

**Rayat Shikshan Sanstha's**  
**Sadguru Gadage Maharaj College, Karad**  
**(An Autonomous College)**  
**B.Sc. Computer Science (Entire) Part-II**  
**Semester-III & IV**  
**STRUCTURE OF COURSE**

**TITLE:** B.Sc. Computer Science (Entire) Part-II

**YEAR OF IMPLEMENTATION:** 2020-21

**PREAMBLE:**

There are bright career prospects for computer science professionals or software professionals in recent scenario. With the opening of huge software and IT companies in India, the job opportunities for trained professionals have increased considerably. India is known to be a leader in software and IT sector.

Computer science graduates pass outs find job opportunities in a variety of environments in academia, research, industry, government, private, business organizations and so on.

They are involved in analyzing problems for solutions, formulating and testing, using advanced communications or multi-media equipment, or working in teams for product development.

The software and IT companies are the major employers of computer science graduates. They offer the best packages to the young graduates which are unmatched with other branches of science.

**GENERAL OBJECTIVES OF THE COURSE:**

- The content of the syllabus have been framed as per UGC norms of CBCS Pattern.
- The students are expected to understand the fundamentals, principles, mathematical, recent IT concepts and recent developments in the subject area.
- The practical course is in relevance to the theory courses to improve the understanding of the concepts.
- It is expected to inspire and boost interest of the students towards Computer Science as the main subject.
- To develop the power of appreciations, the achievements in Computer and role in nature and society.
- To enhance student sense of enthusiasm towards IT and to involve them in an intellectually stimulating experience of learning in a supportive environment.

**Eligibility:**

Candidate should have passed standard XII (10+2) in science stream (Mathematics compulsory) with minimum 50% marks or government approved equivalent diploma in Engineering/ Technology from any recognized Board.

**PEO, PO and CO Mappings:****Program Educational Outcomes:**

After completion of this program, the graduate's students would:

PEO I	Technical Expertise	Learn and implement fundamental knowledge of basic courses for developing effective computer program development and its logic in different languages.
PEO II	Successful Career	Learn basic as well as advanced skills in computer science and its applications within different domain.
PEO III	Interdisciplinary and Life Long Learning	Learn and develop confidence, soft skills, leadership, team work ability with society ethics.

**Program Outcomes (PO's):**

After completion of program Students / graduates will be able to:

- PO1:** Practice and grow as computing professionals, conducting research and / or leading, designing ,developing or maintaining projects in various technical areas of computer science.
- PO2:** Utilize knowledge and skill in computer science effectively for improving the society
- PO3:** Use new technical advancements of computer science to produce tangible contributions in the profession
- PO4:** Substantial knowledge of abroad class of problem solving technique.
- PO5:** Ability to readily work with other disciplines
- PO6:** Appropriate, occasional innovation of our curriculum so it incorporates ever changing computer science technology.
- PO7:** Recognize the need for interdisciplinary, an ability to engage in life-long learning subjects like Mathematics, Electronics and its logical applications related to computer science (Entire)

**COURSE OUTCOMES (CO'S):**

The following student course outcomes describe the skills imparted by our computer science program:

**CO1:** Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

**CO2:** Communicate effectively in variety of professional contexts.

**CO3:** Recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.

**CO4:** Function effectively as members or leader of a team engaged in activities appropriate to the programs discipline.

**CO5:** Design, implement and evaluate a computing –based solution to meet a given set of computing requirements in the context of the programs discipline.

**CO6:** Apply computer science theory and software development fundamentals to produce computing based solutions.

**DURATION:** 3 YEAR

**PATERN:** CBCS SEMESTER

**MEDIUM OF INSTRUCTION:** ENGLISH

**THIRD SEMESTER (NUMBER OF THEORY & PRACTICAL PAPERS)**

Paper Code	Paper Name	TEACHING SCHEME						
		Theory			Practical			
		No. of lectures	Hours	Credits	Subject	No. of lectures	Hours	Credits
BCSE-301	Relational Database Management System	3	2.4	2	BCSE-308 LAB9- COMPUTER	8	6.4	4
BCSE-302	Object Oriented Programming Using C++	3	2.4	2				
BCSE-303	Computer Organization for Electronics	3	2.4	2	BCSE-309 LAB10- ELECTRONICS	8	6.4	4
BCSE-304	Computer Instrumentation	3	2.4	2				
BCSE-305	Linear Algebra	3	2.4	2	BCSE-310 LAB11- MATHEMATICS	8	6.4	4
BCSE-306	Computational Methods	3	2.4	2				
BCSE-307	Environment Science	3	2.4	2				
<b>Total of</b>	<b>SEM-III</b>	<b>21</b>	<b>16.8</b>	<b>14</b>		<b>24</b>	<b>19.2</b>	<b>12</b>

