – data types – indentation- comments-Input and output-types o conversions- The type() Function. Chapter 2: Section 2.1 to Section 2.13						
UNIT II					6 hours	
Control flow Statements: The if-The if...else-The if...elif...else-Nested if The while loop-The for loop-The continue and break statements - catching exception. Chapter 3: Section 3.1 to Section 3.8						
UNIT III					6 hours	
Functions: Buil-in function-commonly used modules-function definition and calling function – The return statement and void function –scope and life time of variables-default parameters – key word argument – args and kwargs – commend line arguments. Strings- creating and storing strings-basic string operations-accessing characters in string by index number-string slicing and joining. Chapter4 : Section 4.1 to Section 4.9 Chapter 5: Section 5.1 to Section 5.4						
UNIT IV					6 hours	
Dictionaries : Creating dictionaries-the dic() function-built –in functions used on dictionaries-Chapter 7; section 7.1 to section 7.3						

UNIT V		6 hours
Files -Types of files- creating and reading text data-file methods to read and write data-reading and writing binary files-reading and writing CSV files- Python os and os.path modules. Object –oriented Programming -Classes and Objects-Creating Classes and Objects in Python-The constructor method-Class attributes versus data attributes Chapter 9: section 9.1 to section 9.7 Chapter 11: section 11.1 to section 11.4, section 11.6		
Total Lecture Hours		30 hours
Text Book		
1	S. Gowri Shankar and A.Veena, Introduction to Python Programming, CRC Press, 2019.	
Reference Book(s)		
1	Mark Summer field.—Programming in Python 3:A Complete introduction to the Python Language, Addison-Wesley Professional,2009.	
2	Martin C. Brown, —PYTHON: The Complete Referencel,McGraw-Hill,2001	
Course Designed by : Dr I. Mohammed Ali Jaffer Dr P. Karthikeyan		

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	L	L	L	L	L	L	L	L	L	L
CO2	M	L	L	L	L	L	L	L	L	L
CO3	S	M	L	L	L	L	L	L	L	L
CO4	S	S	M	L	L	L	L	L	L	L
CO5	S	S	S	L	L	L	L	L	L	L

*S-Strong; M-Medium; L-Low

CourseCode		Python Programming (Practical)	L	T	P	C
Core/elective/Supportive		Skill Based Subject IV	0	0	1	1
Pre- requisite		Knowledge in basic Programming	Syllabus version		2025-2026	
Course Objectives						
To introduce the concepts of python programming constructs						
Expected Course Outcomes						
1	Apply the concept of Decision-making statements, looping constructs, functions for solving basic programs					K3
2	Analyze the concepts of Lists, tuples and error handling mechanisms					K4
3	Evaluate a program in incorporating all the python language constructs					K5
K1–Remember K2 –Understand K3–applyK4-AnalyzeK5–evaluateK6-Create						
PRACTICAL LIST						
1. Write Python Code to Determine Whether the Given String Is a Palindrome or Not Using Slicing						
2. Write a python program to find the largest three integers using if-else and conditional operator.						
3. Write recursive functions for the factorial of positive integer.						
4. Write recursive functions for Fibonacci Sequence upto given number n.						
5. Write a python program to find the mean, median, mode and standard deviation.						





