## CHOICE BASED CREDIT SYSTEM - LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK
## B.Sc Mathematics with Computer Applications

## Those who have joined in the Academic year 2023-24 onwards

**Programme outcomes (PO) of B.Sc Degree programme in Mathematics with Computer Applications**

- ➢ Scientific aptitude will be developed in Students
- ➢ Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the science & humanities stream.
- ➢ Students will become employable; Students will be eligible for career opportunities in education field, Industry, or will be able to opt for entrepreneurship
- ➢ Students will possess basic subject knowledge required for higher studies, professional and applied courses
- ➢ Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.
- ➢ Ability to acquire in-depth knowledge of several branches of Mathematics with Computer Applications and aligned areas . This Programme helps learners in building a solid foundation for higher studies in Mathematics with Computer Applications
- ➢ The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modelling and solving real life problems.
- ➢ Utilize Mathematics with Computer Applications to solve theoretical and applied problems by critical understanding, analysis and synthesis.
- ➢ To recognize patterns and to identify essential and relevant aspects of problems.
- ➢ Ability to share ideas and insights while seeking and benefitting from knowledge and insight of others.
- ➢ Mould the students into responsible citizens in a rapidly changing interdependent society.

**The above expectations generally can be pooled into 6 broad categories and can be modified according to institutional requirements:**

**PO1: Knowledge**

**PO2: Problem Analysis**

**PO3: Design / Development of Solutions**

**PO4: Conduct investigations of complex problems**

**PO5: Modern tool usage**

**PO6: Applying to society**

**Programme Specific Outcomes of B.Sc Degree programme i**

- ❖ Think in a critical manner
- ❖ Familiarize the students with suitable tools of mathematical analysis to handle issues and problems in Mathematics with Computer Applications and related sciences.
- ❖ Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.
- ❖ Understand, formulate, develop Mathematical arguments logically and use quantitative models to address issues arising in social science, business and other contexts.
- ❖ Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Mathematics with Computer Applications and Statistics.
- ❖ Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Mathematics with Computer Applications and its allied areas on multiple disciplines linked with Mathematics with Computer Applications.
- ❖ Equip with Mathematical modelling ability, problem solving skills, creative talent andpower of communication necessary for various forms of employment
- ❖ Develop a range of generic skills helpful in employment, internships& societalactivities.
- ❖ Get adequate exposure to global and local concerns that provides platform for further exploration into multi dimensional aspects of Mathematical sciences.

**Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids: (put tick mark in each row)**

## CHOICE BASED CREDIT SYSTEM - LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK

### B.Sc Mathematics With Computer Applications
### Those who have joined in the Academic year 2023-24 onwards

| Part | Courses | Subject | Code | Cr. | Hrs |
|------|---------|---------|------|-----|-----|
| I | Lang. – I | nghJj;jkpo; - **I** | 230103101 | 3 | 6 |
| II | Lang. - II | General English | 231003101 | 3 | 4 |
| III | CC – 1 | Algebra & Trigonometry | 233103101 | 3 | 5 |
| | CC – 2 | Differential Calculus | 233103102 | 3 | 5 |
| | EC-I - T | Programming in C | 233103103 | 2 | 2 |
| | EC 1 - P | Programming in C Lab | 233103104 | 1 | 2 |
| | EC – I T | Programming in R | 233103105 | 2 | 2 |
| | EC – I P | Programming in R Lab | 233103106 | 1 | 2 |
| IV | SEC –I (NME) | Mathematics for Competitive Examinations | 234603131 | 2 | 2 |
| IV | FC | Bridge Mathematics | 234403131 | 2 | 2 |
| | AECC – 1 | Soft Skill – 1 | | 2 | 2 |
| | Total | | | **23** | **30** |
| | | **SEMESTER II** | | | |
| I | Lang. -I | nghJj;jkpo; - **II** | 230103201 | 3 | 6 |
| II | Lang. -II | General English | 231003201 | 3 | 4 |
| III | CC – 3 | Analytical Geometry (Two & Three Dimensions) | 233103201 | 4 | 5 |
| | CC 4 - | Integral Calculus | 233103202 | 4 | 5 |
| | EC – II T | Programming in Python | 233103203 | 2 | 2 |
| | EC - P | Programming in Python Lab | 233103204 | 1 | 2 |
| | EC – T | Data Structures | 233103205 | 2 | 2 |
| | EC – II P | Data Structures Lab | 233103206 | 1 | 2 |
| IV | SEC –II (NME) | Basic Data Analysis Using Excel | 234603231 | 2 | 2 |
| | SEC - III | Computational Mathematics | 234408231 | 2 | 2 |
| | | Cloud Computing | 238203231 | | |
| | AECC –II | Soft Skill - 2 | | 2 | 2 |
| | | | | **23** | **30** |
| | | **SEMESTER III** | | | |
| I | Lang. -I | nghJj;jkpo; - **III** | 230103301 | 3 | 6 |
| II | Lang. -II | General English | 231003301 | 3 | 4 |
| III | CC – 5 | Vector Calculus and Applications | 233103301 | 4 | 5 |
| | CC - 6 | Differential Equations and Applications | 233103302 | 4 | 5 |
| | EC –3- Theory & Practical | Mathematical Statistics | 233103303 | 3 | 4 |
| | | Programming in Java | 233103304 | | |
| IV. | EC –4- Theory & Practical | Digital Marketing | 233103305 | 1 | 1 |
| | | Web Designing | 233103306 | | |
| | EC-5 - Theory | Statistics with R Programming | 233103307 | 2 | 2 |
| | | Data Analysis with R | 233103308 | | |
| | AECC – III Soft skill – 3 | Soft Skill - 3 | | 2 | 2 |
| | EVS | Environmental Studies | 234103301 | 1 | 1 |
| | | | | **23** | **30** |

| | | Courses | | Code | Cr. | Hrs |
|---|---|---|---|---|---|---|
| **SEMESTER IV** | | | | | | |
| I | Lang. – I | nghJj;jkpo; - IV | | 230103401 | 3 | 6 |
| II | Lang. - II | General English | | 231003401 | 3 | 4 |
| III | CC – 7 | Industry Module – Cyber Security | | 233103401 | 4 | 5 |
| | CC - 8 | Elements of Mathematical Analysis | | 233103402 | 4 | 4 |
| | EC – 4 | Numerical Methods | | 233103403 | 3 | 4 |
| | | Statistical Methods | | 233103404 | | |
| | SEC - 6 | Introduction to Data Science | | 233103405 | 2 | 2 |
| IV | | Mathematical Finance | | 233103406 | | |
| | SEC-7 | Computing Mathematics | | 233103407 | 2 | 2 |
| | | Introduction to Artificial intelligence | | 233103408 | | |
| IV | AECC-Soft Skill – 4 | Soft Skill - 4 | | | 2 | 2 |
| | EVS | Environmental Studies | | 234103401 | 1 | 1 |
| | Total | | | | **24** | **30** |
| **SEMESTER V** | | | | | | |
| III | CC – 9 | Abstract Algebra | | 233103501 | 4 | 5 |
| | CC - 10 | Real Analysis | | 233103502 | 4 | 5 |
| | CC - 11 | Mathematical Modelling | | 233103503 | 4 | 5 |
| | CC-12 | Project with Viva Voce | | 233103504 | 5 | 5 |
| | EC – V Theory & Practical | Introduction to Machine Learning | | 233103505 | 3 | 5 |
| | | PHP Programming | | 233103506 | | |
| | EC-6 | Optimization Techniques | | 233103507 | 3 | 4 |
| | | Discrete Mathematics | | 233103508 | | |
| IV | | Value Education | | 234303501 | 1 | 1 |
| | | Internship/Industrial Training(carried out in II year summer vacation)30 hrs | | **233103509** | 2 | |
| | | | | | **26** | **30** |
| **SEMESTER VI** | | | | | | |
| III | CC – 13 | Linear Algebra | | 233103601 | 4 | 5 |
| | CC – 14 T | Complex Analysis | | 233103602 | 4 | 5 |
| | CC – 15 | Mechanics | | 233103603 | 4 | 5 |
| | EC-7 Theory & Practical | Programming in C++ | | 233103604 | 3 | 5 |
| | | Relational Database Management System | | 233103605 | | |
| | EC – 8 | Graph Theory and Applications | | 233103606 | 3 | 5 |
| | | Fuzzy Sets &Applications | | 233103607 | | |
| IV | Processional competency skill enhancement course | General Studies for Competitive Examinations | | 234403631 | 1 | 4 |
| | | Value Education | | 234303601 | 1 | 1 |
| V | | Extension Activity (outside college hrs) | | **233103608** | 1 | |
| | | | | | **21** | **30** |

| Title of the Course | ALGEBRA AND TRIGONOMETRY | | | | | | |
|---|---|---|---|---|---|---|---|
| Part | III | | | | | | |
| Category | Core – 1 | Year | I | Credits | 3 | Course Code | 233103101 |
| | | Semester | I | | | | |
| Instructional Hours per week | | Lecture | Tutorial | Lab Practice | Total | CIA | External | Total |
| | | 5 | - | -- | 5 | 25 | 75 | 100 |

**Learning Objectives**

- Basic ideas on the Theory of Equations, Matrices and NumberTheory.
- Knowledge to find expansions of trigonometry functions, solve theoretical and applied problems.

