

Course Code	(to be filled by Office of Acad.)	Course Title	Complex Dynamics			
Dept./Faculty proposing the course	SH (Mathematics) / Dr. Subhasis Ghora	Structure (LTPC)	L	T	P	C
			3	1	0	4
To be offered for	PG/Ph.D.	Type	Core ☐		Elective ☒	
		Status	New ☒		Modification	
Pre-requisite	COT	Submitted for approval				
Learning Objectives	- To develop a strong foundational understanding in Complex Dynamics. - To provide exposure to a variety of research problems and methodologies in this field.					
Learning Outcomes	By the end of this course, students will be able to: - Develop a structured approach to research in Complex Dynamics. - Analyze zeros of meromorphic and harmonic functions. - Use advanced techniques to investigate complex dynamical systems.					
Contents of the course (With approximate break-up of hours for L/T/P)	Fatou set and Julia set- Sequence of functions, iterative behaviour of Möbius transformations, Normality of a sequence of functions, Fatou set and Julia set, iterative behaviour of quadratic polynomials, Mandelbrot set-MLC conjecture, general theory of polynomial dynamics, filled Julia set, escaping set. [L8+T2] Fixed point theory- Fixed points of rational and transcendental functions, classification of the fixed points, residue fixed point index, behaviour of the function near fixed points, Fatou components, local behaviour of the sequence of functions on a periodic Fatou component, linearization of a function near fixed points. [L8+T2] Singular values and Fatou components- Critical points, critical values, asymptotic values, singular values, relation between singular values and periodic Fatou components, wandering domain and its relation with singular values, ray-landing dynamics, prime ends and local connectivity, Symmetry of Julia set, classification of polynomial symmetry group. [L10+T3] Quasi-conformal Surgery- Quasi conformal maps, conformal					

	structure, fundamental lemma of surgery, no wandering domain for rational maps, construction of periodic Fatou component using surgery. [L8+T3] Mating- Modular group, fundamental domain of modular group, mating between Julia set of quadratic polynomials and a discrete subgroup of modular group. [L8+T2]
Text Books	1. L. Carleson and T. W. Gamelin, Complex Dynamics, 1st Ed., Springer Science & Business Media, ISBN: 978-0-387-97942-7, 2013. 2. J. Milnor, Dynamics in One complex variable, 3rd Ed., (AM-160), Princeton University Press, ISBN: 978-0-691-12488-9, 2006.
Reference Books	1. B. Branner and N. Fagella, Quasi-conformal surgery in holomorphic dynamics, 1st Ed., volume 141 of Cambridge Studies in Advanced Mathematics, Cambridge University Press, ISBN: 978-1-107-33760-2, 2014. 2. A. F. Beardon, Iteration of rational functions. 2nd Ed., Complex analytic dynamical systems, Springer-Verlag, New York, ISBN: 978-0-387-95151-5, 2000.