

BARASAT GOVT COLLEGE
UNDER GRADUATE DEPARTMENT OF MATHEMATICS
B.Sc. Mathematics (Hons) CBCS Syllabus
With effect from 2018-19

Program Outcome (PO)

PO 1	Analytical reasoning
PO 2	Problem Solving
PO 3	Critical thinking
PO 4	Scientific reasoning
PO 5	Disciplinary knowledge
PO 6	Information/digital literacy
PO 7	Research-related skills
PO 8	Scientific mindset
PO 9	Lifelong Learning

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Programme Specific Outcomes (PSO)

- **PSO1:** A Bachelor's degree in mathematics represents the culmination of in-depth knowledge in algebra, calculus, geometry, differential equations, and several other branches of mathematics. It also encompasses the study of related areas such as computer science, financial mathematics, statistics, and more.
- **PSO2:** The skills and knowledge gained possess intrinsic beauty and lead to proficiency in analytical reasoning. These skills can be utilized in modeling and solving real-life problems. Students undergoing this program learn to logically question assertions, recognize patterns, and distinguish between essential and irrelevant aspects of problems.
- **PSO3:** They also share ideas and insights while seeking and benefitting from the knowledge and insights of others. This helps them learn to behave responsibly in a rapidly changing, interdependent society.
- **PSO4:** Students completing this program will be able to present mathematics clearly and precisely, make vague ideas precise by formulating them in the language of mathematics, describe mathematical ideas from multiple perspectives, and explain fundamental concepts of mathematics to non-mathematicians.
- **PSO5:** Completion of this program will also enable learners to join the teaching profession in primary and secondary schools. Additionally, this program will enhance students' employability for government jobs, jobs in banking, insurance, and investment sectors, data analyst positions, and various other public and private enterprises.
- **PSO6:** This program helps learners build a solid foundation for higher studies in mathematics. This program helps learners to get research ideas in different fields of Mathematics and its applications.

BARASAT GOVERNMENT COLLEGE
Course Outcome or Learning Outcome
Three year B.A. /B.Sc. Degree Course
Under CBCS semester system
HONOURS COURSE IN MATHEMATICS
With effect from the session: 2018 – 2019

Course Name: Core Course-1

Course Code: MTMACOR01T

Topic Name: CALCULUS ,GEOMETRY AND ORDINARY DIFFERENTIAL EQUATION

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Generate curves in Cartesian and polar coordinate systems.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Examine reduction formulae, conduct derivations, and provide illustrations of reduction formulae for integration.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Assess problems concerning arc length, parametric curves' arc length, and surface area of revolution.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Scrutinize and synthesize provided data to tackle geometry problems.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Comprehend the fundamental concepts of conics and elucidate their applications.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Employ the fundamentals of differential equations for mathematical modeling.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO7	Interpret the general, particular, explicit, implicit, and singular solutions of a differential equation.	L4 Annalysing	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	2	2	2	3		2	3	2		1	3	1	3	2	2			
CO2	3	1	2	1	3		1	2	1		2	1	2	1	2	1			
CO3	1	2	2	3	3		3	1	3		3	2	3	3	1	2			
CO4	3	3	1	2	3		2	2	2		3	2	3	2	2	1			
CO5	2	2	3	3	3		3	2	3		3	2	2	3	2	3			
CO6	3	3	3	3	3		3	2	2		2	3	3	2	3	3			
CO7	3	3	3	3	3		3	2	2		3	3	3	2	3	3			
Average	2.43	2.29	2.29	2.43	3.00		2.43	2.00	2.14		2.43	2.29	2.43	2.29	2.14	2.14			