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| I | Reciprocal Equations-Standard form–Increasing or decreasing the roots of a given equation- Removal of terms, Approximate solutions of roots of polynomials by Horner's method – related problems. **Chapter-6 Section 16, 16.1, 16.2, 17, 19, 30** | 15 |
| II | Summation of Series: Binomial– Exponential – Logarithmic series (Theorems without proof) – Approximations- related problems. **Chapter-3 Section 10** **Chapter -4 Sections 3.1, 3.5, 3.6, 3.7** | 15 |
| III | Characteristic equation –Eigen values and Eigen Vectors-Similar matrices - Cayley –Hamilton Theorem (Statement only) - Finding powers of square matrix, Inverse of a square matrix up to order 3, Diagonalization of square matrices - related problems. **Chapter-2 Sections 16, 16.1 to 16.4** | 15 |
| IV | Expansions of $\sin n\theta$, $\cos n\theta$ in powers of $\sin\theta$, $\cos\theta$ -Expansion of $\tan n\theta$ in terms of $\tan\theta$, Expansions of $\cos^n\theta$, $\sin^n\theta$, $\cos^m\theta\sin^n\theta$ –Expansions of $\tan(\theta_1+\theta_2+\ldots,+\theta_n)$- Expansions of $\sin\theta$, $\cos\theta$ and $\tan\theta$ in terms of $\theta$ - related problems. **Chapter 2 Sections 2.1, 2.1.1, 2.1.2** **Chapter 3 Sections 3.1, 3.1.1 to 3.4.3** | 15 |
| V | Hyperbolic functions – Relation between circular and hyperbolic functions Inverse hyperbolic functions, Logarithm of complex quantities, Summation of trigonometric series - related problems. **Chapter 4 Sections 4.1 to 4.7 Chapter 5 Sec 5.3** **Chapter 6 Sections 6.1. to 6.6** | 15 |

| Course Outcomes | |
|---|---|
| **Course Outcomes** | On completion of this course, students will be able; |
| CO1 | Classify and Solve reciprocal equations |
| CO2 | Find the sum of binomial, exponential and logarithmic series |
| CO3 | Find Eigen values, eigen vectors, verify Cayley – Hamilton theorem and diagonalize a given matrix |
| CO4 | Expand the powers and multiples of trigonometric functions in terms of sine and cosine |
| CO5 | Determine relationship between circular and hyperbolic functions and the summation of trigonometric series |

| Text Books (Latest Editions) |
|---|
| 1.Algebra, Volume I by T.K.Manicavachagom Pillay, T.Natarajan,K.S.Ganapathy, Viswanathan Publication 2007, **Unit – 1 and Unit – 2** |
| 2. Algebra, Volume II by T.K.Manicavachagom Pillay, T.Natarajan, K.S.Ganapathy, Viswanathan Publication 2008 **Unit -3** |
| 3. Trigonometry by P.Duraipandian and Kayalal Pachaiyappa,Muhil publishers, **Unit – 4, Unit – 5** |

| References Books |
|---|
| **(Latest editions, and the style as given below must be strictly adhered to)** |
| 1.W.S. Burnstine and A.W. Panton, Theory of equations |
| 2.David C. Lay, Linear Algebra and its Applications, 3rd Ed.,Pearson Education Asia,    Indian Reprint, 2007 |
| 3.G.B. Thomas and R.L. Finney, Calculus, 9th Ed., PearsonEducation, Delhi, 2005 |
| 4.C.V.Durell and A. Robson, Advanced Trigonometry, CourierCorporation, 2003 |
| 5.J.Stewart, L. Redlin, and S. Watson, Algebra and Trigonometry,Cengage Learning, 2012. |
| 6.Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny, Pearson Publication, 9th Edition, 2010. |

| Web Resources |
|---|
| https://www.mathwarehouse.com/ https://www.mathhelp.com/ https://www.mathsisfun.com/ |

|  | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
|  | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO2 | 2 | 1 | 3 | 1 | - | - | 3 | 2 | 1 |
| CLO3 | 3 | 1 | 3 | 1 | - | - | 3 | 2 | 1 |
| CLO4 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO5 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |

| Title of the Course | | DIFFERENTIAL CALCULUS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Part | | III | | | | | | |
| Category | Core – 2 | Year | I | Credits | 3 | Course Code | | 233103102 |
| | | Semester | I | | | | | |
| Instructional Hours per week | | Lecture | Tutorial | Lab Practice | Total | CIA | External | Total |
| | | 4 | 1 | -- | 5 | 25 | 75 | 100 |

**Learning Objectives**

- The basic skills of differentiation, successive differentiation, and their applications.
- Basic knowledge on the notions of curvature, evolutes, involutes and polar co-ordinates and in solving related problems.

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| I | **Successive Differentiation**: Introduction (Review of basic concepts) – The $n^{th}$ derivative – Standard results – Fractional expressions – Trigonometrical transformation – Formation of equations involving derivatives – Leibnitz formula for the $n^{th}$ derivative of a product – Feynman's method of differentiation. <br> **Chapter 3 Sections 1.1 – 1.6** and **Section 2.1** and **2.2** | 15 |
| II | **Partial Differentiation**: Partial derivatives – Successive partial derivatives – Function of a function rule – Total differential coefficient – A special case – Implicit Functions. <br> **Chapter 8 Sections 1.1 – 1.5** | 15 |
| III | **Partial Differentiation (Continued)**: Homogeneous functions – Partial derivatives of a function of two variables – Maxima and Minima of functions of two variables - Lagrange's method of undetermined multipliers. <br> **Chapter 8 Sections 1.6, 1.7, Sections 4 and 5** | 15 |
| IV | **Envelope:** Method of finding the envelope – Another definition of envelope – Envelope of family of curves which are quadratic in the parameter <br> **Chapter 10 Sections 1.1 – 1.4** | 15 |
| V | **Curvature:** Definition of Curvature – Circle, Radius and Centre of Curvature – Evolutes and Involutes – Radius of Curvature in Polar Co-ordinates. <br> **Chapter 10 Sections 2.1, 2.2** and **2.5 – 2.7** | 15 |

| Course Outcomes | |
|---|---|
| **Course Outcomes** | On completion of this course, students will be able; |
| CO1 | Find the nth derivative, form equations involving derivatives and apply Leibnitz formula |
| CO2 | Find the partial derivative and total derivative coefficient |
| CO3 | Determine maxima and minima of functions of two variables and to use the Lagrange's method of undetermined multipliers |
| CO4 | Find the envelope of a given family of curves |
| CO5 | Find the evolutes and involutes and to find the radius of curvature using polar co-ordinates |

| Text Books (Latest Editions) |
|---|
| S. Narayanan and T.K. Manickavachagom Pillay, Calculus Volume I - S. Viswanathan Publishers Pvt. Ltd. 2006 |

| References Books |
|---|
| **(Latest editions, and the style as given below must be strictly adhered to)** |

1. G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2010.
2. M.J. Strauss, G.L. Bradley and K. J. Smith, Calculus, 3rd Ed., Dorling Kindersley (India) P. Ltd. (Pearson Education), Delhi, 2007.
3. R. Courant and F. John, Introduction to Calculus and Analysis (Volumes I & II), Springer- Verlag, New York, Inc., 1989.
4. T. Apostol, Calculus, Volumes I and II.

| Web Resources |
|---|
| https://nptel.ac.in<br>https://www.mathwarehouse.com/<br>https://www.mathhelp.com/ |

**Mapping with Programme Outcomes:**

| | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO2 | 2 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO3 | 3 | 2 | 3 | 2 | - | - | 3 | 2 | 1 |
| CLO4 | 3 | 2 | 3 | 2 | 1 | - | 3 | 2 | 1 |
| CLO5 | 3 | 2 | 3 | 2 | 1 | - | 3 | 2 | 1 |

| Title of the Course | | **PROGRAMMING IN C** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Part** | | III | | | | | | |
| **Category** | Elective 1 Theory | **Year** | I | **Credits** | 2 | **Course Code** | | 233103103 |
| | | **Semester** | I | | | | | |
| **Instructional Hours per week** | | **Lecture** | **Tutorial** | **Lab Practice** | **Total** | **CIA** | **External** | **Total** |
| | | 2 | - | -- | 2 | 25 | 75 | 100 |

| Learning Objectives | |
|---|---|
| | To gain knowledge in C language. |
| | To inculcate fundamental programming skills. |

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| I | Introduction - Importance of C - Programming style-character set - C Tokens-keywords and identifiers – Constants – Variables - Data types - Declaration of variables - Declaration of storage class-assigning values to variables-defining symbolic constants. | 6 |
| II | Operators and expressions-arithmetic, relational, logical, assignment, increment and decrement, bitwise, conditional,special operators-arithmetic expressions-evaluation of expressions-precedence of arithmetic expressions | 6 |
| III | Managing input and output operations-reading a character- writing a character-formatted input-formatted output-decision making with if - simple if, if else, nesting of if else, else if, switch, goto, while do while, for statements-jumps in loops | 6 |
| IV | Arrays-one dimensional arrays-declaration of one dimensionalarrays-initialization of one dimensional arrays-two dimensional arrays initializing two dimensional arrays-multi dimensional arrays-dynamic arrays. | 6 |
| V | Structure definition-declaring structure variables-accessing structure members- structure initialization-pointer expressions- pointer increment and scale factor- pointer and arrays-array of pointers-pointers as function arguments-functions returning pointer- pointers to functions | 6 |

| Course Outcomes | |
|---|---|
| **Course Outcomes** | On completion of this course, students will be able; |
| **CO1** | Remember the program structure of C with its syntax and semantics |
| **CO2** | Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files) |
| **CO3** | Apply the programming principles learnt in real-time problems |
| **CO4** | Analyze the various methods of solving a problem and choose the best method |
| **CO5** | Code, debug and test the programs with appropriate test cases |

| Text Books (Latest Editions) | |
|---|---|
| 1 | E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill,2010. **Unit I** Chapter 2,3; **Unit II:** Chapter 4: **Unit III** – Chapter 5,6,7: **Unit IV** – Chapter 8; **Unit V** – Chapter 11, 12. |

| | |
|---|---|
| **References Books** <br> **(Latest editions, and the style as given below must be strictly adhered to)** | |
| | Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018. |
| | Darrel L. Graham, C Programming Language, Createspace IndependentPublishing Company, 2016 |
| | YashavantKanetkar, Let Us C, Eighteenth Edition, BPB Publications,2021 |
| **Web Resources** | |
| | The C Book - a free online book on C programming: <br> https://publications.gbdirect.co.uk//c_book/ <br> C Programming Wikibook - a free online wikibook on C programming: <br> https://en.wikibooks.org/wiki/C_Programming |
| | https://www.w3schools.com/c/index.php - Free C Tutorial |
| | https://www.geeksforgeeks.org/c-programming-language/ |
| | http://visualcplus.blogspot.com/2006/02/lesson-3-data-types-in-registry.html <br>  **-** Free tutorial on C |

