LAHORE UNIVERSITY OF MANAGEMENT SCIENCES

Name: **Abdullah Ahmed**
Roll No.: **2024-10-0035**
ID: **24894**
Date of Birth: **Oct 27, 2000**

Degree: **Bachelor of Science - BS**
Major: **Mathematics**
Year Admitted: **2020-21**
Year Graduated: **Incomplete**

COURSE CODE	DESCRIPTION	CREDITS	GRADE

COURSE CODE	DESCRIPTION	CREDITS	GRADE

Fall Semester 2020-21

CHEM 101	Principles of Chemistry	3	A
CS 100	Computational Problem Solving	3	A+
EE 100	Engineering Laboratory	1	A+
MATH 101	Calculus I	3	A
PHY 101	Mechanics	4	A+
SS 101	Islamic Studies	2	A

Placed on Dean's Honour List.

Spring Semester 2020-21

BIO 100	Biology Laboratory	1	A-
BIO 101	Introductory Biology	3	A+
MATH 120	Linear Algebra with Differential Equations	3	A
PHY 100	Experimental Physics Lab I	2	A+
PHY 104	Modern Physics	4	A+
SS 100	Writing and Communication	4	A-

Placed on Dean's Honour List at the end of academic year 2020-21

Summer Semester 2020-21

CHEM 100	Experimental Chemistry	1	A
PHY 315	Introduction to Quantum Computing	3	A

Fall Semester 2021-22

MATH 102	Calculus II	3	A+
MATH 204	Introduction to Formal Mathematics	4	A+
MATH 210	Introduction to Differential Equations	3	A
PHY 204	Electricity and Magnetism	3	A+
PHY 212	Quantum Mechanics I	3	A
SS 102	Pakistan Studies: Culture and Heritage	2	A+

Placed on Dean's Honour List.

Spring Semester 2021-22

ECON 100	Principles of Economics	4	A
MATH 205	Introduction to Analysis I	4	A
MATH 230	Probability	3	A
MATH 325	Convex Optimization	3	A
PHY 305	Electromagnetic Fields and Waves	3	A
PHY 312	Quantum Mechanics II	3	A+

Placed on Dean's Honour List at the end of academic year 2021-22

Summer Semester 2021-22

DISC 212	Introduction to Management Science	3	A
PHY 412	Advanced Quantum Mechanics	3	A-

Fall Semester 2022-23

ECON 230	Statistics and Data Analysis	4	A
MATH 222	Linear Algebra II	3	A+
MATH 309	Introduction to Analysis II	3	A+
MATH 320	Algebra I	3	A+
MATH 497B	Directed Research Project	2	P
PHY 404	Relativistic Electrodynamics	3	A

Placed on Dean's Honour List.

Spring Semester 2022-23

MATH 300	Complex Variables	3	A+
MATH 310	Ordinary Differential Equations	3	A
MATH 407	General Topology	3	A+
MATH 426	Computational Algebra and Algebraic Geometry	3	A+
MATH3010	Advanced Calculus	3	A+

Placed on Dean's Honour List at the end of academic year 2022-23

Summer Semester 2022-23

MATH 497A	Directed Research Project	1	P

Fall Semester 2023-24

MATH 491A	Senior Project	3
MATH 521	Advanced Algebra	3
MATH4013	Differential Geometry	3

	CREDITS		
ATTEMPTED	124		
TAKEN TOWARDS GPA	112	CGPA	3.98
TRANSFERRED	0		
CREDITS GIVEN ON RE-ADMISSION	0		
SUCCESSFULLY COMPLETED	115		

End of Undergraduate Programme Transcript

Official Seal

University of Management Sciences ★ Lahore
LAHORE
PAKISTAN

Z. F. Qizilbash
Registrar

Date Printed: **19-Oct-2023**

Transcript Interpretation
Undergraduate Programme

The University moved from Quarter (Units) to Semester (Credits) System in Fall 2009-2010. This interpretation applies to both units and credits.

The medium of instruction at LUMS is English.

Degree Requirements

Programme	Required Units/Credits (Minimum)	Passing CGPA
BSc/BA (Honours), BS	180/130	2.20/2.00
BSc (Honours) Computer Engineering/BS (EE)	192/133	2.20/2.00
Double major	225/160	2.20/2.00
B.A.-LL.B	220/162	2.20/2.00
B.A.-LL.B/(Honours)	0.00/162	0.00/2.00

Explanation of Cumulative GPA/Specialization CGPA (CGPA/SCGPA)

- Batches 1997 to 2004: Calculated on a scale of 4.30
- Batches 2005 onwards: Calculated on a scale of 4.00

Specialization CGPA

At the time of graduation, SCGPA (Specialization CGPA) is also visible on the transcript and is calculated on the basis of all courses taken in the area of the major.

Notations

(): Credits for the course(s) given on readmission/transfer. Upon readmission, all credits will count towards attempted credit hours but not included in computation of CGPA. Transfer credits will not count towards attempted credits.

#: Under Repeat and Replace policy, this represents the lower grade for course(s) repeated. Credits and grades not included in computation of CGPA or towards completed credits. However, these credits count towards total attempted.