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Course Name: Core Course-2

Course Code: MTMACOR02T

Topic Name: ALGEBRA

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Recall elementary complex numbers and their properties.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Examine the theory of equations alongside the nature of roots of algebraic equations.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Utilize the theory of equations to solve cubic and bi-quadratic algebraic equations.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Employ the theory of inequalities, particularly focusing on the relationship between arithmetic mean (AM), geometric mean (GM),	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Investigate the properties of integers comprehensively, including elementary principles such as the well-ordering principle, the principle	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Grasp binary relations and mappings, and apply them to the concept of equipotent sets and cardinality.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO7	Gain an understanding of matrices, their inverses, the rank of matrices, and the concepts of eigenvalues and eigenvectors.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	2	2	2	3		3	2	2		3	3	2	2	2	2			
CO2	2	3	2	1	3		2	2	1		1	3	2	2	2	1			
CO3	2	3	2	2	3		3	3	2		3	1	3	3	1	2			
CO4	3	1	1	3	3		3	1	2		3	1	3	1	2	3			
CO5	3	3	3	3	3		2	2	3		1	3	1	2	2	3			
CO6	3	3	3	3	3		3	3	3		2	2	3	3	3	3			
CO7	1	2	3	3	3		1	2	2		3	3	3	3	3	3			
Average	2.29	2.43	2.29	2.43	3.00		2.43	2.14	2.14		2.29	2.29	2.43	2.29	2.14	2.43			

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Course Name: Core Course-3

Course Code: MTMACOR03T

Topic Name: REAL ANALYSIS

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Grasp the Real number system thoroughly.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Investigate open and closed sets, limit points of sets, the concept of Infimum, Supremum, Archimedean properties, and various topological	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Comprehend the profound concept of Sequences and Infinite series of real numbers, including the convergence and divergence of sequences	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Employ properties of Sequences and Infinite Series of Real numbers to compute limits of sequences and series.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Generate graphical representations of Sequences of Real numbers.	L6 Creating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Enhance the capacity to solve different types of numerical problems.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	2	2	2	3		2	2	2		3	1	3	2	2	2			
CO2	1	3	3	2	3		1	2	2		3	3	2	3	2	1			
CO3	3	1	1	1	3		3	2	1		2	3	3	2	2	3			
CO4	2	3	2	2	3		2	1	2		3	3	1	3	1	2			
CO5	3	3	3	3	3		3	3	1		1	2	3	1	3	3			
CO6	3	3	3	3	3		3	3	3		3	2	3	3	3	3			
Average	2.33	2.50	2.33	2.17	3.00		2.33	2.17	1.83		2.50	2.33	2.50	2.33	2.17	2.33			

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Course Name: Core Course-4

Course Code: MTMACOR04T

Topic Name: DIFFERENTIAL EQUATION AND VECTOR CALCULUS

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Grasp and Assess the existence and uniqueness of solutions to first-order differential equations under boundary value conditions.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Comprehend second-order differential equations, the concept of Wronskian, and scrutinize its solutions using the method of variation of	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Judge the power series solution to the differential equation around an ordinary point.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Understand and Evaluate dynamical systems, the concept of phase planes, and equilibrium points.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Gain insight into and Assess the vector triple product and fundamental vector calculus operations such as differentiation and integration of	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Grasp the capacity to solve different types of numerical problems.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	2	3	2	3		2	2	2		2	3	2	2	2	2			
CO2	1	1	1	3	3		1	1	2		3	2	1	2	1	1			
CO3	2	2	2	3	3		3	2	1		1	3	2	2	2	3			
CO4	3	3	3	1	3		3	2	2		3	1	3	2	2	2			
CO5	3	3	2	3	3		2	3	2		3	3	2	3	3	3			
CO6	3	3	3	3	3		3	3	3		3	3	3	3	3	3			
Average	2.50	2.33	2.33	2.50	3.00		2.33	2.17	2.00		2.50	2.50	2.17	2.33	2.17	2.33			

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Course Name: Core Course-5
Course Code: MTMACOR05T
Topic Name: THEORY OF REAL FUNCTIONS

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Grasp and Evaluate numerous properties of the real line and acquire the ability to define sequences in terms of functions from to a subset	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Gain insight into and Examine bounded, convergent, divergent, Cauchy, and monotonic sequences, and employ these concepts to	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Utilize the ratio, root, alternating series, and limit comparison tests to Assess convergence and absolute convergence of infinite series of real	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Comprehend and analyze the fundamental properties of real numbers that underpin the formal development of real analysis and limits.	L4 Annalysing	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Utilize the aforesaid principles to Evaluate them in sequences, series, continuity, and differentiation.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Understand and Retain how abstract concepts and rigorous methods in mathematical analysis can be Employed to solve significant practical	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	2	2	2	3		2	2	2		2	2	2	2	2	2			
CO2	2	2	2	2	3		2	2	2		2	2	2	2	2	3			
CO3	2	2	2	2	3		2	2	2		3	2	3	2	1	1			
CO4	2	2	2	3	3		2	2	2		1	3	2	3	3	3			
CO5	3	3	2	3	3		3	2	3		3	3	2	3	2	3			
CO6	3	3	3	3	3		3	3	3		3	3	2	3	3	3			
Average	2.33	2.33	2.17	2.50	3.00		2.33	2.17	2.33		2.33	2.50	2.17	2.50	2.17	2.50			