Elective Courses

Course code		ASTRONOMY – I	L	T	P	C
Core/Elective/Supportive		ELECTIVE I – A	5	-	-	3
Pre-requisite		Knowledge in Physics and Mathematics	Syllabus Version			2025-2026
Course Objectives:						
To enable the students to understand the Astronomical aspects and about the laws governing the planet movements.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Define properties of physical systems that comprise the known universe					K1
2	Understand the Solar system, Celestial sphere, Dip-Twilight & Kepler’s laws.					K2
3	Apply their physics and mathematical skills to problems in the areas of planetary science.					K3
4	Demonstrate the skill to infer valid scientific conclusions and communicate those conclusions in a clear and articulate manner.					K4
5	Analyze the astronomical concepts.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1	Solar system				15 hours	
General description of the Solar system. Comets and meteorites – Spherical trigonometry.						
Unit:2	Celestial sphere				15 hours	
Celestial sphere – Celestial co – ordinates – Diurnal motion – Variation in length of the day.						
Unit:3	Geocentric parallax				15 hours	
Dip – Twilight – Geocentric parallax.						
Unit:4	Refraction				15 hours	
Refraction – Tangent formula – Cassini’s formula.						
Unit:5	Kepler’s law				15 hours	
Kepler’s laws – Relation between true eccentric and mean anomalies.						
		Total Lecture Hours			75 hours	

Text Book	
1	Astronomy-S.Kumaravelu and Susheela Kumaravelu (TextPublisher: Sivakasi: Janki7 th Edition 1986)
Course Designed By: 1. Ms. S.Sobia 2. Mr.M.Balasankar	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	S	S	S	M	S	S
CO2	M	M	M	S	S	S	S	M	S	M
CO3	M	M	M	M	M	S	M	S	S	S
CO4	S	S	M	S	S	S	S	S	S	S
CO5	S	M	M	S	S	S	M	S	M	S

*S-Strong; M-Medium; L-Low



Course code		Operations Research – I	L	T	P	C
Core/Elective/Supportive		Elective I - B	5	-	-	3
Pre-requisite		Knowledge in Basic Mathematical Concepts	Syllabus Version		2025 - 2026	
Course Objectives:						
To familiarize students with the basic concepts, models and techniques for effective decision making, model formulation and applications.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Understand the basic concepts and application of operations research in various fields.					K1
2	Know principles of construction of mathematical models of conflicting situations.					K2
3	Analyze the relationship between a linear program and its dual.					K3
4	Apply techniques constructively to make effective decisions in business and solve problems in industry.					K3
5	Build and solve transportation problems.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 - Create						
Unit:1	Basics Of Operations Research and Formulation Of L.P.P				15 hours	
Basics of O.R – Definition of O.R – Characteristics of O.R - Scientific methods in O.R – Necessary of O.R in Industry–limitations of O.R .Linear Programming Problem – Formulation of L.P.P.						
Unit:2	Linear Programming Problem -Simplex methods				15 hours	
Graphical solutions of L.P.P – Simplex Method – Charne’s Penalty Method (or) Big – M Method Problems.						
Unit:3	Duality In L.P.P				15 hours	
Duality in L.P.P – Concept of duality – Duality and Simplex Method – Problems.						
Unit:4	Transportation Model				15 hours	
The transportation Problems – Basic feasible solution by L.C.M – NWC- VAM- optimum solutions – unbalanced Transportation problems.						
Unit:5	Assignment Model				15 hours	
The Assignment Problems – Assignment algorithm – optimum solutions – Unbalanced Assignment Problems.						
	Total Lecture hours				75 hours	
Text Book						
1	Operations Research – Kanti Swarup, P. K. Gupta, Man Mohan (S. Chand & Sons Education Publications, New Delhi, 12th Revised edition-2003)					

Reference Books	
1	Operations Research – Prem Kumar Gupta D. S. Hira (S. Chand & Company Ltd, Ram Nagar, New Delhi ,2014)
2	Operations Research Principles and Problems- S. Dharani Venkata Krishnan(Keerthi publishing house PVT Ltd.1994)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/111/102/111102012/
2	https://nptel.ac.in/courses/111/104/111104027/
Course Designed By: 1. Dr.A.Manonmani 2. Dr.I.Mohammed Ali Jaffer	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	S	M	M	M	S	S
CO2	S	M	S	S	S	S	S	M	M	S
CO3	S	S	S	S	M	M	S	S	S	S
CO4	S	S	S	S	S	S	S	S	M	S
CO5	S	S	S	S	S	S	S	M	S	S

