ASSIGNMENT 3: **NUMERICAL COMPUTING THROUGH PYTHON 3.9.2**

Section 4G

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# **Introduction**

Numerical computing is the vast field in the computer science that deals with the computations and arithmetic problems in the computing world. Numerical Computing deals with solving complex and derived based equations through simple derived formula and mainly computational iterations.

# **Objectives**

The main objective to perform coding for the numerical computing methods are to speed up the process of finding the accurate roots of the equation as in most of the cases the iterations can go up to 25 cycles and beyond as per the complexity and the nature of the equation.

# **Why Python?**

We choose Python due to the fact that in today’s world Python holds an esteem value of being a go to programming language in each and every field of computer science such as Data Science, Artificial Intelligence, Deep Learning and Statistical Computations etc. Numerical Computing through Python makes it easier for the beginners to understand how computations are performs due to the fact that python is one of the simplest language with simple semantics and syntax.

# **Methods Performed Of Numerical Computing**

Following are some of the methods performed through Python programming language.

**Chapter 2:** *Solutions of Equations in One Variable Methods*

**Chapter 3:** *Interpolation and Polynomial Approximation Methods*

**Chapter 4:** *Numerical Differentiation and Integration Methods*

**Chapter 5:** *Initial-Value Problems for Ordinary Differential Equations Methods*

|  |  |  |  |
| --- | --- | --- | --- |
| CHAPTER 2 | CHAPTER 3 | CHAPTER 4 | CHAPTER 5 |
| Bisection Method | Lagrange Interpolation | Three Point End/Mid Point Difference | Euler Method |
| Regular Falsi/False Position | Newton Divided Difference | Five Point End/Mid Point Difference | Modified Euler ODE |
| Secant Method | Newton Forward Difference | Trapezoidal Integration | MidPoint ODE |
| Collective Analysis | Newton Backward Difference | Simpson and Integration | \*ODE => Ordinary Differential Equation |