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Course Name: Core Course-6
Course Code: MTMACOR06T
Topic Name: GROUP THEORY-I

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Understand and Analyze fundamental properties of Group theory, including Subgroups, Cyclic Groups, and Normal subgroups.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Evaluate the aforesaid concepts through numerous examples.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Apply and Analyze properties of Groups through the exploration of Symmetry Groups, Dihedral Groups, and Permutation Groups, and	L4 Annalysing	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Grasp and Analyze the profound concept of permutations.	L4 Annalysing	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Gain insight into and Analyze the fundamental concept of External direct product of Groups, and Evaluate various examples illustrating	L4 Annalysing	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Understand and Analyze Group homomorphisms deeply, Evaluate their implications through numerous examples, and Apply them to	L4 Annalysing	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	2	2	2	3		2	2	2		2	2	2	2	2	2			
CO2	2	3	2	2	3		3	2	2		1	2	2	3	2	2			
CO3	2	2	2	2	3		2	2	2		3	2	2	1	1	3			
CO4	2	3	2	2	3		3	2	3		3	3	3	2	2	1			
CO5	3	3	3	3	3		3	2	2		2	3	3	3	3	3			
CO6	3	3	3	3	3		3	2	2		3	3	3	3	3	3			
Average	2.33	2.67	2.33	2.33	3.00		2.67	2.00	2.17		2.33	2.50	2.50	2.33	2.17	2.33			

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Course Name: Core Course-7

Course Code: MTMACOR07T & MTMACOR07P

Topic Name: NUMERICAL ANALYSIS

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Analyze and Apply techniques to Evaluate numerical solutions of algebraic and transcendental equations.	L4 Annalysing	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Apply methods to Evaluate numerical solutions of systems of linear equations and Verify the accuracy of the solutions.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Understand and Analyze various interpolating and extrapolating methods, and Apply them to discover numerical solutions.	L4 Annalysing	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Analyze and Evaluate initial and boundary value problems in differential equations using numerical methods.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Apply a variety of numerical methods to solve real-life problems.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Apply methods to Evaluate numerical solutions of algebraic and transcendental equations using the programming language C.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO7	Apply techniques to Evaluate numerical solutions of systems of linear equations and Validate the accuracy of the solutions using the	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	1	3	2	2	3		2	2	2		2	2	2	3	2	2			
CO2	2	3	1	1	3		1	1	1		1	1	2	3	2	1			
CO3	3	3	2	2	3		2	1	1		2	3	2	2	1	2			
CO4	2	3	2	2	3		2	2	2		3	3	2	2	2	3			
CO5	3	3	3	3	3		3	3	2		2	3	2	1	1	2			
CO6	3	3	3	3	3		3	3	3		3	2	3	3	3	3			
CO7	3	3	3	3	3		3	3	3		3	3	3	3	3	3			
Average	2.43	3.00	2.29	2.29	3.00		2.29	2.14	2.00		2.29	2.43	2.29	2.43	2.00	2.29			

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Course Name: Core Course-8
Course Code: MTMACOR08T
Topic Name: RIEMANN INTEGRATION AND SERIES OF FUNCTIONS

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Grasp and Analyze the concepts and properties of Riemann Integration.	L4 Annalysing	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Apply the above stated concepts in Evaluating advanced integration problems, building upon mastery of basic Calculus concepts acquired	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Apply some simple techniques for testing the convergence of sequences and series of functions, and demonstrate confidence in	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Learn Calculus concepts to Evaluate problems in physics, geometry, and numerical approximation.	L1 Remembering	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Gain insight into the Applications of proper mathematical notation in relation to the above topics.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Learn some of the Applications of the fundamental theorems of integration.	L1 Remembering	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	3	3	2	3		2	2	2		1	2	2	1	2	1			
CO2	1	1	1	1	3		1	2	1		3	3	3	3	2	2			
CO3	2	2	2	2	3		3	1	1		2	3	3	2	1	3			
CO4	3	3	3	3	3		2	3	3		3	1	1	2	2	2			
CO5	2	3	3	3	3		3	2	2		3	3	3	3	3	3			
CO6	3	3	3	3	3		3	3	3		3	2	3	3	3	3			
Average	2.17	2.50	2.50	2.33	3.00		2.33	2.17	2.00		2.50	2.33	2.50	2.33	2.17	2.33			