*S-Strong; M-Medium; L-Low

Course code		ASTRONOMY II	L	T	P	C
Core/Elective/Supportive		ELECTIVE II – A	5	-		3
Pre-requisite		Knowledge in Physics & Mathematics	Syllabus Version	2025-2026		
Course Objectives:						
To enable the students to learn about the interesting facts of Moon, Sun Planetary Motion.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Understand the concepts of precession and nutation.					K1
2	Describe the eclipse of the moon.					K2
3	Find equation of time.					K3
4	Demonstrate the ability to analyze the concepts.					K4
5	Describe the properties of stellar system.					K2
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1						
		Time	15 hours			
Equation of time – Conversion of time – Seasons – Calendar.						
Unit:2						
		Aberration	15 hours			
Annual Parallax – Aberration.						
Unit:3						
		Precession	15 hours			
Precession – Nutation.						
Unit:4						
		Eclipses	15 hours			
The Moon – Eclipses.						
Unit:5						
		The Stellar System	15 hours			
Planetary Phenomenon – The Stellar system.						
			Total Lecture hours		75 hours	

Text Book	
1	Astronomy-Mr.S.Kumaravelu and Susheela Kumaravelu. (Text <i>publisher</i> : Sivakasi: Janki, 7 th edition, 1986)
Course Designed By: 1. Ms. S.Sobia 2. Mr.M.Balasankar	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	M	M	M	M	M	S	S
CO2	M	M	S	M	M	S	M	M	M	S
CO3	M	M	S	S	S	S	M	S	S	S
CO4	S	M	S	S	S	S	M	S	S	S
CO5	S	M	S	S	M	S	M	S	S	S

*S-Strong; M-Medium; L-Low



Course code		OPERATIONS RESEARCH – II	L	T	P	C
Core/Elective/Supportive		ELECTIVE II - B	5	-	-	3
Pre-requisite		Knowledge in Basic Mathematical Concepts	Syllabus Version	2025-2026		
Course Objectives:						
To impart knowledge in Assignment Problems, Game theory, performance measures of queues and optimal use of Inventory.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Identify the importance of stocks the reasons for holding stock in an organization, determine the optimal order quantity for models.					K1
2	Explain the various costs related to inventory system.					K2
3	Apply game theory concepts to articulate real-world situations by identifying, analyzing and practicing strategic decisions.					K3
4	Apply and extend queueing models to analyze real world systems.					K4
5	Build and solve assignment model.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1	Game Theory				15 hours	
Game Theory – Two-person zero sum game – The Maximin – Minimax principle – problems - Solution of 2 x 2 rectangular Games – (2 x n) and (m x 2) graphical method – Problems.						
Unit:2	Queueing Theory				15 hours	
Queueing Theory – Introduction – Queueing system – Characteristics of Queueing system – Symbols and Notations – Classifications of queues – Problems in (M/M/1) : (∞ /FIFO), (M/M/1):(N/FIFO); (M/M/C) : (∞ /FIFO) Models.						
Unit:3	Sequencing Problems				15 hours	
Introduction-problem of sequencing - basic terms used in sequencing- processing n-jobs through 2 machines - processing 2 jobs through k machines- - processing n –jobs through k machines (Problems only).						
Unit:4	Inventory Problems				15 hours	
Inventory control – Types of inventories – Inventory costs – EOQ Problem with no shortages – Production problem with no shortages – EOQ with shortages – Production problem with shortages.						
Unit:5	Network Scheduling By PERT/CPM				15 hours	
Introduction- Network and basic components- Rules of Network construction- Time calculation in Networks - CPM and PERT Calculations.						
				Total Lecture hours		75 hours