**Mapping with Programme Outcomes:**

| | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 1 | 3 | 2 | 1 | 2 | 3 | 2 | 1 |
| CLO2 | 2 | 2 | 2 | 3 | 1 | 2 | 3 | 2 | 1 |
| CLO3 | 3 | 1 | 1 | 3 | 1 | 2 | 3 | 2 | 1 |
| CLO4 | 2 | 3 | 1 | 2 | 3 | 2 | 3 | 2 | 1 |
| CLO5 | 3 | 3 | 1 | 1 | 2 | 2 | 3 | 2 | 1 |

| Title of the Course | Programming in C Lab | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Part** | **III** | | | | | | | |
| **Category** | EC – I Practical | **Year** | I | **Credits** | 1 | **Course Code** | 233103104 | |
| | | **Semester** | I | | | | | |
| **Instructional Hours per week** | | **Lecture** | **Tutorial** | **Lab Practice** | **Total** | **CIA** | **External** | **Total** |
| | | | - | 2 | 2 | 25 | 75 | 100 |

| **Learning Objectives** |
|---|
| To gain knowledge in C language.<br>To inculcate fundamental programming skills. |

| **Details** | |
|---|---|

1. Create a one dimensional array of characters and store a string inside it by reading from standard input.

2. Write a program to input 20 arbitrary numbers in one dimensional array. Calculate thefrequency of each number. Print the number and its frequency in a tabular form.

3. Write a C function to remove duplicates from an ordered array.

4. Write a program which will arrange the positive and negative numbers in one dimensionalarray in such a way that all negative numbers should come first and then all the positive numbers will come without changing the original sequence of numbers.

5. Write a program to perform following operations on a 2D array a. Addition b. Multiplication
   c. Transpose

6. Write a program to find the GCD and LCM of two numbers

7. Implement a swap () function which exchanges the values of two integers. Call the functionfrom the main to test the function with different values.

8. Write a program to remove duplicates from an ordered array

9. Write a function to generate the Fibonacci series using recursion.

10. Write a recursive function that adds first 'n' natural numbers.

11. Write a recursive function that finds factorial of a number

12. Write a program to demonstrate the use of recursion in Tower of Hanoi problem

| **Course Outcomes** | |
|---|---|
| **Course Outcomes** | On completion of this course, students will be able; |
| **CO1** | Remember the program structure of C with its syntax and semantics |
| **CO2** | Understand the programming principles in C (data types, operators, branching and looping, arrays, functions, structures, pointers and files) |
| **CO3** | Apply the programming principles learnt in real-time problems |
| **CO4** | Analyze the various methods of solving a problem and choose the best method |
| **CO5** | Code, debug and test the programs with appropriate test cases |

| **Text Books (Latest Editions)** |
|---|
| E. Balagurusamy, Programming in ANSI C, Fifth Edition, Tata McGraw-Hill,2010.<br><br>**Unit I** Chapter 2,3; **Unit II:** Chapter 4: **Unit III** – Chapter 5,6,7:<br>**Unit IV** – Chapter 8; **Unit V** – Chapter 11, 12. |

| | References Books **(Latest editions, and the style as given below must be strictly adhered to)** |
|---|---|
| | Byron Gottfried, Schaum's Outline Programming with C, Fourth Edition, Tata McGraw-Hill, 2018. |
| | Darrel L. Graham, C Programming Language, Createspace IndependentPublishing Company, 2016 |
| | YashavantKanetkar, Let Us C, Eighteenth Edition, BPB Publications,2021 |
| | **Web Resources** |
| | The C Book - a free online book on C programming: https://publications.gbdirect.co.uk//c_book/ C Programming Wikibook - a free online wikibook on C programming: https://en.wikibooks.org/wiki/C_Programming |

**Mapping with Programme Outcomes:**

| | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 1 | 3 | 2 | 1 | 2 | 3 | 2 | 1 |
| CLO2 | 2 | 2 | 2 | 3 | 1 | 2 | 3 | 2 | 1 |
| CLO3 | 3 | 1 | 1 | 3 | 1 | 2 | 3 | 2 | 1 |
| CLO4 | 2 | 3 | 1 | 2 | 3 | 2 | 3 | 2 | 1 |
| CLO5 | 3 | 3 | 1 | 1 | 2 | 2 | 3 | 2 | 1 |

**3 – Strong, 2 – Medium , 1 – Low**

| **Title of the Course** | | **Programming in R** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Part** | | **III** | | | | | | |
| **Category** | Elective 1 | **Year** | I | **Credits** | 2 | **Course** | | **233103105** |

| Theory | | Semester | I | | | Code | | |
|---|---|---|---|---|---|---|---|---|
| **Instructional Hours per week** | | **Lecture** | **Tutorial** | **Lab Practice** | **Total** | **CIA** | **External** | **Total** |
| | | 2 | - | -- | 2 | 25 | 75 | 100 |

**Learning Objectives**

- Learn Fundamentals of R.
- Covers how to use different functions in R, how to read data into R, accessing Rpackages,
- Writing R functions, debugging, and organizing data using R functions.
- The whole syllabus will give an idea to collect, compile and visualize data usingstatistical functions.

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| I | Features of R- -Reserved words –Identifiers – Constants – Variables - Operators - Operator Precedence –Strings- Basic Data Types - Creating and combining vectors -Accessing Vector Elements - Modifying Vectors-Vector arithmetic and Recycling -Vector Element Sorting - Reading Vectors -Creating Lists -Accessing List elements - Updating List Elements -Merging Lists -List to Vector conversion | 6 |
| II | Creating matrices -Creating Arrays -Creating factors - Creating Data Frames -Aggregating Data -Sorting Data -Merging Data -Reshaping data -Sub-setting data -Data Type Conversion-Decision making (using if statement - if…else statement - Nested If…Else statement - if else function - Switch statement) -Loops (for loop – while Loop – repeat Loop) – Loop Control Statements | 6 |
| III | Function definition and Function Calling - Function without arguments - Built-in functions - Recursive function – infix operator - packages | 6 |
| IV | Bar charts– Histogram – Line graphs – Pie charts– Box Plots – Scatter Plots – Strip Charts – Density Plots – Dot plots -Graphical analysis and summaries of Data using Descriptive Statistics | 6 |
| V | Connecting R : CSV files – Excel Files – Databases – XML files – JSON files – Binary Files | 6 |

**Course Outcomes**

| Course Outcomes | On completion of this course, students will be able; |
|---|---|
| CO1 | the students will be able to: analyze data using the statistical tool R. |
| CO2 | Create vectors, lists, matrices, arrays and data frames using R. |
| CO3 | Design and implement the program using data frame, list to provide the solution for various problem. |
| CO4 | Ability to apply statistical techniques using R Programming for decision making. |
| CO5 | Study about factors and tables and to solve statistical problems. |

**Text Books (Latest Editions)**

| 1 | Jeeva Jose (2018),"Beginner's Guide for Data Analysis using R Programming",Khanna Book Publishing Co. Ltd., New Delhi**.** |
|---|---|
| | **Unit I – Chapter 1 & Chapter 2- 2.1 to 2.4** |
| | **Unit II – Chapter 2- 2.5 to 2.9 & Chapter 3** |
| | **Unit III – Chapter 4** |
| | **Unit IV – Chapter 5** |
| | **Unit V – Chapter 6** |
| 2 | Statistics Using R – Sudha G.Purohit , Sharad D.Gore, Shailaja R.Deshmukh –Narosa Publishing House, 2015 |

**References Books**

| | |
|---|---|
| **(Latest editions, and the style as given below must be strictly adhered to)** | |
| 1 | Modern Statistics with R - Måns Thulin – FREE ONLINE BOOK |
| 2 | P. Dalgaard. Introductory Statistics with R, 2nd Edition.Springer 2008. |
| 3 | Gardener, M (2012) Beginning R: The Statistical Programming Language,Wiley Publications. |
| **Web Resources** | |
| 1 | https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf |
| 2 | http://wise.cgu.edu/wp-content/uploads/2016/07/Getting-Started-with-R-and-RStudio.pdf |
| 3 | https://www.w3resource.com/r-programming-exercises/basic/index.php |

**Mapping with Programme Outcomes:**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 1 | 3 | 2 | 1 | 2 | - | - | - | - |
| **CO2** | 2 | 2 | 3 | 3 | 1 | 2 | - | - | - | - |
| **CO3** | 3 | 1 | 1 | 3 | 1 | 1 | - | - | - | - |
| **CO4** | 3 | 1 | 2 | 1 | 2 | 3 | - | - | - | - |
| **CO5** | 3 | 3 | 3 | 1 | 3 | 2 | - | - | - | - |