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Course Name: Core Course-9
Course Code: MTMACOR09T
Topic Name: MULTIVARIATE CALCULUS

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Grasp and scrutinize the calculus of several variables, encompassing functions, limit, continuity, partial derivatives, directional derivatives,	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Utilize the afore said concepts to determine extreme values of such functions.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Comprehend and scrutinize double and triple integrals.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Employ the above stated concepts to solve various problems.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Acquire an understanding of vector fields, curl, divergence, and line integrals along with their practical applications.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Gain insight into Green's, Stoke's, and Gauss divergence theorem, and their relevance in solving diverse problems.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	2	2	3	3		2	2	2		2	2	2	2	2	2			
CO2	2	3	1	2	3		2	1	1		3	3	1	1	2	1			
CO3	2	1	2	1	3		2	2	3		3	1	2	2	1	3			
CO4	3	3	2	3	3		3	1	3		3	3	3	3	2	2			
CO5	3	3	3	1	3		3	3	2		1	2	2	3	3	3			
CO6	3	3	3	3	3		3	3	3		3	3	3	3	3	3			
Average	2.50	2.50	2.17	2.17	3.00		2.50	2.00	2.33		2.50	2.33	2.17	2.33	2.17	2.33			

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Course Name: Core Course-10

Course Code: MTMACOR10T

Topic Name: RING THEORY AND LINEAR ALGEBRA I

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Grasp and examine precise and accurate mathematical objects in ring theory.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Grasp and examine the fundamental concepts in ring theory, including ideals, quotient rings, integral domains, and fields, as well as the	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Familiarize oneself with the basic ideas of vector algebra, including linear dependence, independence, and spanning sets.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Investigate the row space, column space, and null space of a matrix.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Gain an understanding of the concepts of dimension of a subspace and the rank and nullity of a matrix. Utilize the relationship of these	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Utilize the relationship of aforesaid concepts to associated systems of linear equations. Additionally, grasp and examine the notion of a linear	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	2	2	2	3		2	2	2		2	2	2	1	2	3			
CO2	2	1	1	2	3		1	1	2		1	1	3	2	1	1			
CO3	2	3	3	2	3		3	2	2		3	2	1	3	2	2			
CO4	1	3	2	3	3		3	2	1		3	3	3	2	3	3			
CO5	3	3	3	1	3		3	3	3		3	3	3	3	2	3			
CO6	3	3	3	3	3		3	3	3		3	3	3	3	3	3			
Average	2.17	2.50	2.33	2.17	3.00		2.50	2.17	2.17		2.50	2.33	2.50	2.33	2.17	2.50			

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Course Name: Core Course-11

Course Code: MTMACOR11T

Topic Name: PARTIAL DIFFERENTIAL EQUATIONS, APPLICATIONS OF ORDINARY DIFFERENTIAL EQUATIONS

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Grasp and scrutinize precise and accurate mathematical objects in ring theory.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Comprehend and scrutinize the fundamental concepts in ring theory, encompassing ideals, quotient rings, integral domains, and fields, as	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Familiarize oneself with the basic ideas of vector algebra, including linear dependence, independence, and spanning sets.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Examine the row space, column space, and null space of a matrix.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Acquire an understanding of the concepts of dimension of a subspace and the rank and nullity of a matrix.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Utilize the relationship of aforesaid concepts to associated systems of linear equations. Additionally, scrutinize the notion of a linear	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	3	2	1	2	3		2	2	1		2	2	2	2	2	2			
CO2	1	1	2	1	3		2	1	2		1	1	1	1	1	1			
CO3	3	3	3	2	3		1	2	2		3	3	3	3	2	2			
CO4	2	3	3	2	3		3	3	3		3	2	3	2	3	2			
CO5	1	3	3	3	3		3	2	2		3	2	3	3	3	3			
CO6	2	3	3	3	3		3	3	3		3	3	3	3	3	3			
Average	2.00	2.50	2.50	2.17	3.00		2.33	2.17	2.17		2.50	2.17	2.50	2.33	2.33	2.17			