Text Book	
1	Operations Research – Kanti Swarup, P. K. Gupta, Man Mohan (S. Chand & Sons Education Publications, New Delhi, 12th Revised edition, 2003)
Reference Books	
1	Operations Research – Prem Kumar Gupta D. S. Hira (S. Chand & Company Ltd, Ram Nagar, New Delhi, 2014)
2	Operations Research Principles and Problems- S. Dharani Venkata Krishnan (Keerthi publishing house PVT Ltd. 1994)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/111/102/111102012/
2	https://youtu.be/zADj0k0waFY https://youtu.be/xvDdrswAj8M https://www.youtube.com/watch?v=xVPoWkkQTrQ https://www.youtube.com/watch?v=7kDtTAnvuww https://www.youtube.com/watch?v=IfLsPHKk5lw
3	https://nptel.ac.in/courses/109/103/109103021/
4	https://nptel.ac.in/courses/110/105/110105082/ https://nptel.ac.in/courses/110/106/110106045/
Course Designed By: 1. Dr. A.Manonmani 2. Dr. I.Mohammed Ali Jaffer	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	S	S	M	S	M	M	M	S	S
CO2	M	M	M	M	S	S	M	M	M	S
CO3	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	M	S	M	S	M	S	M

*S-Strong; M-Medium; L-Low

Course code		GRAPH THEORY	L	T	P	C
Core/Elective/Supportive		ELECTIVE III - A	5	-	-	3
Pre-requisite		Knowledge In Basic Mathematics	Syllabus Version			2025-2026
Course Objectives:						
Enables the students to learn the basic concepts of Graphs, sub-graphs, Eulerian graphs, Digraphs, tournaments, connectivity, graphs, matrix representation of graphs, trees, planar graphs.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Identify the properties of different types of graph and their application.					K1
2	Demonstrate knowledge of basic concepts in graph theory					K2
3	Understand cut graphs, cycle spaces					K2
4	Apply principles and concepts of graph theory in practical situations.					K3
5	Analyze the concepts of Planar graphs.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1						
Graphs			15 hours			
Graphs –Sub graphs – Degree of a vertex walks, paths and cycles in a Graphs – connectedness cut vertex and cut edge.						
Unit:2						
Euler and Hamiltonian Graphs			15 hours			
Euler and Hamiltonian Graphs – Algorithm for Euler circuits – Bipartite Graphs						
Unit:3						
Trees			15 hours			
Trees- Matrix representation of a graph..						
Unit:4						
Planar graphs			15 hours			
Planar graphs – Euler’s theorem on planar graphs – characterization of planar graphs (no proofs) of the difficult part of the characterization.						
Unit:5						
Directed graphs			15 hours			
Directed graphs – Connectivity – Euler Digraphs.						
Total Lecture hours			75 hours			

Text Book	
1	A First Course in Graph Theory - A.Choudum (Macmillan,2001) Chapters 1 to 7.
Reference Books	
1	Graph theory with applications to Engineering and computer science-Narsingh Deo (Prentice Hall of India1979).
2	Graph Theory -Frank Harary (Narosa Publishing HQCK 2001).
3	Introduction to Graph Theory- Dr. M. Murugan.(Muthali Publishing House,2005)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/111/106/111106102/
2	https://www.digimat.in/nptel/courses/video/106104170/L19.html
Course Designed By: 1. Dr. A.Manonmani 2. Dr. P.Karthikeyan	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	S	S	S	M	S	S
CO2	M	M	M	S	S	S	M	M	M	S
CO3	M	M	M	S	M	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	M	M	S	M	S	M	S	S	S

