* [Vector and Linear Algebra](https://en.wikipedia.org/wiki/List_of_linear_algebra_topics)
  + Vector and Scalar,
  + Unit Vector
  + Dot product and its physical significance
  + Cross Product and its physical significance
  + Matrices
    - Identity matrix
    - 4 x 4 Matrix / 3 x 3 Matrix Multiplication
    - Column Matrix
    - Row Matrix
    - Matrix Multiplication, Addition
  + Affine Transform
  + Quaternion
  + Rotation, Translation and Scaling
  + Plane, Line, Circle equations using Vector Algebra
    - Point on plane, point on line
  + **Assignment**: Build a simple Mathematics library for finding dot product and cross product of given vectors
  + **Assignment**: Given a unit vector and rotation matrix try to rotate the vector.
  + **Assignment**: Given two 2D or 3D points find out equation of line which passes through these points. And find out perpendicular distance of 3rd point from the line.
  + **Assignment**: Change the above-mentioned program to accept a CSV file which has 3-point coordinates (first- and second-point coordinates useful for line and 3rd point for perpendicular distance) and write the perpendicular distance of the 3rd point from line in the same CSV as a new column
* C++ Programming
  + Basic STL
    - <https://nuwen.net/stl.html> Stephan T. Lavavej
    - Lecture Videos from Stephan <https://channel9.msdn.com/Series/C9-Lectures-Stephan-T-Lavavej-Standard-Template-Library-STL-/C9-Lectures-Introduction-to-STL-with-Stephan-T-Lavavej>
    - [Part 1](https://channel9.msdn.com/shows/Going+Deep/C9-Lectures-Introduction-to-STL-with-Stephan-T-Lavavej/) (sequence containers)
    - [Part 2](https://channel9.msdn.com/shows/Going+Deep/C9-Lectures-Stephan-T-Lavavej-Standard-Template-Library-STL-2-of-n/) (associative containers)
    - [Part 3](https://channel9.msdn.com/shows/Going+Deep/C9-Lectures-Stephan-T-Lavavej-Standard-Template-Library-STL-3-of-n/) (smart pointers)
    - [Part 4](https://channel9.msdn.com/shows/Going+Deep/C9-Lectures-Stephan-T-Lavavej-Standard-Template-Library-STL-4-of-n/) (Nurikabe solver) - see Wikipedia's [article](http://en.wikipedia.org/wiki/Nurikabe) and Stephan's [updated source code](http://cid-e66e02dc83efb165.office.live.com/browse.aspx/nurikabe)
    - [Part 5](https://channel9.msdn.com/shows/Going+Deep/C9-Lectures-Stephan-T-Lavavej-Standard-Template-Library-STL-5-of-n/) (Nurikabe solver, continued)
    - [Part 6](https://channel9.msdn.com/Shows/Going+Deep/C9-Lectures-Stephan-T-Lavavej-Standard-Template-Library-STL-6-of-n) (algorithms and functors)
    - [Part 7](https://channel9.msdn.com/Shows/Going+Deep/C9-Lectures-Stephan-T-Lavavej-Standard-Template-Library-STL-7-of-n) (algorithms and functors, continued)
    - [Part 8](https://channel9.msdn.com/Shows/Going+Deep/C9-Lectures-Stephan-T-Lavavej-Standard-Template-Library-STL-8-of-n) (regular expressions)
    - [Part 9](https://channel9.msdn.com/Shows/Going+Deep/C9-Lectures-Stephan-T-Lavavej-Standard-Template-Library-STL-9-of-n) (rvalue references)
    - [Part 10](https://channel9.msdn.com/Shows/Going+Deep/C9-Lectures-Stephan-T-Lavavej-Standard-Template-Library-STL-10-of-10) (type traits)**[Error! Hyperlink reference not valid.]( )**
  + Creating and using Static / dynamic libraries / Console Application
  + Introduction to COM (Optional)
  + CLI / Managed C++ (Optional)
  + Visual Studio C++ Unit Test Framework
  + **Assignment**: Generate 500 words simple English story text from ChatGPT and save it as txt file on your machine. Then write a console C++ application and read this text file using STL concept and print all the unique words in the file along with their occurrence count in CSV file. Write unit test cases for your program.
* Geometry
  + Three Dimensional Spaces (<https://en.wikipedia.org/wiki/Three-dimensional_space>)
    - Left Handed coordinate system
    - Right Handed coordinate system
    - Cartesian coordinate system
    - Cylindrical coordinate system
    - Spherical coordinate system
  + Basic 3D Shapes <https://www.mathsisfun.com/geometry/solid-geometry.html>
  + Constructive Solid Geometry <https://en.wikipedia.org/wiki/Constructive_solid_geometry>
  + Triangular Meshes <https://en.wikipedia.org/wiki/Triangle_mesh>
  + **Assignment**: Write a program to generate Cylinder and Sphere by taking user input and save it to STL file format. Write unit test cases for your program. (<https://en.wikipedia.org/wiki/STL_(file_format>))
* Computer Graphics (<https://en.wikipedia.org/wiki/Computer_graphics> )
  + Scene Graph
  + 2D Viewing + 2D Drawings
  + 3D Viewing + OpenGL/DirectX
* **Assignment**: Write a program which will find if two rectangles supplied to the application intersect or not. Write unit test cases for the same.