**3 – Strong, 2 – Medium , 1 - Low**

**Mapping with Programme Specific Outcomes:**

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | - | - |
| CO2 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 2 | 1 | - | - |
| CO4 | 3 | 2 | 1 | - | - |
| CO5 | 3 | 2 | 1 | - | - |
| Weightage | | | | | |
| Weighted percentage of Course Contribution to Pos | | | | | |

| Title of the Course | | **Programming in R Lab** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Part** | | **III** | | | | | | |
| **Category** | EC – I Practical | **Year** | I | **Credits** | 1 | **Course Code** | **233103106** | |
| | | **Semester** | I | | | | | |
| **Instructional Hours per week** | | **Lecture** | **Tutorial** | **Lab Practice** | **Total** | **CIA** | **External** | **Total** |
| | | | - | 2 | 2 | 25 | 75 | 100 |

| **Learning Objectives** |
|---|
| Learn Fundamentals of R. Covers how to use different functions in R, how to read data into R, accessing Rpackages, Writing R functions, debugging, and organizing data using R functions. The whole syllabus will give an idea to collect, compile and visualize data usingstatistical functions |

| **Details** | |
|---|---|

1. Write a R program to create a sequence of numbers from 20 to 50 and find the mean of numbers from 20 to 60 and sum of numbers from 51 to 91
2. Write a R program to get the first 10 Fibonacci numbers.
3. Write a R program to print the numbers from 1 to 100 and print "Fizz" for multiples of 3,print "Buzz" for multiples of 5, and print "FizzBuzz" for multiples of both.
4. Write a R program to extract first 10 English letter in lower case and last 10 letters in uppercase and extract letters between 22$^{nd}$ to 24$^{th}$ letters in upper case
5. Write a R program to get all prime numbers up to a given number
6. Write a R program to get the unique elements of a given string and unique numbers ofvector
7. Write a R program to create three vectors a,b,c with 3 integers. Combine the three vectors to become a 3×3 matrix where each column represents a vector. Print the content of the matrix.
8. Write a R program to read the .csv file and display the content.
9. Write a R program to create three vectors numeric data, character data and logical data. Display the content of the vectors and their type
10. Write a R program to create a 5 × 4 matrix, 3 × 3 matrix with labels and fill the matrix byrows and 2 × 2 matrix with labels and fill the matrix by columns.
11. Write a R program to create an array, passing in a vector of values and a vector ofdimensions. Also provide names for each dimension.
12. Write a R program to create an array with three columns, three rows, and two "tables",taking two vectors as input to the array. Print the array
13. Write a R program to create a Data frames which contain details of 5 employees anddisplay summary of the data
14. Write a R program to compute sum, mean and product of a given vector elements
15. Write a R program to draw an empty plot and an empty plot specify the axes limits of thegraphic
16. Write a R program to create a simple bar plot of five subjects marks
17. Write a R program to create bell curve of a random normal distribution
18. Design a data frame in R for storing about 20 employee details. Create a CSV file named"input.csv" that defines all the required information about the employee such as id, name,salary, start_date, dept. Import into R and do the following analysis. **a**. Find the total number rows & columns **b**. Find the maximum salary **c**. Retrieve the details of the employee with maximum salary **d**. Retrieve all the employees working in the IT .

| **Course Outcomes** | |
|---|---|
| **Course** | On completion of this course, students will be able; |

| Outcomes | |
|---|---|
| **CO1** | the students will be able to: analyze data using the statistical tool R. |
| **CO2** | Create vectors, lists, matrices, arrays and data frames using R. |
| **CO3** | Design and implement the program using data frame, list to provide the solution for various problem. |
| **CO4** | Ability to apply statistical techniques using R Programming for decision making. |
| **CO5** | Study about factors and tables and to solve statistical problems. |

| **Text Books (Latest Editions)** | |
|---|---|
| | Jeeva Jose (2018),"Beginner's Guide for Data Analysis using R Programming",Khanna Book Publishing Co. Ltd., New Delhi**.** |
| | **Unit I – Chapter 1 & Chapter 2- 2.1 to 2.4** |
| | **Unit II – Chapter 2- 2.5 to 2.9 & Chapter 3** |
| | **Unit III – Chapter 4** |
| | **Unit IV – Chapter 5** |
| | **Unit V – Chapter 6** |
| | Statistics Using R – Sudha G.Purohit , Sharad D.Gore, Shailaja R.Deshmukh –Narosa Publishing House, 2015 |
| **References Books** **(Latest editions, and the style as given below must be strictly adhered to)** | |
| | Modern Statistics with R - Måns Thulin – FREE ONLINE BOOK |
| | P. Dalgaard. Introductory Statistics with R, 2nd Edition.Springer 2008. |
| | Gardener, M (2012) Beginning R: The Statistical Programming Language,Wiley Publications. |
| **Web Resources** | |
| | https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf |
| | http://wise.cgu.edu/wp-content/uploads/2016/07/Getting-Started-with-R-and-RStudio.pdf |
| | https://www.w3resource.com/r-programming-exercises/basic/index.php |

| Title of the Course | | **MATHEMATICS FOR COMPETITIVE EXAMINATIONS** | | | | | |
|---|---|---|---|---|---|---|---|
| **PART** | | IV | | | | | |
| **Category** | SEC I - NME | **Year** | I | **Credits** | 2 | **Course Code** | **234603131** |
| | | **Semester** | I | | | | |
| **Instructional Hours per week** | | **Lecture** | **Tutorial** | **Lab Practice** | **Total** | **CIA** | **External** | **Total** |
| | | 2 | - | -- | 2 | 25 | 75 | 100 |

**Learning Objectives**

To make the students think logically and objectively.

To develop skills to attend the competitive exams confidently.

To expose the technique of problem solving on quantitative aptitude.

To develop the students ability to deal with numerical and quantitative issues in business.

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| I | **Average**: facts and formulae – problems on average – problems on average speed.**Chapter 6** | 6 |
| II | **Problems on Numbers**: concept of numbers – problems involving set of numbers – solving unknown quantities. **Chapter 7** | 6 |
| III | **Problems on Ages**: problems on present age – problems on ratio between ages.Chapter 8 | 6 |
| IV | **Percentage**: concept of percentage – problems on population – problems on depreciation.Chapter 11 | 6 |
| V | Profit and loss.Chapter 12 | 6 |

**Course Outcomes**

| Course Outcomes | Students will be able to |
|---|---|
| **CO1** | provide a comprehensive and clear description of properties concerning averages, study the short cut techniques of solving problems. |
| **CO2** | demonstrate procedural fluency with real number arithmetic operations and use those operations to represent real-world scenarios and solve stated problems. |
| **CO3** | establish a framework to acquire knowledge and expertise in necessary concepts needed to solve age related problems. |
| **CO4** | illustrate the concept of percentage; calculate specified percent of a given number or a quantity; interpret concept of percentages based on population increase – decrease and depreciation. |
| **CO5** | explain how to calculate profit and loss, identify the impact of profit or loss can have on a business and describe how a business can obtain a supernormal profit. |

| Text Books (Latest Editions) | |
|---|---|
| 1. | Aggarwal R.S., Quantitative Aptitude, S.Chand & company Ltd, New Delhi, Revised Edition (Reprint 2020) |

| Reference Books | |
|---|---|
| 1. | Ranganath G.K, Sampangiram C.S, and Rajaram.Y, & text books of business Mathematics, Himalaya Publishing House, New Delhi, Reprint 2006. |
| 2. | Ponnien Selvi.M, & Sri Devi.N, Business Mathematics, Yoga Publishing House, Virudhunagar, 2007. |
| 3. | Dinesh Khattar, Quantitative Aptitude for Competitive Examinations, Pearson Publications, 2019 |

| Web Resources |
|---|
| 01. https://youtu.be/KE7tQf9spPg |
| 02. https://youtu.be/7DJ-lzPnv8I |
| 03. https://youtu.be/vsBpWgNYjtQ |
| 04. https://youtu.be/STaokT5d9Q4 |
| 05. https://youtu.be/HbuMwVGtn80 |
| 06. http://www.practiceaptitudetests.com/ |

**Mapping with Programme Outcomes:**

| | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO2 | 2 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO3 | 3 | 2 | 3 | 2 | - | - | 3 | 2 | 1 |
| CLO4 | 3 | 2 | 3 | 2 | 1 | - | 3 | 2 | 1 |
| CLO5 | 3 | 2 | 3 | 2 | 1 | - | 3 | 2 | 1 |

**S-Strong      M-Medium    L-Low**

| Title of the Course | | **BRIDGE MATHEMATICS** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **PART** | | IV | | | | | | |
| **Category** | FC | **Year** | I | **Credits** | 2 | **Course Code** | | 234403131 |
| | | **Semester** | I | | | | | |
| **Instructional Hours per week** | | **Lecture** | **Tutorial** | **Lab Practice** | **Total** | **CIA** | **External** | **Total** |
| | | 2 | - | -- | 2 | 25 | 75 | 100 |

**Learning Objectives**

To bridge the gap and facilitate transition from higher secondary to tertiary education;

To instil confidence among stakeholders and inculcate interest for Mathematics;

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| **I** | Algebra: Binomial theorem, General term, middle term, problems based on these concepts | **6** |
| **II** | Sequences and series (Progressions). Fundamental principle of counting. Factorial n. | **6** |
| **III** | Permutations and combinations, Derivation of formulae and their connections, simple applications, combinations with repetitions, arrangements within groups, formation of groups. | **6** |
| **IV** | Trigonometry: Introduction to trigonometric ratios, proof of sin(A+B), cos(A+B), tan(A+B) formulae, multiple and sub multiple angles, sin(2A), cos(2A), tan(2A) etc., transformations sum into product and product into sum formulae, inverse trigonometric functions, sine rule and cosine rule | **6** |
| **V** | Calculus: Limits, standard formulae and problems, differentiation, first principle, uv rule, u/v rule, methods of differentiation, application of derivatives, integration - product rule and substitution method. | **6** |

**Course Outcomes**

| Course Outcomes | After completion of this course successfully, the students will be able to |
|---|---|
| **CO1** | Prove the binomial theorem and apply it to find the expansions of any $(x + y)^n$ and also solve the related problems |
| **CO2** | Find the various sequences and series and solve the problems related to them. Explain the principle of counting. |
| **CO3** | Find the number of permutations and combinations in different cases. Apply the principle of counting to solve the problems on permutations and combinations |
| **CO4** | Explain various trigonometric ratios and find them for different angles, including sum of the angles, multiple and submultiple angles, etc. Also, they can solve the problems using the transformations |
| **CO5** | Find the limit and derivative of a function at a point, the definite and indefinite integral of a function. |

| Text Books (Latest Editions) | |
|---|---|
| 1. | NCERT class XI and XII text books. |
| 2. | Any State Board Mathematics text books of class XI and XII |
| **Web Resources** | |
| 01. htttps://www.aicte-india.org/sites/default/files/final%20maths.pdf | |
| 02. https://egyankosh.ac.in/bitstream/123456789/13834/1/Unit-1.pdf | |

**Mapping with Programme Outcomes:**

| | POs | | | | | | PSOs | |
|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 |
| CLO1 | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 |
| CLO2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| CLO3 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1 |
| CLO4 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 1 |
| CLO5 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 |
| | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 |

**S-Strong      M-Medium    L-Low**

| Title of the Course | ANALYTICAL GEOMETRY (Two & Three Dimensions) | | | | | |
|---|---|---|---|---|---|---|
| **PART** | **III** | | | | | |
| **Category** | CC 3 | **Year** | I | **Credits** | 4 | **Course** | 231003201 |

| Instructional Hours per week | Semester | | II | | | Code | | |
|---|---|---|---|---|---|---|---|---|
| | Lecture | Tutorial | Lab Practice | Total | CIA | External | | Total |
| | 5 | - | -- | 5 | 25 | 75 | | 100 |

### Learning Objectives

Necessary skills to analyze characteristics and properties of two- and three-dimensional geometric shapes.