*S-Strong; M-Medium; L-Low

Course code		AUTOMATA THEORY AND FORMAL LANGUAGES	L	T	P	C
Core/Elective/Supportive		ELECTIVE III - B	5	-	-	3
Pre-requisite		Knowledge in Mathematics	Syllabus Version		2025-2026	
Course Objectives:						
To impart knowledge in Finite automata, regular languages, regular grammars, context free grammars, languages, and pushdown automata which play a crucial role to Identify different formal language classes and their relationship.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Acquire a fundamental understanding of the core concepts in automata theory and formal languages.					K1
2	Design grammars and automata for different language classes.					K2
3	Describe the types of grammar and derivation tree.					K2
4	To apply context-free languages, push-down automata.					K3
5	Design automata, regular expressions and context-free grammars accepting or generating a certain language.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1	Phrase Structure Languages.				15 hours	
Introduction – phrase structure languages.						
Unit:2	Closure Operations				15 hours	
Closure operations.						
Unit:3	Context Free Languages.				15 hours	
Context free languages.						
Unit:4	Finite State Automata				15 hours	
Finite state automata.						
Unit:5	Push Down Automata.				15 hours	
Push down automata.						
Total Lecture hours					75 hours	

Text Book	
1	Formal Languages and Automata- Rani Siromoney. (Revised edition 1984) (Published by the Christian Literary Society, Madras-3) Chapters 1 to 6.
Reference Books	
1	Formal languages and their relation automata-J.E. Hopcroft and D.Ullman (Addison Wesley1969)
2	Automata theory: Machines and Languages-Richard .Y.Kain (McGraw Hill1972)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/106/103/106103070/
2	https://www.digimat.in/nptel/courses/video/111103016/L02.html
Course Designed By: 1. Dr.T.Nandhagopal 2. Ms.S.Kavunthi	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	M	M	M	M	M	S	S
CO2	S	M	S	S	S	S	M	M	M	S
CO3	M	M	S	S	S	S	M	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S

*S-Strong; M-Medium; L-Low

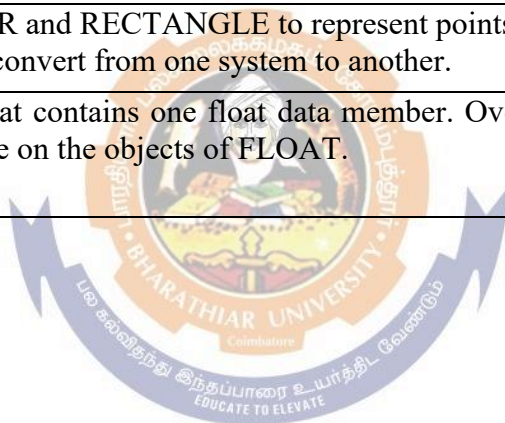
Course code		PROGRAMMING IN C++	L	T	P	C
Core/Elective/Supportive		ELECTIVE III C	4	-		3
Pre-requisite		Knowledge in C Programming	Syllabus Version	2025-2026		
Course Objectives:						
To enable the students to learn about the class structure, operators, inheritance, polymorphism, file handling.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Know about class structure, member functions & data members, inheritance types and example problems.					K1
2	Understand how C++ improves C with object-oriented features.					K2
3	Develop programming skills.					K2
4	To make use of objects and classes for developing programs.					K3
5	Build C++ classes.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1	Tokens, Expressions and Control Structures				12 hours	
Evolution of C++ - applications of C++ - structure of C++ program. Tokens – keywords – identifiers and constants – basic data types – user-defined data types – constant pointers and pointers to constants – symbolic constants –type compatibility – declaration of variables – dynamic initialization of variables – reference variables – operators in C++ - scope resolution operator – memory management operators – manipulators – type cast operator – expressions and their types – special assignment expressions – implicit conversions – operator precedence.						
Unit:2	Functions in C++				12 hours	
The main function – function prototyping – call by reference – return by reference – inline functions – default arguments – const arguments – function overloading. Managing Console, I/O Operations: C++ streams – C++ stream classes – unformatted console I/O operations – formatted console I/O operations –managing output with manipulators.						
Unit:3	Classes and Objects				12 hours	
Specifying a class – defining member functions – making an outside function inline – nesting of member functions – private member functions – arrays within a class – memory allocation for objects –arrays of objects – objects as function arguments – friend functions – returning objects – const member functions. Constructors and Destructors: Introduction – constructors – parameterized constructors – multiple constructors in a class – constructors with default arguments – copy constructor.						