# **Code Sample Outputs** (3 Methods Output Shown)

|  |  |
| --- | --- |
| OUTPUT | DESCRIPTION |
| https://lh5.googleusercontent.com/4awdZNySBMxY8H_TH4QtAPIM7IjBWYHhq5PlQiFkYrL1iRMIQVQFGBY2oHI4Sx0P2JMSRCjnXkZwKIu9IGlpvKLNulyoQKw27Ac5Tmkzg8Mg1zYrt_wyeCrNMhj81zjNKg-t8vyi | **Opening Screen Of Program with Introduction** |
| https://lh6.googleusercontent.com/bEArHuhm4_XVq-lyjpXsY7bGQtgNySt9suQz9ao_oG83UQSY2T7bBqY1Z7NpkM5EaEW8CvVYgmCnOVYr7y1WoYTzt393pqY8rc7LV7-DggdZTyHiIs3CWhX4CsUmMH9YhuZxF9J1 | **Chapter Menu To be chosen for performing computation** |
| https://lh3.googleusercontent.com/39mjRvicU3Olv15GVpfKu0DikxvrrtjJ0Wy13wSr69nu8RmZEv5EyQCSr99RuP89JV7236kjkS6kzJaJxlJZYg8icMOaK0gKL-qUviTQmkRQzavc_hrkGkD9KAEbo05TSW7YC9Jq | **Chapter 2 Bisection Method Implemented.** |
| https://lh5.googleusercontent.com/Zuesx3YlxG3FbgjJEi6V22VSa3dAn2LDfU1ytvM3dmkwTsQWDaoWmNB2-GOQ6VSJzLV3XFjJxj2o1c9RLlF2Awp4XhATXoV72vbn7fgEl_D9P-8uI5tkNf3zIgGJSHyIp8zQY-G4 | **Chapter 2 Regular Falsi Method Implemented** |
| https://lh4.googleusercontent.com/MFEOzpxXAYQY88Oz2YdZdMrCW0P0SAsZ2OxcetHt1ijcOOCBa6nzZMcIOfwokP5NEAGG_pL7vk-xHWxruWjlYwUfEfHmydhcUY-M8Dv2Unv5KBowyRJCnlg5vCE0y5Aj03wN-Gm0 | **Chapter 2 Secant Method Implemented** |
| https://lh4.googleusercontent.com/hpNWNEK35rVIEqvJe2K-VngZyJ8PFzn-WIpjMEPmtzXKHCT_WXqRjwyBv7hW6gQS1-RybjbuBkoOLXD4jZYzH7-LrprlNXFlos_pAyyt5xn2EWHSorBkuZNjweKYDqm66L8vnnfh | **Chapter 3 Lagrange Interpolation Implemented** |
| https://lh5.googleusercontent.com/GD3IjBvmmEikr2z5QvCr1Nh8epMBxcVs_fdew1Y73pK4GKd95ZwFSnsInROZROz06AB5k86hqka5VoP6T8AQZoRHnat4faTaNTuHHI-hHR_Ra1020m9SKbVzxDFXVw-FPKKv4wGd | **Chapter 3 Newton Backward Difference Implemented** |
| https://lh5.googleusercontent.com/PccfShVTQB8xAPI6sVAobBlW8iFRmg1uUaZB7clME-5SOJdkw8K79gu6ouILfrDzR4rCQTXxbL-cwEK2zYdPZkyqxEXbra0Au4lw2bGph3oyRw5l0BNUth9HMFuaZI_T4FuSmkMG | **Chapter 3 Newton Forward Difference Implemented** |
| https://lh3.googleusercontent.com/y261llWIpooniQmVRuDSqCE_VSGo_g6VCVZpFD9A7KtO18SkBLFEnsj3GcjyVFNezZpUCQdhQyKQL-3g3nr3U-mYG6OoUDs8XcPY27YWgfpr2lFc46OkKnbnOZjuKbRQQx8XTwsE | **Chapter 4 Three Point Endpoint Differentiation Implemented.** |
| https://lh6.googleusercontent.com/tfhfIntJ5hSLsVyQwctG4n5AxNLk5rDmORUwrQnCz2lK3jfJGf-l7b26CWb0q4-OqaLKxxKXQwzS-l1-jLmXWbB1uuUvmtzvwyqdHWuW_lsRnRYebhOF-5e4RUGzZFXwphwXaVDx | **Chapter 4 Three Point Midpoint Differentiation Implemented.** |
| https://lh6.googleusercontent.com/XqekjV9RfJT2UnTKZJNX_JNPeZIc8qQWqvIgnVVrSyvYHmXjcu8pps3LppVPZ-j_YL8BZtLtJn_fZxBdWGfaLQjAhHeoTRLoasRf6kUACokxfjd_y90Mj2w-OOdHqI9O7-SLbY_e | **Chapter 4 Five Point Endpoint Differentiation Implemented.** |
| https://lh6.googleusercontent.com/nXleXEE0HF5TgS6Htyd0y6aZGl_vT1WYF-bIPZbBz11LrYbzb4ioDPVHTqhBYwSwBSQ1leOCCwHmF7y_VjYchAfBHOUMzp3uEggbuX1a1St6z-AScMbIXqO-UZlfekh2zstDQpPk | **Chapter 5 Euler Method Implemented.** |
| https://lh6.googleusercontent.com/D3J0e_R3SIAYg3uRMCRpu2Oi4nTWwmJTRI2enqZhPw-rhRwaEtLG5EpXMjbvDttDl-P4oMLAcZkNf-UvqsjHexuLEmttnIystvpQFpuNGd11cWnalnUhU6AWaEpjD_xeKxcPF6W0 | **Chapter 5 Midpoint Ordinary Differential Equation Implemented.** |
| https://lh4.googleusercontent.com/n-H-UpsAaUDfpUSAm5_CWhCWcEMxb8JBq0TeNOMlgOnRoqNCEntkWiJNyLQrQ0Ma6OjMqxOuql51_8LaAOaLWDAMf2rjbu58i_eO_qRxhPDE3Zl8L7GJ5pXSyVUZ8FNB7NS6s3CC | **Chapter 5 Modified Euler Ordinary Differential Equation Implemented.** |