To present mathematical arguments about geometric relationships.

To solve real world problems on geometry and its applications.

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| I | Pole, Polar - conjugate points and conjugate lines – diameters – conjugate diameters of an ellipse - semi diameters- conjugate diameters of hyperbola. **Chapter 7 Sections 7.1 to 7.3Chapter 8 Sections 8.1 to 8.5** | 12 |
| II | Polar coordinates: General polar equation of straight line – Polar equation of a circle given a diameter, Equation of a straight line, circle, conic – Equation of chord, tangent, normal. Equations of the asymptotes of a hyperbola. **Chapter 10 Sections 10.1 to 10.8** | 12 |
| III | System of Planes-Length of the perpendicular–Orthogonal projection. **Chapter 2 Sections 2.1 to 2.10** | 12 |
| IV | Representation of line–angle between a line and a plane – co – planar lines–shortest distance between two skew lines –length of the perpendicular–intersection of three planes. **Chapter 3 Sections 3.1 to 3.8** | 12 |
| V | Equation of a sphere-general equation-section of a sphere by a plane-equation of the circle- tangent plane- angle of intersection of two spheres- condition for the orthogonality- radical plane. **Chapter 6 Sections 6.1 to 6.8** | 12 |

| Course Outcomes | Students will be able to |
|---|---|
| CO1 | Find pole, polar for conics, diameters, conjugate diameters for ellipse and hyperbola |
| CO2 | Find the polar equations of straight line and circle, equations of chord, tangent and normal and to find the asymptotes of hyperbola |
| CO3 | Explain in detail the system of Planes |
| CO4 | Explain in detail the system of Straight lines |
| CO5 | Explain in detail the system of Spheres |

| Text Books (Latest Editions) | |
|---|---|
| 1. | Analytical Geometry of 2D by P.Duraipandian, Muhil publishers for Unit 1, 2 |
| 2. | Analytical Solid Geometry of 3D by S. Narayanan and T.K. Manickavachagom Pillai, S.V. Publications, 2006 for Units 3, 4, 5. |
| **Reference Books** | |
| 1. | S. L. Loney, Co-ordinate Geometry |

| | |
|---|---|
| 2. | Robert J. T. Bell, Co-ordinate Geometry of Three Dimensions. |
| 3. | Calculus and Analytical Geometry, G.B. Thomas and R. L. Finny,  Pearson Publication, 9th Edition, 2010. |
| 4. | William H. McCrea, Analytical Geometry of Three Dimensions, Dover Publications, Inc, New York, 2006. |
| 5. | John F. Randelph, Calculus and Analytic Geometry, Wadsworth Publishing Company, CA, USA, 1969. |
| 6. | Ralph Palmer Agnew, Analytic Geometry and Calculus with Vectors, McGraw-Hill Book Company, Inc. New York, 1962. |

<div align="center">

**Web Resources**

</div>

01. https://nptel.ac.in
02. https://www.mathwarehouse.com/
03. https://www.mathhelp.com/
04. https://www.mathsisfun.com/

**Mapping with Programme Outcomes:**

| | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 2 | 2 | 2 | 1 | - | - | 3 | 2 | 1 |
| CLO2 | 2 | 2 | 2 | 1 | - | - | 3 | 2 | 1 |
| CLO3 | 3 | 2 | 2 | 1 | - | - | 3 | 2 | 1 |
| CLO4 | 3 | 2 | 3 | 1 | - | - | 3 | 2 | 1 |
| CLO5 | 3 | 2 | 3 | 1 | - | - | 3 | 2 | 1 |

<div align="center">

**S-Strong        M-Medium    L-Low**

</div>

| Title of the Course | | INTEGRAL CALCULUS | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **PART** | | **III** | | | | | | |
| **Category** | CC 4 | **Year** | I | **Credits** | 4 | **Course Code** | | 233103202 |
| | | **Semester** | II | | | | | |
| **Instructional Hours per week** | | **Lecture** | **Tutorial** | **Lab Practice** | **Total** | **CIA** | **External** | **Total** |
| | | 5 | - | -- | 5 | 25 | 75 | 100 |

<table>
<tr><th colspan="9">Learning Objectives</th></tr>
</table>

- ✍ Knowledge on integration and its geometrical applications, double, triple integrals and improper integrals.
- ✍ Knowledge about Beta and Gamma functions and their applications.
- ✍ Skills to Determine Fourier series expansions.

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| I | Reduction formulae -Types, integration of product of powers of algebraic and trigonometric functions, integration of product of powers of algebraic and logarithmic functions - Bernoulli's formula, **Chapter 1 Sections 13, 14, 15.1** | 15 |
| II | Multiple Integrals - definition of double integrals - evaluation of double integrals – double integrals in polar coordinates **Chapter 5 Sections 1, 2, 3** | 15 |
| III | Triple integrals –applications of multiple integrals - volumes of solids of revolution - areas of curved surfaces **Chapter 5 Sections 4, 5, 6, 7** | 15 |
| IV | Beta and Gamma functions – infinite integral - definitions–recurrence formula of Gamma functions – properties of Beta and Gamma functions- relation between Beta and Gamma functions - Applications. **Chapter 7 Sections 1, 2, 3, 4, 5, 6** | 15 |
| V | Geometrical applications of integration – area under plane curves (Cartesian and polar co-ordinates) - Physical Applications of Integration – centre of mass of an arc and a plane area. **Chapter 2 Sections 1.1, 1.4** **Chapter 3 Sections 1.2, 1.3** | 15 |

| Course Outcomes | Students will be able to |
|---|---|
| CO1 | Determine the integrals of algebraic, trigonometric and logarithmic functions and to find the reduction formulae |
| CO2 | Evaluate double and triple integrals and problems using change of order of integration |
| CO3 | Solve multiple integrals and to find the areas of curved surfaces and volumes of solids of revolution |
| CO4 | Explain beta and gamma functions and to use them in solving problems of integration |
| CO5 | Explain Geometric and Physical applications of integral calculus |

| Text Books (Latest Editions) | |
|---|---|
| 1. | Calculus, Volume II, by S.Narayanan and T.K ManicavachagomPillay. – S. Viswanathan, Publishers, 2007. |

| Reference Books | |
|---|---|
| 1. | H. Anton, I. Birens and S. Davis, Calculus, John Wiley and Sons, Inc., 2002 |
| 2. | G.B. Thomas and R.L. Finney, Calculus, Pearson Education, 2007. |
| 3. | D. Chatterjee, Integral Calculus and Differential Equations, Tata-McGraw Hill Publishing Company Ltd. |
| 4. | P. Dyke, An Introduction to Laplace Transforms and Fourier Series, Springer Undergraduate Mathematics Series, 2001 (second edition). |

| Web Resources |
|---|
| 01. https://www.mathwarehouse.com/ |
| 02. https://www.mathhelp.com/ |
| 03. https://www.mathsisfun.com/ |
| 04. 04. https://nptel.ac.in |

**Mapping with Programme Outcomes:**

| | POs | | | | | | PSOs | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 1 | 2 | 3 |
| CLO1 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO2 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO3 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO4 | 3 | 1 | 3 | - | - | - | 3 | 2 | 1 |
| CLO5 | 3 | 1 | 3 | - | 2 | 1 | 3 | 2 | 1 |

**S-Strong     M-Medium    L-Low**

| Title of the Course | | PROGRAMMINGIN PYTHON | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Part | | III | | | | | | |
| Category | EC – II Theory | Year | I | Credits | 2 | Course Code | | 233103203 |
| | | Semester | II | | | | | |
| Instructional Hours per week | | Lecture | Tutorial | Lab Practice | Total | CIA | External | Total |
| | | 2 | - | -- | 2 | 25 | 75 | 100 |

**Learning Objectives**

- To Understand fundamental programming concepts of Python programming
- To study basic programming concepts and packages for data analysis,.
- To study about structure and LOOP
- To gain inputs in Data structure, plotting & visualisation