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Course Name: Core Course-12
Course Code: MTMACOR12T
Topic Name: GROUP THEORY II

CO, PO & PSO Mapping				
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping PSOs mapping
	CO1	Utilize the concept of Group Automorphisms to construct new groups from the given group.	L3 Applying	1,2,3,4,5,7,8,9 1,2,3,4,5,6
	CO2	Gain proficiency in group automorphism which will aid in exploring further aspects of field theory.	L2 Understanding	1,2,3,4,5,7,8,9 1,2,3,4,5,6
	CO3	Explore direct products of groups, group actions, and class equations. This course lays the groundwork for more advanced courses in algebra	L3 Applying	1,2,3,4,5,7,8,9 1,2,3,4,5,6
	CO4	Utilize these concepts to solve various problems.	L3 Applying	1,2,3,4,5,7,8,9 1,2,3,4,5,6
	CO5	Employ external direct product of groups in applications such as data security and electric circuits.	L3 Applying	1,2,3,4,5,7,8,9 1,2,3,4,5,6
	CO6	Apply Sylow's theorems to characterize certain finite groups and to verify the non-simplicity of finite groups.	L3 Applying	1,2,3,4,5,7,8,9 1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	1	2	2	3		2	2	2		3	3	3	2	2	2			
CO2	2	2	1	1	3		1	2	1		1	2	2	3	1	1			
CO3	1	2	3	3	3		2	3	1		3	2	1	1	3	2			
CO4	3	3	3	1	3		3	1	3		2	3	3	2	1	3			
CO5	1	3	3	3	3		3	1	3		3	1	3	3	3	3			
CO6	3	3	3	3	3		3	3	3		3	3	3	3	3	3			
Average	2.00	2.33	2.50	2.17	3.00		2.33	2.00	2.17		2.50	2.33	2.50	2.33	2.17	2.33			

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Course Name: Core Course-13

Course Code: MTMACOR13T

Topic Name: METRIC SPACES AND COMPLEX ANALYSIS

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Grasp the concept of Abstract Analysis through Metric Spaces.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Explore the topological properties of metric spaces.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Investigate the convergence and divergence of sequences abstractly in Metric spaces.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Familiarize oneself with the concept of the Fixed Point Theorem (Banach) in metric spaces.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Utilize Banach Fixed Point Theorem to demonstrate Picard Theorem on first order differential equations.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Delve deeply into the complex number system and its topological properties in Complex Analysis.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO7	Comprehend the limit and derivative of complex-valued functions of complex variables.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	2	1	2	3		3	2	2		2	1	2	2	1	2			
CO2	2	1	3	1	3		2	1	1		1	3	1	1	1	1			
CO3	3	2	2	3	3		1	2	2		2	3	2	2	2	2			
CO4	1	3	3	1	3		3	1	3		3	1	3	3	3	3			
CO5	3	3	3	1	3		1	3	1		3	2	3	2	2	3			
CO6	1	3	2	3	3		3	3	2		3	3	3	3	3	3			
CO7	3	3	3	3	3		3	3	3		3	3	3	3	3	3			
Average	2.14	2.43	2.43	2.00	3.00		2.29	2.14	2.00		2.43	2.29	2.43	2.29	2.14	2.43			

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Course Name: Core Course-14

Course Code: MTMACOR14T

Topic Name: RING THEORY AND LINEAR ALGEBRA II

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Recall precise and accurate mathematical objects in ring theory.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Grasp and scrutinize the fundamental concepts in ring theory, including ideals, quotient rings, integral domains, Euclidean domains,	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Gain insight into polynomial rings.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Utilize to ascertain the irreducibility of higher degree polynomials over rings.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Acquire an understanding of matrices and their representation of linear transformations of vector spaces, including change of basis.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Explore the beginnings of the theory of eigenvectors and eigenvalues and utilize them for diagonalizability.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO7	Determine the canonical form of linear transformations.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	3	2	1	3		3	2	2		3	1	2	2	2	2			
CO2	2	3	2	2	3		2	2	1		3	3	1	1	2	1			
CO3	2	2	1	1	3		3	1	3		1	2	2	3	1	3			
CO4	3	2	3	3	3		1	2	1		2	3	2	2	3	2			
CO5	1	1	2	2	3		2	3	3		3	1	3	3	2	3			
CO6	3	3	3	3	3		3	1	2		2	3	3	3	2	3			
CO7	3	3	3	3	3		3	3	3		3	3	3	3	3	3			
Average	2.29	2.43	2.29	2.14	3.00		2.43	2.00	2.14		2.43	2.29	2.29	2.43	2.14	2.43			