R*: Best grade for repeated course(s) which counts towards graduation requirements (i.e. CGPA and completed credits) and total attempted credits.

‡: Under All Grades Counts Policy, this represents the original grade of repeated course(s). Such credits and grades are included in the computation of CGPA. These credits are not included in total completed credits but are counted towards total attempted credits.

*** For courses repeated between Academic Year 2014-15 to 2015-16, 'R' will denote the latest attempt instead of best grade.**

Minor

Subject to fulfillment of the minor requirements; the title of the minor is displayed only on the transcript and not on the degree.

Graduation Honours

CGPA	Recognition
3.80 and above*	**Deans' Honour List** and Graduation with **High Distinction**
3.60 to 3.79	**Deans' Honour List** and Graduation with **Distinction**
3.30 to 3.59	Graduation with **High Merit**
3.10 to 3.29	Graduation with **Merit**

***For Batch 2014 and onwards.**

Grading Legend

Letter Grade	Grade Points	Description
A+	4.3*	Exceptional
A+	4.0**	Exceptional
A	4.0	Outstanding
A-	3.7	Excellent
B+	3.3	Very Good
B	3.0	Good
B-	2.7	Average
C+	2.3	Satisfactory
C	2.0	Low Pass
C-	1.7	Marginal Pass
D	1.0	Unsatisfactory
F	0	Fail
P	--	Pass
NC	--	No Credit***
W	--	Withdrawn
WF	--	Withdrawn while failing
WP	--	Withdrawn while passing
NGR	--	No Grade Reported
I	--	Incomplete
IP	--	In-Progress
U	--	Unsatisfactory
T	--	Transfer

***For batches 2004 and earlier.**
****For batches 2005 and onwards.**
*****From Spring 2020 onwards, this is a special accommodation due to COVID-19.**

Authenticity

A signed and dated transcript provides a certified copy of the student's academic performance. A LUMS official transcript is printed on security paper and sealed in an envelope or emailed via password protected PDF document. An official, confidential transcript can only be obtained directly from the Office of the Registrar. If the document is received with a broken seal or the PDF is not secure, the transcript should be considered an unofficial document.

Contact Information

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Counter Signed by

Senior Assistant/Assistant Registrar
Lahore University of Management Sciences (LUMS)

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B.S Mathematics Course List

Lahore University of Management Sciences

Name: Abdullah Ahmed **CGPA**: 3.98 **MATH CGPA:** 4.00

Area of Interest: Topology/Geometry

Term	Course Code	Course Name and Instructor	Textbook	Course Description	Grade
Fall 2020	MATH 101	Calculus I (Dr. Sultan Sial)	Calculus by Gilbert Strang	Real Sequences and Series. Limits, Continuity, Differentiation, and Integration of single variable real-valued functions	A
Spring 2021	MATH 120	Linear Algebra with Differential Equations (Dr. Amer Rasheed)	Elementary linear algebra (Howard Anton) and Differential equations with boundary value problems (Dennis G. Zill)	Systems of linear equations, matrix algebra, determinants, eigenvectors/values, matrix diagonalization (calculation-focused). 1st and 2nd order linear ODEs and systems of linear ODE's with constant coefficients.	A
Fall 2021	MATH 102	Calculus II (Dr. Masood Shah)	Calculus Early Transcendentals, 7th Edition by James Stewart	Limits, Continuity, Differentiation, and Integration of multi-variable real-valued functions	A+
Fall 2021	MATH 204	Introduction to Formal Mathematics (Dr. Shaheen Nazir)	Mathematical Proofs-A Transition to Advanced Mathematics by Ping Zhang	Set Theory, Mathematical Logic and Proof Techniques. Applied to Elementary Number Theory and Combinatorial problems.	A+

Fall 2021	MATH 210	Introduction to Differential Equations (Dr. Amer Rasheed)	Differential equations with boundary value problems (Dennis G. Zill)	Applications of linear ODEs in Decay, Newton's Law of Cooling, Circuits etc, Non-homogenous Differential Equations, Wronskian, Power series method	A
Spring 2021	MATH 205	Introduction to Analysis I (Dr. Waqas Ali Azhar)	R. G. Bartle, D. R. Sherbert, Introduction to Real Analysis, 4th edition	Field Axioms, Completeness, Limits of sequences, Cauchy Sequences, Bolzano Weierstrass Theorem, Series, Topology of R, Uniform continuity, Differentiability, MVT, Taylor series	A
Spring 2021	MATH 230	Probability (Dr. Adnan Khan)	First Course in Probability by Sheldon M. Ross	Counting, Randomness, Probability, Discrete Random Variables examples, Continuous Random Variable examples, Normal distribution, Central Limit Theorem	A
Spring 2021	MATH 325	**Convex Optimization (Graduate Course) (Dr. Hassan Mohyuddin)**	S. Boyd & L. Vandenberghe, Convex Optimization	Convex Sets/functions, convex optimization in machine learning, signal processing etc. Global optimality conditions. Least Squares, Zoutendijk Theorem and Gradient Descent (Newton, Damped Newton, Conjugate)	A
Fall 2022	MATH 222	Linear Algebra II (Dr. Haniya Azam)	Linear Algebra Done Right, Sheldon Axler	Abstract vector spaces, linear independence, span, basis, eigenvectors/values, inner product spaces,	A+