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| I | **Introduction to Python** - Features of Python - Identifiers - Reserved Keywords - Variables Comments in Python – Input , Output and Import Functions – Operators <br> **Data Types and Operations** – int, float, complex, Strings, List, Tuple, Set, Dictionary - Mutable and Immutable Objects  – Data Type Conversion t | 6 |
| II | **Flow Control -** conditional (if), alternative (if-else), if-else if.-else, nested if - Loops for, while, break, continue, pass; <br> **Functions:** Functions, Modules and Exception Handling Functions Definition, Function Calling, Function Argument (Required, Keyword, Default), Recursion | 6 |
| III | **Built-in Modules** - Creating Modules - Import statement - Locating modules - Namespaces and Scope -  Packages in Python <br> **File Handling** : Opening, Closing, Writing, Reading and deleting <br> **Exceptions Handling**: Built-in Exceptions  Exception  handling, Exception with arguments, Raising an Exception - User defined Exceptions - Assertions in Python | 6 |
| IV | **Object Oriented Programming**: Class Definition, Object Creation, Built-in Attribute Methods, Encapsulation, Data Hiding, Inheritance, Multi-Level Inheritance, Polymorphism (Method Overriding, Operator Overloading) | 6 |
| V | **GUI Programming** :Introduction – Tkinter Widgets – Label – Message Widget – Entry Widget – Text Widget – tk Message Box – Button Widget – Radio Button- Check Button – List box Frames _ Top-level Widgets – Menu Widget | 6 |

| Course Outcomes | |
|---|---|
| Course Outcomes | On completion of this course, students will be able; |
| CO1 | Demonstrate the understanding of basic programming terminologies and packages of python language. |
| CO2 | Will gain knowledge on concepts and packages for data analysis, modelling,and visualization in python language. |
| CO3 | In depth understanding about structure and LOOP |
| CO4 | In depth Understanding about OOP |
| CO5 | gain inputs in GUI programming |

| Text Books (Latest Editions) | |
|---|---|
| 1 | Taming Python By Programming, Dr. Jeeva Jose, Khanna Publishing, 2019. <br> **Unit I**: Chapter 1 & 2 ; **Unit II:** Chapter 3 – 3.1 to 3.4 and Chapter 4 <br> **Unit III:** Chapter 5 – 5.1 -5.5. & 5.8; Chapter 6 – 6.1 to 6.7 and Chapter 8. <br> **Unit IV:** Chapter 7 ; **Unit V**: Chapter 12- 12.1, 12.2 – 12.2.1 to 12.2.12 |

| | References Books |
|---|---|
| | **(Latest editions, and the style as given below must be strictly adhered to)** |
| 1 | Introduction to Problem solving using Python -E.Balagurusamy – TMH – FirstEdition - 2015 |
| 2 | Ch Satyanarayana, M Radhika Mani, BN Jagadesh - Python Programming-Cengage, New Delhi. |
| | **Web Resources** |
| | http://do1.dr-chuck.com/pythonlearn/EN_us/pythonlearn.pdf - free Python Book |
| | https://books.trinket.io/pfe/index.html - Interactive HTML for Python |
| | https://www.geeksforgeeks.org/formatted-string-literals-f-strings-python/ |
| | https://docs.python.org/3/tutorial/index.html |
| | https://pandas.pydata.org/docs/getting_started/index.html#getting-started |
| | https://numpy.org/doc/stable/user/absolute_beginners.html |
| | https://matplotlib.org/stable/tutorials/introductory/pyplot.html#sphx-glr-tutorials-introductory- pyplot-py |

**Mapping with Programme Outcomes:**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 3 | 1 | 1 | 1 | - | - | - | - |
| **CO2** | 2 | 2 | 3 | 1 | 2 | 1 | - | - | - | - |
| **CO3** | 3 | 1 | 3 | 2 | 1 | 1 | - | - | - | - |
| **CO4** | 3 | 1 | 3 | 2 | 1 | 1 | - | - | - | - |
| **CO5** | 3 | 1 | 3 | 2 | 1 | 1 | - | - | - | - |

**3 – Strong, 2 – Medium , 1 - Low**

**Mapping with Programme Specific Outcomes:**

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | - | - |
| **CO2** | 3 | 2 | 1 | - | - |
| **CO3** | 3 | 2 | 1 | - | - |
| **CO4** | 3 | 2 | 1 | - | - |
| **CO5** | 3 | 2 | 1 | - | - |
| **Weightage** | | | | | |
| **Weighted percentage of Course Contribution to Pos** | | | | | |

| Title of the Course | | **Programming in Python Lab** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Part** | | **III** | | | | | | |
| **Category** | EC – I Practical | **Year** | I | **Credits** | 1 | **Course Code** | 233103204 | |
| | | **Semester** | I | | | | | |
| **Instructional Hours per week** | | **Lecture** | **Tutorial** | **Lab Practice** | **Total** | **CIA** | **External** | **Total** |
| | | | - | 2 | 2 | 25 | 75 | 100 |

| Learning Objectives |
|---|
| • To Understand fundamental programming concepts of Python programming |
| • To study basic programming concepts and packages for data analysis,. |
| • To study about structure and LOOP |
| • To gain inputs in Data structure, plotting & visualisation |

1. Write a Python program to find the value of Triple Integral
2. Write a python program to find the solution of simultaneous linear equations.
3. Write a Python program to find the nth derivatives.
4. Python program to find nth derivative with and without Leibnitz rule.
5. Write a python program to solve partial differential equations.
6. Write a program to input and multiply two matrices
7. Write a program to compute Eigen value and Eigen vector of a given 3X3 matrixusing Numpy
8. Write a python program to determine the intersection point of two lines.
9. Create a program that performs the Fourier transform of a given function. Youcan use the FFT algorithm to implement this.
10. Create a program that visualizes mathematical functions and data using the Matplotlib library. The program should be able to create line plots, scatter plots,bar charts, and other types of visualizations

| Course Outcomes | |
|---|---|
| **Course Outcomes** | On completion of this course, students will be able; |
| **CO1** | Demonstrate the understanding of basic programming terminologies and packages of python language. |
| **CO2** | Will gain knowledge on concepts and packages for data analysis, modelling,and visualization in python language. |
| **CO3** | In depth understanding about structure and LOOP |
| **CO4** | In depth Understanding about OOP |
| **CO5** | gain inputs in GUI programming |

| Text Books (Latest Editions) |
|---|
| Taming Python By Programming, Dr. Jeeva Jose, Khanna Publishing, 2019. **Unit I**: Chapter 1 & 2 ; **Unit II:** Chapter 3 – 3.1 to 3.4 and Chapter 4 **Unit III:** Chapter 5 – 5.1 -5.5. & 5.8; Chapter 6 – 6.1 to 6.7 and Chapter 8. **Unit IV:** Chapter 7 ; **Unit V**: Chapter 12- 12.1, 12.2 – 12.2.1 to 12.2.12 |
| **References Books** **(Latest editions, and the style as given below must be strictly adhered to)** |
| Introduction to Problem solving using Python -E.Balagurusamy – TMH – FirstEdition - 2015 |
| Ch Satyanarayana, M Radhika Mani, BN Jagadesh - Python Programming-Cengage, New Delhi. |

| Title of the Course | | **DATA STRUCTURES** | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Part** | | **III** | | | | | | |
| **Category** | EC – II theory | **Year** | I | **Credits** | 2 | **Course Code** | 233103205 | |
| | | **Semester** | II | | | | | |

| Instructional Hours per week | Lecture | Tutorial | Lab Practice | Total | CIA | External | Total |
|---|---|---|---|---|---|---|---|
| | 2 | - | -- | 2 | 25 | 75 | 100 |

| **Learning Objectives** | | | | | | | |
|---|---|---|---|---|---|---|---|
| | ✍ Define data structures and explain the different data structure operations. | | | | | | |
| | ✍ Analyze the complexity of algorithms and apply asymptotic notations to measurealgorithm complexity. | | | | | | |
| | ✍ Understand and implement linear arrays, multidimensional arrays, and pointers. | | | | | | |
| | ✍ Understand and implement linked lists, including insertion, deletion, and traversing. | | | | | | |
| | ✍ Understand and implement stacks and queues, including their array and linked representations | | | | | | |

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| I | I**ntroduction**: Definition of data structure, data structure operations. Algorithms : Complexity, Time Space tradeoff, Complexity of Algorithms, Asymptotic Notations for Complexity of Algorithms, Subalgorithms, Variables, data types<br><br>**Arrays and Pointers**: Introduction, Linear arrays, Representation of linear arrays in memory, Address calculation of using row and column major ordering, Traversing linear arrays, Inserting and Deleting, Multidimensional arrays: Representation of Two-Dimensional arrays in memory, Pointers: Pointers arrays, Matrices, Sparse Matrices. | 6 |
| II | **Linked Lists**: Representation of Linear Lists in memory, Traversing aLinked List, Searching a linked List, Memory allocation: Garbage collection, overflow and underflow, Insertion into a linked list, Deletion from linked list, Circular linked lists, Doubly linked lists, Header linked lists. | 6 |
| III | **Stacks** : Definition, Array representation of stacks, Linked representation of stacks, Polish notation, Evaluation of a Postfix Expression, Transforming Infix Expressions into Postfix Expressions.<br><br>**Queues** : Definition, Array representation of Queues, Linked representation of Queues, Circular queues, Priority Queue and D-Queue | 6 |
| IV | **Trees:**. Introduction and Definition of Trees, Tree Terminology, Binary Tree, Representing Binary Tress in Memory, Traversing Binary Tree: Preorder, In-order, Post-ordered traversal, Traversal algorithms using stacks, Headed nodes: Threads (definition only), Binary Search trees, Searching and Inserting in Binary Search trees, Deleting in a Binary search tree. AVL trees, m-trees and B-Trees (definition only). | 6 |
| V | **Sorting and Searching**:. Sorting, Bubble Sort, Insertion sort, Quick Sort, Selection sort, Merging, Merge-sort. Searching : Sequential and binary searches, Indexed search, Hashing Schemes | 6 |

| Course Outcomes | |
|---|---|
| **Course Outcomes** | On completion of this course, students will be able; |
| **CO1** | Analyze the complexity of algorithms and choose the appropriate algorithm for agiven problem. |
| **CO2** | Implement linked lists, including insertion, deletion, and traversing.. |
| **CO3** | Implement stacks and queues, including their array and linked representations, anduse them to solve problems. |
| **CO4** | Implement trees, including binary trees, binary search trees, AVL trees, and B-trees |
| **CO5** | Implement sorting algorithms, including bubble sort, insertion sort, quicksort,selection sort, and merge sort |

| Text Books (Latest Editions) | |
|---|---|
| 1 | **Data Structures , Seymour Lipschutz, Schaum's Outlines, TMH, 2006**<br>**Unit I:** Chapter 1, 2, 4<br>**Unit II:** Chapter 5<br>**Unit III:** Chapter 6<br>**Unit IV:** Chapter 7 – 7.1 to 7.15<br>**Unit V:** Chapter 9 |
| **References Books** <br> **(Latest editions, and the style as given below must be strictly adhered to)** | |
| 1 | Data structures Using C Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein, Kindersley (India) Pvt. Ltd., |
| 2 | Data structure and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Pearson Education Pvt. Ltd., |
| | |
| **Web Resources** | |
| | https://www.programiz.com/dsa - Learn DS & Algorithm |
| | https://www.javatpoint.com/data-structure-tutorial - Data Structures Tutorial |
| | https://opendatastructures.org/ - Free Books |