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Course Name: Discipline Specific Elective-1

Course Code: MTMADSE01T

Topic Name: LINEAR PROGRAMMING PROBLEM

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Examine and assess linear programming models of real-life situations.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Construct graphical solutions of linear programming problems with two variables, incorporating the concept of convex sets and extreme	L6 Creating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Familiarize oneself with the theory of the simplex method.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Gain insight into the connections between the primal and dual problems and sensitivity analysis.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Utilize in transportation, assignment, and two-person zero-sum game problems.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Enhance the capacity to solve different types of numerical problems.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	2	3	2	3		3	2	2		3	3	2	1	2	2			
CO2	3	3	3	1	3		2	3	1		1	3	3	3	2	3			
CO3	2	2	2	2	3		2	2	3		3	1	1	2	1	1			
CO4	2	1	3	1	3		1	3	2		2	3	3	2	3	3			
CO5	1	3	1	3	3		3	2	1		3	2	2	3	2	2			
CO6	3	3	3	3	3		3	1	3		3	3	3	3	3	3			
Average	2.17	2.33	2.50	2.00	3.00		2.33	2.17	2.00		2.50	2.50	2.33	2.33	2.17	2.33			

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Course Name: Discipline Specific Elective-2

Course Code: MTMADSE03T

Topic Name: PROBABILITY & STATISTICS

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Investigate distributions in the study of the joint behavior of two random variables.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Develop a formulation aiding in the prediction of one variable in terms of the other, namely correlation and linear regression.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Gain insight into the central limit theorem, which establishes the remarkable fact that the empirical frequencies of many natural	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Recall Markov Chains, Chapman-Kolmogorov equations, and the classification of states.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Explore the characteristics of sample data using various methods of statistical measurements.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Enhance the capacity to solve different types of numerical problems.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	2	3	2	3		3	2	2		3	3	1	2	2	3			
CO2	3	2	2	2	3		2	3	2		1	1	3	3	1	1			
CO3	1	3	2	3	3		3	2	1		2	3	3	2	2	3			
CO4	3	1	3	1	3		1	2	1		3	2	3	1	2	2			
CO5	1	3	1	2	3		3	3	3		3	2	2	3	3	3			
CO6	2	3	3	3	3		3	1	3		3	3	3	3	3	3			
Average	2.00	2.33	2.33	2.17	3.00		2.50	2.17	2.00		2.50	2.33	2.50	2.33	2.17	2.50			

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Course Name: Discipline Specific Elective-3

Course Code: MTMADSE04T

Topic Name: THEORY OF EQUATIONS

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Examine the relation between roots and coefficients and utilize it to solve various problems.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Explore Newton's Theorem.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Utilize the aforesaid theorem to determine the sum of the power (positive and negative) of the roots, and the sum of products of	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Develop transformations of the equation through roots multiplied by a given number, increase in roots, decrease in roots, and removal of	L6 Creating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Determine roots of the reciprocal equations.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Investigate the location of the real roots and the nature of the roots of an equation.	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	3	3	2	3		3	2	2		3	2	1	2	2	1			
CO2	1	3	3	2	3		3	2	2		2	3	2	2	3	2			
CO3	2	2	2	3	3		3	1	2		3	3	3	1	1	3			
CO4	3	2	3	1	3		2	1	3		1	1	3	3	1	2			
CO5	2	1	1	3	3		1	3	1		2	3	3	3	3	3			
CO6	3	3	3	1	3		3	3	3		3	3	3	3	3	3			
Average	2.17	2.33	2.50	2.00	3.00		2.50	2.00	2.17		2.33	2.50	2.50	2.33	2.17	2.33			

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Course Name: Discipline Specific Elective-4

