

D. Syllabus Detailing and Learning objectives

Module	Chapter	Detailed Content	Syllabus Detailing	Learning Objectives
Module 1	Chapter 1 Laplace Transform	Laplace transform (LT) of standard functions: function of bounded variation, Laplace transform of standard functions such as $1, t^n, e^{at}, \sin at, \cos at, \sinh at, \cosh at$. function, 1.2 Linearity property of Laplace Transform, First shifting property, second shifting property of L.T. (without proof), $L\{t^n f(t)\}, L\{f(t)/t\}, L\left\{\int_0^t f(u)du\right\},$ $L\left\{\frac{d^n f(t)}{dt^n}\right\}$	Purpose: To make students understand with Laplace Transform (LT) of Standard Functions & its Properties	1. Define Laplace transform & its properties. (R) 2. Explain First shifting theorem, Multiplication theorem, Division theorem, Integrals Theorem, Change of scale property. (U) 3. Evaluation of integrals using Laplace transform. (A) 4. Calculate the Laplace transform of given functions. (A) 5. Evaluate the Heaviside unit step function, Dirac-delta function. (A) 6. Evaluate the Laplace transform of Periodic function. (A)
			Scope – 1. Academic Aspects- Evaluate the Laplace Transform (LT) of function & Evaluation of integrals using Laplace transform. 2. Technology Aspect- Sci Lab, Matlab 3. Application Aspect- Signal & Systems, Control System, solving the differential equations etc... Students Evaluation – 1. Theory Questions to be asked on Laplace transform. 2. Tutorial on Laplace transform. 3. Corresponding short questions can be asked on Laplace transform in tutorials, GATE, GMAT, GRE and aptitude test for placement.	
Module 2	Chapter 2 Inverse Laplace Transform	Inverse Laplace Transform: Linearity property, use of theorems to find inverse Laplace Transform, Partial fractions method and convolution theorem Heaviside unit step function, Dirac delta function, Periodic 1.4 Applications	Purpose: To make students understand with Inverse Laplace Transform & its Applications. Scope – 1. Academic Aspects- Evaluate the Inverse Laplace Transform & its Applications. 2. Technology Aspect- Sci Lab, Matlab	1. Define Inverse Laplace Transform & its Properties. (R) 2. Discuss the First shifting theorems & partial fraction method. (U) 3. Explain the Method of convolution. (A)

		to solve initial and boundary value problems involving ordinary differential equations with one dependent variable	3. Application Aspect- Linear differential equation, image compression, computer graphics, circuit theory etc... Students Evaluation – 1. Theory Questions to be asked on Inverse Laplace Transform & its Applications. 2. Tutorial on Inverse Laplace Transform & its Applications. 3. Corresponding short questions can be asked on Inverse Laplace Transform & its Applications in tutorials, GATE, GMAT, GRE and aptitude test for placement.	4. Compute Laplace inverse by derivative. (A) 5. Compute the Laplace Inverse by partial fraction method. (A) 6. Solve initial and boundary value problem involving ordinary differential equations with one dependent variable and constant coefficients. (A)
Module 3	Chapter 3 Complex Variable & Mapping	Complex Variable 3.1 Functions of a complex variable, Analytic functions, Cauchy Riemann equations in Cartesian co-ordinates & Polar co-ordinates. 3.2 Harmonic functions, Analytic method and Milne Thomson methods to find $f(z)$, Orthogonal trajectories. 3.3 Mapping: Conformal mapping, bilinear transformations, cross ratio, fixed points, bilinear transformation of straight lines and circles.	Purpose - To make student understand about Function of a Complex Variable, Milne Thomson Method and its application, Harmonic function, orthogonal trajectories, Conformal mapping, Bilinear transformations, cross ratio, fixed points. Scope – 1. Academic Aspects- Find the analytic function, harmonic function and Conformal mapping which is important in complex analysis, as well as in many areas of physics and engineering, in solving physical problems. 2. Technology Aspect- Sci Lab, Matlab. 3. Application Aspect: Conformal mappings is used for constructing solutions to the Laplace equation on complicated planar domains that appear in a wide range of physical problems,	1. Define Analytic Function, Cauchy Riemann equation in Cartesian form and polar forms. (R) 2. Discuss the Milne Thomson Method and its application. (U) 3. Explain the Harmonic function and find the Harmonic conjugates and orthogonal trajectories. (A) 4. Explain the Conformal mapping (A) 5. Explain the Bilinear transformations, fixed points (A) 6. Explain the cross ratio property of Bilinear transformations (A) coefficients. (A)