Unit:4	Operator Overloading	12 hours
Introduction – defining operator overloading – overloading unary operators – overloading binary operators - overloading binary operators using friends – rules for overloading operators.		
Unit:5	Inheritance	12 hours
Introduction – defining derived classes – single inheritance – making a private member inheritable – multilevel inheritance – multiple inheritance – hierarchical inheritance – hybrid inheritance.		
	Total Lecture hours	60 hours
Text Books		
1	Object Oriented programming with C++- E.Balagurusamy (McGraw Hill 3 rd Edition 2006.)	
Reference Books		
1	Programming with C++ - D. Ravi Chandran (Tata McGraw-Hill publishing company limited, New Delhi 1996)	
2	Object Oriented Programming with ANSI and Turbo C++- Ashok N. Kamthane (Pearson Education publishers 2003)	
3	Programming with C++ - John R.Hubbard (2nd Edition, TMH publishers 2002).	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://nptel.ac.in/courses/106/105/106105151/	
2	https://nptel.ac.in/courses/106/101/106101208/	
3	https://www.classcentral.com/course/swayam-programming-in-c-6704	
Course Designed By: 1. Dr.T.Narppasalai Arasu 2.Dr.P.Rajarajeswari		

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	S	M	S	M	S	S
CO2	M	M	M	M	S	S	S	M	S	S
CO3	S	S	S	S	S	S	M	S	S	S
CO4	S	S	S	M	S	S	S	S	S	S
CO5	S	S	S	M	S	M	S	S	S	M

*S-Strong; M-Medium; L-Low

Course code		PROGRAMMING IN C++ (PRACTICAL)	L	T	P	C
Core/Elective/Supportive		ELECTIVE III - C(Practical)	-	-	1	1
Pre-requisite		Knowledge in C++	Syllabus Version		2025-2026	
PRACTICAL LIST						
1. Write a function 'power()' to raise a number 'm' to a power 'n'. The function takes a 'double' value for 'm' and 'int' value for 'n', and returns the result correctly. Use a default vale of 2 for 'n' to make the function to calculate squares when this argument is omitted. Write a main() that gets the values of 'm' and 'n' from the user to test the function.						
2. Write a program to compute compound interest of a given amount AMT for 'n' years. Use function overloading so that the program gets input of interest rate RATE in any of the data type 'float' or 'int'						
3. Create a class which consist of employee detail ENO, ENAME, DEPT, BASIC SALARY. Write a member function to get and display them. Derive a class PAY from the above class and write a member function to calculate DA, HRA and PF depending on the grade and display the pay slip in a neat format using console I/O						
4. Define two classes POLAR and RECTANGLE to represent points in the polar and rectangle system. Write a program to convert from one system to another.						
5. Create a class FLOAT that contains one float data member. Overload all the four arithmetic operators so that they operate on the objects of FLOAT.						



Course code		NUMBER THEORY	L	T	P	C
Core/Elective/Supportive		ELECTIVE III – D	5	-	-	4
Pre-requisite		Knowledge in Algebra	Syllabus Version	2025–2026		
Course Objectives:						
To impart knowledge in the basic concepts of number theory, fundamental definitions, theorems.						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Understand the concepts of divisibility and primes					K1
2	Solve congruence.					K2
3	Describe the fundamental theorem of Arithmetic.					K3
4	Understand the concepts and apply the theorems in areas of Mathematics.					K3
5	Compute powers of integers modulo prime numbers.					K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1	Early Number Theory				15 hours	
Peano's Axiom - Mathematical Induction - The Binomial Theorem - Early Number Theory.						
Unit:2	Divisibility Theory in Integers				15hours	
Divisibility Theory in Integers - The Division Algorithm - The g.c.d. - Euclidean Algorithm - The Diophantine Equation $ax + by = c$						
Unit:3	Primes and their Distributions				15 hours	
Primes and their Distributions - The Fundamental Theorem of Arithmetic - The sieve of Eratosthenes - The Gull Conjecture.						
Unit:4	The Theory of Congruence				15 hours	
The Theory of Congruence - Basic Properties of Congruence - Special Divisibility test - Linear Congruence-Prime modulus- Power residues.						
Unit:5	Fermat's Theorem				15 hours	
Fermat's Theorem - Fermat's factorization method - The Little theorem - Wilson's theorem.						
	Total Lecture hours				75 hours	