**Mapping with Programme Outcomes:**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | 1 | 2 | 1 | - | - | - | - |
| **CO2** | 3 | 2 | 3 | 2 | 3 | 2 | - | - | - | - |
| **CO3** | 3 | 1 | 2 | 3 | 1 | 2 | - | - | - | - |
| **CO4** | 2 | 3 | 1 | 2 | 3 | 2 | - | - | - | - |
| **CO5** | 1 | 2 | 3 | 3 | 2 | 1 | - | - | - | - |

**3 – Strong, 2 – Medium , 1 - Low**

**Mapping with Programme Specific Outcomes:**

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | - | - |
| **CO2** | 3 | 2 | 1 | - | - |
| **CO3** | 3 | 2 | 1 | - | - |
| **CO4** | 3 | 2 | 1 | - | - |
| **CO5** | 3 | 2 | 1 | - | - |
| **Weightage** | | | | | |
| **Weighted percentage of Course Contribution to Pos** | | | | | |

| Title of the Course | | Data Structures Lab | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Part | | III | | | | | | |
| Category | EC – I Practical | Year | I | Credits | 1 | Course Code | 233103206 | |
| | | Semester | I | | | | | |
| Instructional Hours per week | | Lecture | Tutorial | Lab Practice | Total | CIA | External | Total |
| | | | - | 2 | 2 | 25 | 75 | 100 |

## Learning Objectives

- ✍ Define data structures and explain the different data structure operations.
- ✍ Analyze the complexity of algorithms and apply asymptotic notations to measurealgorithm complexity.
- ✍ Understand and implement linear arrays, multidimensional arrays, and pointers.
- ✍ Understand and implement linked lists, including insertion, deletion, and traversing.
- ✍ Understand and implement stacks and queues, including their array and linked representations

## Details

1. Write a C program to create two array list of integers. Sort and store theelements of bothof them in third list.
2. Write a C program to multiply two matrices A and B and store theresultant matrix in Cusing arrays.
3. Write a C program to experiment the operation of STACK using array.

4. Write a C program to create menu driven options to implement QUEUEto perform thefollowing
    (i) Insertion (ii) Deletion (iii) Modification (iv) Listing of elements

5. Write a C program to create Linked list representations of employeerecords and do thefollowing operations using pointers.
    (i)  To add a new record.

    (ii) To delete an existing record.

    (iii) To print the details about an employee.

    (iv) To find the number of employees in the structure.

6. Write a C Program to count the total nodes of the linked list and toinsert an element atthe end of the linked list.
7. Write a C program to insert an element at the beginning of a doubly linked list.

8. Write a C program to display the hash table, using the mid square method.

9. Write a C program to traverse the given binary tree using all traversal methods.

10. Write a C program to insert an element in a binary tree.

| Course Outcomes | |
|---|---|
| Course | On completion of this course, students will be able; |

| Outcomes | |
|---|---|
| **CO1** | Analyze the complexity of algorithms and choose the appropriate algorithm for agiven problem. |
| **CO2** | Implement linked lists, including insertion, deletion, and traversing.. |
| **CO3** | Implement stacks and queues, including their array and linked representations, anduse them to solve problems. |
| **CO4** | Implement trees, including binary trees, binary search trees, AVL trees, and B-trees |
| **CO5** | Implement sorting algorithms, including bubble sort, insertion sort, quicksort,selection sort, and merge sort |

| Text Books (Latest Editions) | |
|---|---|
| 1 | **Data Structures , Seymour Lipschutz, Schaum's Outlines, TMH, 2006** <br> **Unit I:** Chapter 1, 2, 4 <br> **Unit II:** Chapter 5 <br> **Unit III:** Chapter 6 <br> **Unit IV:** Chapter 7 – 7.1 to 7.15 <br> **Unit V:** Chapter 9 |
| **References Books** <br> **(Latest editions, and the style as given below must be strictly adhered to)** | |
| 1 | Data structures Using C Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein, Kindersley (India) Pvt. Ltd., |
| 2 | Data structure and Algorithms, Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman, Pearson Education Pvt. Ltd., |
| | |
| **Web Resources** | |
| | https://www.programiz.com/dsa - Learn DS & Algorithm |
| | https://www.javatpoint.com/data-structure-tutorial - Data Structures Tutorial |
| | https://opendatastructures.org/ - Free Books |

**Mapping with Programme Outcomes:**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 2 | 2 | 1 | 2 | 1 | - | - | - | - |
| **CO2** | 3 | 2 | 3 | 2 | 3 | 2 | - | - | - | - |
| **CO3** | 3 | 1 | 2 | 3 | 1 | 2 | - | - | - | - |
| **CO4** | 2 | 3 | 1 | 2 | 3 | 2 | - | - | - | - |
| **CO5** | 1 | 2 | 3 | 3 | 2 | 1 | - | - | - | - |

**3 – Strong, 2 – Medium , 1 - Low**

**Mapping with Programme Specific Outcomes:**

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 1 | - | - |
| **CO2** | 3 | 2 | 1 | - | - |
| **CO3** | 3 | 2 | 1 | - | - |
| **CO4** | 3 | 2 | 1 | - | - |
| **CO5** | 3 | 2 | 1 | - | - |
| **Weightage** | | | | | |
| **Weighted percentage of Course Contribution to Pos** | | | | | |

| Title of the Course | | Basic Data Analysis Using Excel | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Part | | IV | | | | | | |
| Category | SEC – II NME | Year | I | Credits | 2 | Course Code | | 234603231 |
| | | Semester | II | | | | | |
| Instructional Hours per week | | Lecture | Tutorial | Lab Practice | Total | CIA | External | Total |
| | | 2 | - | -- | 2 | 25 | 75 | 100 |
| Learning Objectives | | | | | | | | |
| | | ✍ Understand the basic features of Microsoft Excel | | | | | | |
| | | ✍ Understand basic data analysis using Excel | | | | | | |
| | | ✍ Learn basic Excel functions and formulas | | | | | | |

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| I | **Introduction to Excel For Data Analysis** : Introduction of Data Analysis – Data Analysis process - Understanding Worksheet Basics – Editing Data – Insert, delete – Formatting cells | 6 |
| II | **Data Handling Wizards**: Data tools – Data grouping & cleansing –. Sort, Filter, Remove Duplicates, conditional formatting, Consolidate,- Data Validation - Quick analysis | 6 |
| III | **Data Analysis Function**: Formula & functions - Sum, Average, if, Count, max, min, Proper, Upper, Lower, AutoSum,  Concatenate, Vlookup, Hlookup, Match, Countif, Text, Trim, Len, Days, Networkdays, sumifs, Averageifs, Countsifs, Counta, iferror, Find/search, left/right, Rank. | 6 |
| IV | **Charts:** Chart types and uses - Different types of chart, - Waterfall chart , Histogram and Pareto chart | 6 |
| V | **Pivot Tables**: Creating Pivot Tables, Manipulating a Pivot Table, Using the Pivot Table Toolbar, Changing Data Field, Properties, Displaying a Pivot Chart, Setting Pivot Table Options,  Adding Subtotals to Pivot Tables | 6 |

| Course Outcomes | |
|---|---|
| Course Outcomes | On completion of this course, students will be able; |
| CO1 | Ability to analyze data using Excel |
| CO2 | Ability to create basic Excel formulas and functions |
| CO3 | Understand the basic concepts of using formulas in Excel |
| CO4 | Ability to apply data handling functions |
| CO5 | Ability to create a data chart in excel |

| Text Books (Latest Editions) | |
|---|---|
| 1 | Data Analysis with Excel - Manish Nigam – BPB publications, 2019Unit I: Chapter 1 – 1.8 – 1.8.1, 1.8.2 ,1.8.3 & 1.8.5.8 **and** https://www.analyticsvidhya.com/blog/2021/11/a-comprehensive-guide-on-microsoft-excel-for-data-analysis/ <br><br> Unit II: Chapter 1 – 1.8.4 [ 1.8.4.1, 1.8.4.2] **and** https://www.analyticsvidhya.com/blog/2021/11/a-comprehensive-guide-on-microsoft-excel-for-data-analysis/ <br><br> Unit III: Chapter 3 – 3.1, 3.5, 3.9 – 3.13 |

| | |
|---|---|
| | Unit IV: Chapter 4 – 4.1, 4.2, 4.3, 4.4<br>Unit V: Chapter 7 – 7.1, 7.2, 7.3 – 7.7 |
| | |
| | **References Books**<br>**(Latest editions, and the style as given below must be strictly adhered to)** |
| 1 | Excel 2022 Bible by John Walkenbach |
| 2 | Excel 2022 All-In-One For Dummies by Greg Harvey |
| | **Web Resources** |
| | Microsoft Excel Training Center:<br>https://support.microsoft.com/en-us/excel/<br>Exceljet: https://exceljet.net/ |
| | Excel Easy: https://www.excel-easy.com<br>http://home.ubalt.edu/ntsbarsh/excel/excel.htm - Excel for Data Analysis |
| | |

**Mapping with Programme Outcomes:**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 1 | 3 | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | 3 | - | - | - | - | - | - | - |
| **CO3** | 3 | 2 | 3 | 2 | - | - | - | - | - | - |
| **CO4** | 3 | 2 | 3 | 2 | 1 | - | - | - | - | - |
| **CO5** | 3 | 2 | 3 | 2 | 1 | - | - | - | - | - |

**3 – Strong, 2 – Medium , 1 - Low**

**Mapping with Programme Specific Outcomes:**

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | - | - |
| CO2 | 3 | 2 | 1 | - | - |
| CO3 | 3 | 2 | 1 | - | - |
| CO4 | 3 | 2 | 1 | - | - |
| CO5 | 3 | 2 | 1 | - | - |
| Weightage | | | | | |
| Weighted percentage of Course Contribution to Pos | | | | | |

| Title of the Course | Computational Mathematics | | | | | | |
|---|---|---|---|---|---|---|---|
| Part | IV | | | | | | |
| Category | SEC III | Year | I | Credits | 2 | Course Code | 234403231 |
| | | Semester | II | | | | |
| Instructional Hours per week | | Lecture | Tutorial | Lab Practice | Total | CIA | External | Total |
| | | 2 | - | -- | 2 | 25 | 75 | 100 |

**Learning Objectives**

To introduce students to computational mathematics and its applications in solvingmathematical problems.