Course Code: MTMADSE06T

Topic Name: MECHANICS

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Explore techniques to address problems in the field of Analytical Statics, covering co-planar forces, astatic equilibrium, friction,	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Examine virtual work, forces in three dimensions, general conditions of equilibrium, center of gravity for different bodies, and stable and	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Analyze the motion of a projectile in a resisting medium and rotating axes.	L4 Annalysing	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Investigate the stability of nearly circular orbits and motion under the inverse square law, including various cases on slightly disturbed orbits	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Study the motion of a particle in three dimensions, including motion on a smooth sphere, cone, and any surface of revolution. compound	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Investigate Rigid Dynamics with special emphasis on degrees of freedom, moments and products of inertia, principal axes,	L5 Evaluating	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	1	3	2	3		3	2	2		3	3	2	3	2	2			
CO2	2	3	2	2	3		3	2	2		3	2	3	3	2	1			
CO3	3	3	3	3	3		2	3	3		1	3	1	3	3	3			
CO4	1	2	1	2	3		3	2	1		3	3	3	3	1	2			
CO5	3	3	3	3	3		1	2	2		2	1	3	3	2	3			
CO6	1	3	3	1	3		3	1	3		2	3	3	3	3	3			
Average	2.00	2.50	2.50	2.17	3.00		2.50	2.00	2.17		2.33	2.50	2.50	3.00	2.17	2.33			

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Course Name: Skill Enhancement Course-1

Course Code: MTMSSEC01M

Topic Name: C- PROGRAMMING

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Grasp the similarity between HLL and C.	L4 Annalysing	1,2,3,4,6,5,7,8,9	1,2,3,4,5,6
	CO2	Explore the history of the High-Level Language (H.L.) revolution.	L3 Applying	1,2,3,4,6,5,7,8,9	1,2,3,4,5,6
	CO3	Examine C coding.	L5 Evaluating	1,2,3,4,6,5,7,8,9	1,2,3,4,5,6
	CO4	Utilize C coding to address various problems.	L3 Applying	1,2,3,4,6,5,7,8,9	1,2,3,4,5,6
	CO5	Employ C in practical problem-solving.	L3 Applying	1,2,3,4,6,5,7,8,9	1,2,3,4,5,6
	CO6	Apply knowledge of HLL and C in practical applications.	L3 Applying	1,2,3,4,6,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO \ CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	2	2	2	3	2	2	2	2		2	2	3	2	2	2			
CO2	1	1	3	2	3	1	1	2	2		1	1	2	1	2	1			
CO3	2	3	2	1	3	2	3	3	2		3	3	1	2	1	2			
CO4	2	3	1	3	3	3	2	2	3		2	3	3	3	3	3			
CO5	3	3	3	1	3	3	3	1	1		3	2	3	2	1	3			
CO6	3	3	3	3	3	3	3	3	2		3	3	3	3	3	3			
Average	2.17	2.50	2.33	2.00	3.00	2.33	2.33	2.17	2.00		2.33	2.33	2.50	2.17	2.00	2.33			

BARASAT GOVERNMENT COLLEGE
Course Outcome or Learning Outcome
Three year B.A. /B.Sc. Degree Course
Under CBCS semester system
HONOURS COURSE IN MATHEMATICS
With effect from the session: 2018 – 2019

Course Name: Skill Enhancement Course-2

Course Code: MTMSSEC02M

Topic Name: LOGIC AND SETS

CO, PO & PSO Mapping					
Course Outcome:	SI No	Course outcome	Knowledge level Blooms Level	POs Mapping	PSOs mapping
	CO1	Grasp Description of Symbolic Logic.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO2	Able to understand Set algebra.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO3	Employ Logic in practical Problems.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO4	Enhance the capacity to solve Boolean logic.	L3 Applying	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO5	Understand the Predicate logic.	L2 Understanding	1,2,3,4,5,7,8,9	1,2,3,4,5,6
	CO6	Can achieve to construct circuit with Gates.	L6 Creating	1,2,3,4,5,7,8,9	1,2,3,4,5,6

Program Articulation Matrix (CO-PO Matrix)																			
PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8	PSO9
CO1	2	1	2	2	3		2	2	2		2	2	2	2	2	2			
CO2	2	2	2	1	3		2	2	1		2	1	1	3	1	2			
CO3	1	3	1	2	3		1	1	2		1	2	3	3	2	1			
CO4	3	3	3	2	3		2	3	1		3	3	2	2	1	2			
CO5	1	3	3	1	3		3	1	3		3	3	3	1	2	3			
CO6	3	3	3	3	3		3	3	3		3	3	2	3	3	3			
Average	2.00	2.50	2.33	1.83	3.00		2.17	2.00	2.00		2.33	2.33	2.17	2.33	1.83	2.17			