Department of City & Regional Planning,
School of Architecture & Planning,
University of Management and Technology

Course Outline – Applied Mathematics

UMT Vision

OUR VISION IS LEARNING!

It defines our existence, inspires all stakeholders associated with us, creates a powerful momentum inside, and responds to the challenges outside. It continues to evolve as present captures new realities and foresight unfolds new possibilities.

All in an incessant attempt to help individuals and organizations discover their God-given potentials to achieve ultimate Success actualizing the highest standards of efficiency, effectiveness, excellence, equity, trusteeship and sustainable development of global human society.

UMT Mission

OUR MISSION IS LEADING!

We aspire to become a learning institution and evolve as the leading community for the purpose of integrated development of the society by actualizing strategic partnership with stakeholders, harnessing leadership, generating useful knowledge, fostering enduring values, and projecting sustainable technologies and practices.

Vision and Mission Statements of the City & Regional Planning Department

The vision statement of the Department of City & Regional Planning is:

- To be a leading City & Regional Planning Department aiming for excellence in learning, research and innovation with integrity and equity.

The mission of the Department of City & Regional Planning is:

- The mission is to establish a very important program concerning the development and management of the built environment. This is entitled as Bachelor of Science in City and Regional Planning. The studies will be focused on needs of the nation in the field of built environment of our regional, urban and rural settlements. The students are required to be equipped with knowledge of advanced skills, latest knowledge and technology used in the planning and management of various settlements. They need to be fully aware of the current world, new trends and direction of the developments in future.

Program Educational Objectives (PEOs)

Five years after graduating, the graduates of the program should be characterized by the following three features:

PEO-1:

The graduates will apply learnt knowledge and skills of spatial, temporal, and physical planning.

PEO- 2:

The graduates will propose and execute appropriate solutions to complex planning and urban

issues and adapt recent developments in planning focusing on research, creativity, and innovation.

PEO-3:

The graduates will reflect core ethical values in their professional conduct and become responsible members of society.

Program Learning Outcomes (PLOs) / Graduate Attributes

Graduates of the BS CRP program at UMT are expected to have acquired and developed the following set of knowledge, skills, and personality traits (these are also referred to as graduate attributes)

PLO 1: Planning Knowledge

An ability to demonstrate knowledge of contemporary planning theories and conceptual ideologies and models.

PLO 2: Designing Analysis

An ability to identify and investigate problems, construct theoretical framework through literature review and case studies and synthesize information.

PLO 3: Professional Skills

Apply planning knowledge in design/planning process to synthesize and articulate multi-faceted variables to generate an integrated solution based on societal and environmental considerations.

PLO 4: Usage of IT

An ability to select and apply appropriate techniques and resources, including prediction and modelling, to complex planning activities.

PLO 5: Communication

Convey ideas and solutions of planning/urban problems in verbal, written and graphical modes, effectively.

PLO 6: Leadership

Ability to opt for a role for affective coordination within the team & collaboration with the community.

PLO 7: Professional Ethics

An ability to apply ethical principles and professional codes following the social norms to the best interest of society.

PLO 8: Lifelong Learning

Capable of acquiring knowledge, skill, and information self-reliantly from diverse sources and appreciating new ideas and concepts.

Course Learning Outcomes:

After studying this course, the learners will be able to:

- Understand the basics of statistics.
- Explain the sampling design and other statistical concepts.
- Apply statistical knowledge to analyze planning related problems.

Tittle	Course Learning Outcomes	PLO 1: Planning Knowledge	PLO 2: Professional Skills	PLO 3: Usage of IT	PLO 4: Communication	PLO 5: Critical Thinking	PLO 6: Leadership and Professional Ethics	PLO 7: Lifelong Learning
Applied Mathematics	Understand the basics of Mathematics.	✓						
	Explain the mathematical logics					✓		
	Apply Mathematical equation for analytical reasoning.	✓				✓		

Upon successful completion of the course, the student will be able to:

No	CLO Statement	Domain	Taxonomy Level	PLO
1	Recall and understand the basics of Mathematics.	Cognitive	1	1
2	Apply the learned concepts and basic square root formulas, Sample size calculations, Shapes and calculations.	Cognitive	3	2
3	Apply the concepts of matrices, determinant, linear transformations and linear systems for the urban and regional planning problems	Cognitive	3	4
4	Apply Mathematical equation for logical reasoning and analytical reasoning.	Cognitive	3	5

Proposed Teaching Methodology

- Lecturing
- Demonstration

- **Proposed Assessment (theory, 100%)**

  Mid Term (40%)

  - Written long/short questions, quizzes etc.

  Final Term (60%)

  - Written long/short questions, quizzes etc.

Recommended Text Book

1. Wilson, A. G, *Mathematics for Geographers and Planners*, Oxford, Claredon, (Latest Edition)
2. Washington, J. Allyn, *Basic Technical Mathematics*, London; Banjamin, (Latest Edition).
3. Bhatti, M.I. and Nasir, M., "Mathematics for Engineers and Scientists" Allied Book Centre, Urdu Bazar Lahore.
4. Kreyszig, E., "Advanced Engineering Mathematics" John Wiley & Sons.
5. Spiegel. M.R., "Vector Analysis" McGraw – Hill Book Company.

COURSE CALENDAR

Week	Theory	CLO	Reading
1	Pre-requisite: Algebra of complex numbers; Polar form of complex numbers; Algebra of matrices; Determinants and their properties; Crammer's rule. Algebra of vectors; Scalar and vector products; Rules of differentiation; Techniques of integration	1	**Class Notes**
2	Contents: Product and quotient of complex numbers in polar form; Properties of complex numbers; Logarithm of a complex number; De Moivres Theorem, The nth roots of a number; Solution of equations.	1, 2	//
3-4	A review of matrices, determinants and Crammer's ru Inverse of a matrix through elementary row operatio Solution of the system of linear equations; Eigenvalues a eigenvectors.	1,3	//
5	Function and its different kinds; Inverse of a function; Graphs of some well-known functions; Continuous functions;	1,3	//
6-7	A review of differentiation: Geometrical interpretation of a derivative; Infinitesimal; Differential coefficient; Derivatives of higher order; Indeterminate forms and L. Hopital's rule; Asymptotes; Increasing and decreasing functions; Maxima and minima of a function; Directional derivatives.	1,3	//
8	Further techniques of Integration; Integration by reduction formula; Fundamental Theorem of Integral Calculus; Definite integral and its properties; Area	1,3	//

	enclosed between curves; Arc length;		
9	Scalar and vector triple products. Scalar and vector point functions; Differentiation and integration of vector point functions.	1,2,3	
10-12	Formation of differential equations and solution of various types of first order differential equations.	3	//
13-14	Cartesian, cylindrical and spherical coordinates; The ratio formula; Equations of a straight line in R3; Direction ratios and direction cosines; Angle between two straight lines, Distance of a point from a line; Equations of a plane; Angle between two planes; The sphere.	3	//
15	**Final Term Exam**		