QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Mathematics Department

Study plan No.	**2021-2022**	**University Specialization**		**Bachelor of Mathematics**	
Course No.	**0101351**	**Course name**		**Complex Analysis**	
Credit Hours	**3**	**Prerequisite/ Co-requisite**		**Real Analysis 1**	
Course type	☐ MANDATORY UNIVERSITY REQUIREMENT ☐ UNIVERSITY ELECTIVE REQUIREMENTS	☐ FACULTY MANDATORY REQUIREMENT ☐ Support course family requirements		✓ **Mandatory requirements** ☐ Elective requirements	
Teaching style	☐ Full online learning	✓ **Blended learning**	☐ Traditional learning		
Teaching model	☐ 1 Synchronous: 1 asynchronous	✓ **1 face to face : 1 asynchronous**	☐ 2 Traditional		

Faculty member and study divisions' information (to be filled in each semester by the subject instructor)

Name	Academic rank	Office No.	Phone No.	E-mail	
Division number	**Time**	**Place**	**Number of students**	**Teaching style**	**Approved model**

Brief description

Complex numbers, Algebraic properties, Cartesian coordinates, The triangle Inequality, Polar coordinates, Power and roots, Functions of a complex variable, Limits, Continuity, Derivatives, The Cauchy-Riemann equations, Analytic functions, Harmonic functions, The exponential functions, Trigonometric functions, Branches of Logz, Complex exponent, Contours, Line integrals, The Cauchy-Goursat theorem, Cauchy integral formula, Derivative of analytic functions.

Learning resources

Course book information (Title, author, date of issue, publisher ... etc)	Complex analysis, third edition by Dennis G. Zill & Patrick D. Shnahan. Jones & Bartlett LEARNING, 2015.			
Supportive learning resources (Books, databases, periodicals, software, applications, others)	1.Complex analysis, third edition by Dennis G. Zill & Patrick D. Shnahan. Jones & Bartlett LEARNING, 2015 2."Complex Variables and Applications". By: R . Churchil and J. Brown McGraw-Hill, 7th Edition (2003).			
Supporting websites	https://www.britannica.com/science/analysis-mathematics/Complex-analysis https://nptel.ac.in/courses/111/103/111103070/			
The physical environment for teaching	✓ Class room	☐ labs	**Virtual educational platform**	☐ Others
Necessary equipment and software				
Supporting people with special needs				
For technical support				

Course learning outcomes (S= *Skills, C= Competences K= Knowledge,)*

QF01/0408-4.0E	Course Plan for Bachelor program - Study Plan Development and Updating Procedures/ Mathematics Department

No.	Course learning outcomes	The associated program learning output code
	Knowledge	
K1	Defining the analyticity of complex functions	**MK1**
K2	Defining the limits and continuity of complex functions	**MK2**
K3	Differentiation of the complex function	**MK3**
K4	Classification the different integral of complex functions	**MK3**
	Skills	
S1	Graphing complex functions on paper, calculator and computer.	**MS1**
S2	Testing the analyticity of complex functions	**MS2**
S3	Summarize all integral techniques of complex functions	**MS2**
	Competences	
C1	Using complex analysis to solve various problems in all branches of mathematics.	**MC1**
C2	Valuing the role of complex analysis in other sciences and aspects of daily life	**MC2**

Mechanisms for direct evaluation of learning outcomes

Type of assessment / learning style	Fully electronic learning	Blended learning	Traditional Learning (Theory Learning)	Traditional Learning (Practical Learning)
Midterm exam	30%	**30%**	40%	30%
Participation / practical applications	0	**0**	10%	30%
Asynchronous interactive activities	30%	**20%**	0	0
Final exam	40%	**50%**	50%	40%

Schedule of simultaneous / face-to-face encounters and their topics

Week	Subject	learning style	Reference
1	Complex Numbers: Sums and Products, Further Properties, Moduli.	Lecture	3-9
2	Complex Conjugates. Exponential Form Products and Quotients in Exponential Form	Lecture	16-27
3	Roots of Complex Numbers Regions in the Complex Plane	Lecture	22-33
4	Functions of a Complex Variable. Mappings.	Lecture	47-71
5	Theorems on Limits. Limits Involving the Point at Infinity Continuity	Lecture	103-120
6	Derivatives. Differentiation Formulas	Lecture	120-130
7	Cauchy-Riemann Equations Sufficient Conditions for Differentiability	Lecture	130-137
8	Cauchy Riemann Equations in Polar System Analytic Functions	Lecture	130-137

9	Harmonic Functions. Midterm Exam 30%	Lecture	137-141
10	The Exponential Function and Logarithmic Function	Lecture	151-165
11	Derivatives of Logarithms. Some Identities Involving Logarithms. Complex Exponents	Lecture	151-165
12	Trigonometric Functions. Hyperbolic Functions	Lecture	171-182
13	Inverse Trigonometric and Hyperbolic Functions Complex-Valued Functions w(t)	Lecture	183-190
14	Contours. Contour Integrals	Lecture	201-217
15	Antiderivatives. Cauchy-Goursat Theorem Simply and Multiply Connected Domains	Lecture	218-226
16	**Final Exam**		

Schedule of asynchronous interactive activities (in the case of e-learning and blended learning)

Week	Task / activity	Reference	Expected results
1	Background	On vector valued functions and partial derivatives Students Notes or any Calculus book	Self-reading and Discussion
2	Video 1 Solving exercises	E-learning	Discussion in the class
3	Homework1: On the subjects studied on the first three weeks	(Lecture notes and Ref.1)	Submit a pdf or word sheet
4	Quiz 1	All subjects were studied on the first three weeks	Submitting on the E-learning
5	Assignment 1	Internet sources and the other Supportive learning resources	Presentation
6	Video 2	Solving exercises	Discussion in the class
7	Homework 2 On the subjects studied in the weeks 4,5 and 6	(Lecture notes and Ref.1)	Submit a pdf or word sheet
8	Assignment 2	Internet sources and the other Supportive learning resources	Submitted with the mid exam
9	Self-reading	Hyperbolic Functions (Ref.1)	Talk
10	Video3 Solving exercises	E-learning	Discussion in the class
11	Homework 3: On the subjects studied after the midexam	(Lecture notes and Ref.1)	Submit a pdf or word sheet
12	Self-reading	Contour Integrals (Ref.1)	Talk
13	Quiz 2	On the subjects studied on the subject studied after midexam	Submitting on the E-learning
14	Presentation of the subject: The second fundamental form.	Internet sources and the reference book	Video
15	Video 4 Revision of all the course	E-learning	Discussion in the class
16	**Final Exam**	-	