			including fluid mechanics, aerodynamics, thermomechanics, electrostatics, and elasticity.	
			Students Evaluation – 1. Theory Questions to be asked on Complex Variable & Mapping. 2. Tutorial on Complex Variable & Mapping. 3. Corresponding short questions can be asked on Complex Variable & Mapping in tutorials, GATE, GMAT, GRE and aptitude test for placement.	
Module 4	Set Theory	Set Theory Definition of sets, Venn diagram, complements, Cartesian products, power sets, counting principle, cardinality and countability (countable & uncountable sets), proofs of some general identities on sets, pigeonhole principle.	Purpose - To make student understand about sets, Venn diagram, complements, Cartesian products, power sets, counting principle, cardinality and countability (countable & uncountable sets) Scope – 1. Academic Aspects- Compute the union, intersection, Complement, Power sets, Cartesian product of the sets. Apply set operations, Pigeonhole Principle. 2. Technology Aspect- Sci Lab, Matlab. 3. Application Aspect: Set Theory is the foundation of many aspects of Computer Systems Engineering and data management. Databases: Set Theory determines which data will be included and exclude in searches and selections. Security & Access control lists for users and systems. Distribution lists for messages such as email. Cryptography for secure communications. Bayesian filtering of	1. Define sets, operations on sets. (U) 2. Explain Cartesian products, power sets. (U) 3. Explain counting principle, cardinality (A) 4. Explain countability (countable & uncountable sets). (A) 5. Explain pigeonhole principle, addition principle. (R)

			junk email. Artificial Intelligence decision making. Image Recognition. Linguistics, Translation and proto-language study. Students Evaluation – 1. Theory Questions to be asked on Set theory. 2. Tutorial on Set theory. 3. Corresponding short questions can be asked on set operations, Pigeonhole Principle in tutorials, GATE, GMAT, GRE and aptitude test for placement.	
Module 5	Relation & Function	Relation & Function 5.1 Relation: Definition, types of relation, composition of relations, domain and range of a relation, pictorial representation of relation, properties of relation, partial ordering relation. 5.2 Function: Definition and types of function, composition of functions, recursively defined functions.	Purpose - To make student understand about types of relation, domain and range of a relation, properties of relation, partial ordering relation, types of function, composition of functions, recursively defined functions. Scope – 1. Academic Aspects- Identify and manipulate different types of Relation. Find Domain and range of a relation, properties of relation, Composition of functions, distinguish between recursively defined functions. 2. Technology Aspect- Sci Lab, Matlab. 3. Application Aspect: Functions allow us to visualize relationships in terms of graphs, which are much easier to read and interpret than list of numbers. Functions are mathematical building blocks for designing machines, predicting natural	1. Define relation, types and properties of relation. (U) 2. Explain composition of relations, domain and range of a relation (A) 3. Explain properties of relation, partial ordering relation. (R) 4. Define function, types and properties of function. (U) 5. Explain composition of functions, recursively defined functions. (A)

			disasters, curing diseases, understanding world economies and for keeping aero planes in the air. Students Evaluation – 1. Theory Questions to be asked on Relation & Function 2. Tutorial on Relation & Function. 3. Corresponding short questions can be asked on domain and range of a relation, partial ordering relation, types of function, recursively defined functions. in tutorials, GATE, GMAT, GRE and aptitude test for placement.	
Module 6	Permutations, Combinations and Probability	Permutations, Combinations and Probability 6.1 Rule of sum and product, Permutations, Combinations, Algorithms for generation of Permutations and Combinations. Discrete Probability, Conditional Probability, Bayes' Theorem, Information and Mutual Information.	Purpose -To make students understand Permutations, Combinations, Discrete Probability, Conditional Probability, Bayes' Theorem. Scope – 1. Academic Aspects – Find Probability, Conditional Probability, Apply Bayes' Theorem. 2. Technology Aspect- Sci Lab, Matlab. 3. Application Aspect: Permutations are frequently used in communication networks and parallel and distributed systems. The main use of probability in our life is to measure the success or the fail of something. Also to measure the risk of many dangerous	1. Define factorial, permutations, combinations. (U) 2. Explain Rule of sum and product, Permutations, Combinations. (R) 3. Explain Discrete Probability, Rule of sum & product of probability. (A) 4. Apply conditional probability and Bayes' Theory in probability theory. (A)



			situations. Some goes for the use of probability in programming. Programmers use probability to measure the success of the program before running it. Probability is also used to solve paradox.	
			Students Evaluation – 1. Theory Questions to be asked on Permutations, Combinations, Probability. 2. Tutorial on Permutations, Combinations, Probability. 3. Corresponding short questions can be asked on Permutations, Combinations and probability in tutorials, GATE, GMAT, GRE and aptitude test for placement.	