To familiarize students with the basics of Scilab programming language and its use innumerical computations.

To teach students how to implement numerical algorithms for solving mathematicalproblems using Scilab.

To enable students to use computational methods to solve mathematical problems and interpret the results obtained

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| I | **Introduction to Scilab** – Scilab Environment: Manipulating the command line - Variables in Memory - Startup Commands - The Scilab Menu Bar –Toolboxes<br>**Vectors** : Initialising vectors in Scilab - Mathematical operationson vectors - Relational operations on vectors - Logical operations on vectors<br>**Functions:** Built-in logical functions -Elementary Mathematical Functions - Mathematical functions on scalars | 5 |
| II | **Matrices** : Introduction - Arithmetic operators for Matrices - Basic matrix processing<br>**Programming in Scilab** : Introduction - Variables & Variable names - Assignment statements - Arithmetic, Relational & Logical operators - Input & Output - Flow control/branching /conditional statements - Break and continue - Handling Matrices With Loops | 5 |
| III | Scripts - The Concept of Functions - User Defined Functions - Special Function command<br>**Graphic output** : Introduction - 2d Plotting - - Function versionsfor graphic commands - 3d plotting | 4 |
| IV | **Numerical Methods using SCILAB [ Concepts, Problem &Scilab code]**<br>**Solution of Algebraic and Transcendental Equation**: Bisection method -Newton-Raphson method –Regula Falsi method - Secantmethod<br>**Interpolation:** Finite Difference Operators – Newton's Gregory Forward Interpolation Method, - Newton's Gregory backward Interpolation Method - Lagrange interpolation method | 8 |
| V | **Numerical Differentiation**: Equal interval - Unequal Interval<br>**Numerical Integration:** Newton Cotes formula - Trapezoidal rule - Simpson's 1/3 rule – Simpson's 3/8 rule - Monte Carlo method | 8 |

| Course Outcomes | |
|---|---|
| Course Outcomes | On completion of this course, students will be able; |
| CO1 | Develop an understanding of numerical methods for solving mathematical problems. |
| CO2 | Acquire knowledge of programming concepts and the basics of Scilab language. |
| CO3 | Apply numerical algorithms to solve mathematical problems using Scilab. |
| CO4 | Implement and test numerical algorithms using Scilab. |
| CO5 | Analyze and interpret the results of numerical differentiation and integerations |

| Text Books (Latest Editions) | |
|---|---|
| 1 | SCILAB (A Free Software to MATLAB) -Author :Achuthsankar S Nair & Hema Ramchandran -: S. Chand Publishing - : 2012 <br> **Unit I**: Chapter 2 – 2.1, 2.2, 2.5, 2.8, 2.9 : Chapter 3 – 3.2 to 3.8 <br><br> **Unit II**: Chapter 4 – 4.1,4.2,4.3 ; Chapter 5 – 5.1 to 5.8 <br> **Unit III**: Chapter 5 – 5.9 to 5.12 : Chapter 8 – 8.1 – 8.4 |
| 2 | NUMERICAL METHODS KIT : FOR MATLAB, SCILAB AND OCTAVE USERS <br><br> by RohanVerma <br><br> **Unit IV**: Chapter 1 & 2 <br> **Unit V**: Chapter 4 & 5 |

| References Books <br> (Latest editions, and the style as given below must be strictly adhered to) | |
|---|---|
| 1 | Introduction to Scilab: For Engineers and Scientists.-Sandeep Nagar |
| 2 | Computing in Scilab -Chetana Jain – Cambridge University |
| 3 | COMPUTER-BASED NUMERICAL & STATISTICAL TECHNIQUES - M. GOYAL - INFINITY SCIENCE PRESS LLC |

| Web Resources | |
|---|---|
| 1 | https://www.scilab.org/tutorials |
| 2 | https://egyankosh.ac.in/bitstream/123456789/88092/1/Unit-15.pdf |
| 3 | https://www.edx.org/course/scilab-programming-for-beginners |
| 4 | https://www.scilab.org/sites/default/files/Scilab_beginners.pdf |

**Mapping with Programme Outcomes:**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 2 | 3 | 1 | 1 | 1 | - | - | - | - |
| CO2 | 1 | 1 | 1 | 2 | 2 | 1 | - | - | - | - |
| CO3 | 2 | 1 | 1 | 2 | 2 | 1 | - | - | - | - |
| CO4 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | - | - |
| CO5 | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - | - |

**3 – Strong, 2 – Medium , 1 - Low**

**Mapping with Programme Specific Outcomes:**

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO1 | 1 | 2 | 1 | - | - |
| CO2 | 1 | 1 | 1 | - | - |
| CO3 | 2 | 1 | 1 | - | - |
| CO4 | 2 | 1 | 1 | - | - |
| CO5 | 2 | 1 | 1 | - | - |
| Weightage | | | | | |
| Weighted percentage of Course Contribution to Pos | | | | | |

| Title of the Course | | Cloud Computing | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Part | | IV | | | | | | |
| Category | SEC –III | Year | I | Credits | 2 | Course Code | | 238203231 |
| | | Semester | II | | | | | |
| Instructional Hours per week | | Lecture | Tutorial | Lab Practice | Total | CIA | External | Total |
| | | 2 | - | -- | 2 | 25 | 75 | 100 |

### Learning Objectives

- To provide students with a comprehensive understanding of Cloud Computing, includingits basics, history, characteristics, and advantages and disadvantages.
- To enable students to identify the different types of Cloud Computing and understandtheir infrastructure and application architecture.
- To introduce students to the working of Cloud Computing, including the different serviceand deployment models and the pros and cons of using Cloud Computing services.
- To provide students with an understanding of the Cloud Computing technology

| UNIT | Details | No. of Periods for the Unit |
|---|---|---|
| I | **Introduction to Cloud Computing** : Cloud computing basics – History of Cloud Computing – Importance of Cloud Computing – Characteristics of Cloud Computing - Pros and cons of Cloud Computing | 6 |
| II | **Move to Cloud Computing**:: Nature of the Cloud – Technologies in Cloud Computing – Migrating into the cloud – Seven step model **Types of Cloud** : Public and Private cloud – Cloud infrastructure - Cloud application Architecture | 6 |
| III | **Working of Cloud Computing** : Trends in Computing - Cloud Service model – Cloud Deployment models – Pros and Cons of Cloud Computing – Cloud computing services pros and cons | 6 |
| IV | **Cloud Computing Technology**: Cloud Life Cycle Model – Role of Cloud Modeling and Architecture – Reference model for cloud computing – Cloud industry standard <br><br> **Cloud Architecture**: Cloud Computing Logical Architecture | 6 |
| V | Developing holistic cloud computing reference model – cloud system architecture <br><br> **Cloud modeling and Design:** Cloud Computing basic principles - Model for federated cloud computing – Cloud ecosystem model – Cloud Governance | 6 |

| Course Outcomes | |
|---|---|
| **Course Outcomes** | On completion of this course, students will be able; |
| CO1 | able to understand the basics of Cloud Computing and the history of its development. |
| CO2 | able to identify the characteristics of Cloud Computing and analyze the advantages and disadvantages of Cloud Computing. |
| CO3 | able to identify the different types of Cloud Computing, including Public and Private Clouds |
| CO4 | able to understand the working of Cloud Computing |
| CO5 | able to analyze the Cloud Computing technology |

| Text Books (Latest Editions) | |
|---|---|
| 1. | A.Srinivasan and J.Suresh, "Cloud Computing –A Practical Approach for Learning and Implementation", Pearson India Publications, 2014.<br>**Unit I:** Chapter 1, Chapter 2 – 2.1<br><br>**Unit II**: Chapter 2 – 2.2 to 2.5, Chapter 3<br><br>**Unit III**: Chapter 4<br><br>**Unit IV** :Chapter 5, Chapter 6 – 6.1<br><br>**Unit V** :Chapter 6 – 6.2 to 6.4, Chapter 7 |
| | |

| References Books<br>(Latest editions, and the style as given below must be strictly adhered to) | |
|---|---|
| 1 | Rajkumar Buyya, James Broberg, Andrzej, "Cloud Computing: Principles and Paradigms", Wiley India Publications , 2011. |
| 2 | Arshdeep Bahga and Vijay Madisetti, "Cloud Computing –A Hands on Approach", Universities Press (India) Pvt Ltd, 2014. |
| | |

| Web Resources | |
|---|---|
| 1 | https://www.simplilearn.com/tutorials/cloud-computing-tutorial      - CloudComputing Tutorials |
| 2 | https://www.javatpoint.com/cloud-computing |
| | |

**Mapping with Programme Outcomes:**

| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 2 | 1 | 1 | 1 | 1 | - | - | - | - |
| CO2 | 1 | 1 | 2 | 2 | 1 | 2 | - | - | - | - |
| CO3 | 2 | 1 | 1 | 2 | 1 | 2 | - | - | - | - |
| CO4 | 2 | 1 | 2 | 1 | 1 | 1 | - | - | - | - |
| CO5 | 1 | 1 | 1 | 1 | 1 | 1 | - | - | - | - |

**3 – Strong, 2 – Medium , 1 - Low**

**Mapping with Programme Specific Outcomes:**

| CO /PO | PSO1 | PSO2 | PSO3 | PSO4 | PSO5 |
|---|---|---|---|---|---|
| CO1 | 1 | 2 | 1 | - | - |
| CO2 | 1 | 1 | 1 | - | - |
| CO3 | 2 | 1 | 1 | - | - |
| CO4 | 2 | 1 | 1 | - | - |
| CO5 | 2 | 1 | 1 | - | - |
| Weightage | | | | | |
| Weighted percentage of Course Contribution to Pos | | | | | |