Text Book	
1	Elementary Number theory -David M. Burton (W.M.C. Brown Publishers, Dubuque, Iowa, 1989).
Reference Books	
1	An Introduction to theory of Numbers -Ivan Niven and H. Zuckerman (5 th edition, Wiley 1991)
2	Elements of Number Theory - Prof. S.Kumaravelu and Susheela Kumaravelu (Raja Sankar offset Printers , Siva kasi, 2002)
3	Beginning Number Theory -Neville Robinns (2 nd Ed., Narosa Publishing House Pvt. Ltd., Delhi, 2007)
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]	
1	https://nptel.ac.in/courses/111/103/111103020/ https://nptel.ac.in/courses/111/101/111101137/
Course Designed By: 1.Dr.C.Janaki 2. Dr.M.Anandhi	

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	M	M	M	M	M	S	S
CO2	S	S	S	M	S	S	S	M	M	S
CO3	M	M	M	M	M	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	M	S	S	S	S	M	S	S	S

*S-Strong; M-Medium; L-Low

Course code		INTRODUCTION TO BIG DATA	L	T	P	C
Core/Elective/Supportive		ELECTIVE III – E	5	-	-	4
Pre-requisite		Basic Knowledge of Big Data	Syllabus Version		2025-2026	
Course Objectives:						
1. To impart knowledge on Big Data and Data Analytics						
Expected Course Outcomes:						
On the successful completion of the course, student will be able to:						
1	Analyze the applications of Big Data					K4
						K4
K1 - Remember; K2 - Understand; K3 - Apply; K4 - Analyze; K5 - Evaluate; K6 – Create						
Unit:1	Data Explosion				15 hours	
Data: Definition - Data in digital age- Big Data: Introduction - Search Engine Data - Healthcare Data - Social Media Data - E-Commerce Data - Media and Entertainment Data - Real-time Data - Astronomical Data						
Unit:2	Big Data				15 hours	
Definition - Big Data Vs Small Data - The Five V's: Volume - Velocity - Variety - Veracity - Value - Mining Big Data : Clustering - Classification - Decision Tree for Transactions - Data Visualization						
Unit:3	Big Data Analytics				15 hours	
Big Data Analytics: Introduction - Tools for Data Analytics - Hadoop: Features - Hadoop Architecture - Hadoop Distributed File System - MapReduce - Map Function - Shuffle and Reduce Functions - Advantages						

Unit:4	Big Data Storage	15 hours
Introduction-Moore's Law- ACID Properties- Storing Structured Data - Storing Un-Structured Data: Relational Database Management Systems - NoSQL databases for big data- Types of No-SQL Databases : Document Oriented - Columnar - Graph - Key-Value Pair		
Unit:5	Applications	15 hours
Application of Big Data : Healthcare - Advertising : Pay per click advertising- Targeted advertising - Recommender Systems - Big Data in Society: Smart Vehicle-Smart Homes - Smart Cities		
	Total Lecture hours	75 hours
Text Book		
1	Dawn E. Holmes, 2017, “Big Data: A Very Short Introduction”,1st Edition, Oxford	
Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]		
1	https://nptel.ac.in/courses/106/105/106105195/	
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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	M	M	M	S	S	S	S	M	S	S
CO2	M	M	M	S	S	S	S	M	M	S
CO3	S	S	S	S	S	S	S	S	S	M
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	M	S	M	S	S	S	S	S	S

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