				spectral theorem, SVD (Proof-based)	
Fall 2022	MATH 309	Introduction to Analysis II (Dr. Shaheen Nazir)	R. G. Bartle, D. R. Sherbert, Introduction to Real Analysis, 4th edition	Reimann/Darboux Integrability, Fundamental Theorem of Calculus, series and sequences of functions, Abstract Metric Spaces, Lesbegue Integrations	A+
Fall 2022	MATH 320	Algebra I (Dr. Haniya Azam)	Abstract Algebra, 3rd Edition by David S. Dummit	Group Theory: Symmetry groups, Cyclic groups, Quotients, Lagrange Theorem, Sylow's Theorem, Isomorphism Theorems, Semi-Direct Products, Finitely generated abelian groups. Basic Ring Theory	A+
Spring 2023	MATH 300	Complex Variables (Dr. Ali Asher Zaidi)	Brown Churchill 'Complex Variables and Application 8th edition'	Complex-valued functions, limits, continuity, complex differentiability and Cauchy-Reimann Equations. Complex Exponential, Logarithm, Trigonometric functions. Cauchy integral formula, Laurent Series, Residue Theorem. Improper integrals, conformal maps	A+
Spring 2023	MATH 310	Ordinary Differential Equations (Dr. Imran Naeem)	Differential Equations: Theory, Technique, and practice by George F. Simmons	Strum Liouville problems, Frobenius Method, Fourier Series, Laplace Transform, Phase portraits, Introduction to PDEs.	A

Spring 2023	MATH 407	**General Topology (Graduate Course) (Dr. Haniya Azam)**	Topology by James Munkres	Topological Spaces, Basis, Order/Product/Subspace and Quotient Topology. Connectedness, Compactness, Countability Axioms, Urysohn Metrization Theorem, Tietze Extension. Homotopy Groups, Covering spaces, Fundamental Group of S^1	A+
Spring 2023	MATH 426	**Computational Algebra and Algebraic Geometry (Graduate Course) (Dr. Shaheen Nazir)**	Ideals, Varieties, and Algorithms: An Introduction to Computational Algebraic Geometry and Commutative Algebra by David A. Cox	Affine and Projective Varieties, Bezout's theorem, Grobner Basis. Zariski Topology, irreducibility, and dimension. Smooth and singular points, Hilbert Functions and dimension.	A+
Spring 2023	MATH 3010	Advanced Calculus (Dr. Imran Anwar)	Michael Spivak - Calculus on manifolds	Differentiation of multi-valued real functions, Differential forms and exterior derivative, Hodge Star, Pullbacks, winding number, integration of forms over chains, Stokes Theorem, Manifolds, Regular Value Theorem.	A+
Fall 2023	MATH 4013	**Differential Geometry (Graduate Course) (Dr. Waqas Ali Azhar, Dr.**	Differential Geometry: Curves - Surfaces - Manifolds by Wolfgang Kuhnel	Local Theory of Curves, Frenet Curves, Curvature, torsion, four vertex theorem, Fundamental theorem of space curves. Surfaces, Orientation, First/Second	Pending

		Marco Abate (Uni of PISA), Dr. Abdelghani Zeghib (CNRS))		fundamental form, Gaussian curvature, Intrinsic geometry and Christoffel symbols, Geodesics. Reimannian Manifolds	
Fall 2023	MATH 521	**Advanced Algebra (Graduate Course) (Dr. Imran Anwar, Dr. Špela Špenko (Université Libre de Bruxelles), Dr. Peter Stevenhagen (Leiden University)**	Abstract Algebra, 3rd Edition by David S. Dummit	Ring Theory: Ideals, Ring of Fractions, Eds, PIDs, UFDs, Polynomial Ring, Modules, Field extensions, Galois Theory	Pending
Fall 2023	MATH 4102	**Qualitative Differential Equations/ Dynamical Systems (Graduate Course) (Dr. Stefano Luzzato (ICTP))**	Dr. Stefano Luzzato's lecture notes, and 'An Introduction to Chaotic Dynamical Systems' by Robert L. Devaney	Discrete Dynamical Systems, Orbits, Conjugacy, Topological Conjugacy, Probabilistic Measures, Measurable Conjugacy	Unofficial Audit
Spring 2023	MATH 503	**Complex Analysis (Graduate Course) (Dr. Sultan Sial and other international faculty)**	Complex Analysis by Serge Lang, Fourth Edition	Winding Numbers, Calculus of Residues, Schwarz reflection, Reimann Mapping Theorem, Analytic Continuation. Elliptic, Gamma and Zeta Functions. Distribution of Primes	Future Course

Spring 2023	MATH 513	**Partial Differential Equations (Graduate Course) (Dr. Ali Asher Zaidi)**	FOLLAND, G.H., Introduction to Partial Differential Equations	First Order PDEs, Linear PDEs, Transport Equation, Laplace Equation, Heat Equation, Conservation Laws, Transforms, Sobolev Spaces	Future Course