**FOURTH SEMESTER (NO OF THEORY & PRACTICAL PAPERS)**

Paper Code	Paper Name	TEACHING SCHEME						
		Theory			Practical			
		No. of lectures	Hours	Credits	Subject	No. of lectures	Hours	Credits
BCSE-401	Data Structure	3	2.4	2	BCSE-408 LAB12- COMPUTER	8	6.4	4
BCSE-402	Cyber Security Essentials	3	2.4	2				
BCSE-403	Single board computer	3	2.4	2	BCSE-409 LAB13- ELECTRONICS	8	6.4	4
BCSE-404	Computer Applications	3	2.4	2				
BCSE-405	Computational Geometry	3	2.4	2	BCSE-410 LAB14- MATHEMATICS	8	6.4	4
BCSE-406	Operation Research	3	2.4	2				
BCSE-407	Environment Science	3	2.4	2				
<b>Total of SEM-IV</b>		<b>21</b>	<b>16.8</b>	<b>14</b>		<b>24</b>	<b>19.2</b>	<b>12</b>

# Examination Scheme

## Semester – III

Paper Code	Paper Name	SEE	Internal Exam		Subject	Practical-I		Submission	
			CCE-I	CCE-II (Online Test)		Exam	Journal	Case study/ Educational Tour/ Seminar	Day to day Performance
BCSE-301	Relational Database Management System	30	5	5	BCSE-308: LAB9- COMPUTER	50	10	5	5
BCSE-302	Object Oriented Programming Using C++	30	5	5					
BCSE-303	Computer Organization for Electronics	30	5	5	BCSE-309: LAB10- ELECTRONICS	50	10	5	5
BCSE-304	Computer Instrumentation	30	5	5					
BCSE-305	Linear Algebra	30	5	5	BCSE-310: LAB11- MATHEMATICS	50	10	5	5
BCSE-306	Computational Methods	30	5	5					
BCSE-307	Environment Science	40	5	5					
<b>Total of SEM-III</b>	<b>TOTAL</b>	220	35	35		150	30	15	15
	<b>GRAND TOTAL</b>	<b>500</b>							

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**Structure and Titles of Papers of Course**

**Semester-III**

<b>Sr. No.</b>	<b>Paper Code</b>	<b>Paper No.</b>	<b>Paper Name</b>
1	BCSE-301	Computer Science Paper -V	Relational Database Management System
2	BCSE-302	Computer Science Paper -VI	Object Oriented Programming Using C++
3	BCSE-303	Electronics Paper-V	Computer Organization for Electronics
4	BCSE-304	Electronics Paper-VI	Computer Instrumentation
5	BCSE-305	Mathematics Paper-V	Linear Algebra
6	BCSE-306	Mathematics Paper-VI	Computational Methods
7	BCSE-307	-	Environment Science
8	BCSE-308	-	LAB9-COMPUTER
9	BCSE-309	-	LAB10-ELECTRONICS
10	BCSE-310	-	LAB11-MATHEMATICS

**Semester-IV**

<b>Sr. No.</b>	<b>Paper Code</b>	<b>Paper No.</b>	<b>Paper Name</b>
1	BCSE-401	Computer Science Paper -VII	Data Structure
2	BCSE-402	Computer Science Paper -VIII	Cyber Security Essentials
3	BCSE-403	Electronics Paper-VII	Single board computer
4	BCSE-404	Electronics Paper-VIII	Computer Applications
5	BCSE-405	Mathematics Paper-VII	Computational Geometry
6	BCSE-406	Mathematics Paper-VIII	Operation Research
7	BCSE-407	-	Environment Science
8	BCSE-408	-	LAB12-COMPUTER
9	BCSE-409	-	LAB13-ELECTRONICS
10	BCSE-410	-	LAB14-MATHEMATICS

## B.Sc. Computer Science (Entire) Part-II, Semester-III and IV

TEACHING SCHEME																
Sr. No.	Theory									Practical's						
	Subject Code		CCE		SEE		No. of lectures	Hours	Credits	SEM-III	SEM	max	min	No. of lectures	Hours	Credits
	SEM-III	SEM-IV	max	min	max	min										
	1	BCSE-301	BCSE-401	10	4	30	12	3	2.4	2	BCSE-308	BCSE-408	70	28	8	6.4
2	BCSE-302	BCSE-402	10	4	30	12	3	2.4	2							
3	BCSE-303	BCSE-403	10	4	30	12	3	2.4	2	BCSE-309	BCSE-409	70	28	8	6.4	4
4	BCSE-304	BCSE-404	10	4	30	12	3	2.4	2							
5	BCSE-305	BCSE-405	10	4	30	12	3	2.4	2	BCSE-310	BCSE-410	70	28	8	6.4	4
6	BCSE-306	BCSE-406	10	4	30	12	3	2.4	2							
7	BCSE-307	BCSE-407	10	4	30	12	3	2.4	2	--	--	--	--	--	--	--
<b>Total</b>							<b>21</b>	<b>16.8</b>	<b>14</b>					<b>24</b>	<b>19.2</b>	<b>12</b>
<b>Sem-III &amp; IV Total</b>			<b>1000</b>													
<b>Total Credits</b>			<b>52</b>													



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**B.Sc. Computer Science (Entire) Part-II: Semester- III**

**BCSE-301: Computer Science Paper -V: Relational Database Management System**

**Learning Objectives:**

1. To study the concepts and terminologies of RDBMS
2. To understand SQL concepts.
3. To Understand PL/SQL
4. To Study MySQL Concepts

**Unit 1: Introduction to RDBMS (10)**

Data , Database, DBMS, RDBMS, Concepts of Data Models object based, Record based (Network, Hirarchical, Relational),Physical , Concept of RDBMS Terminologies: relation, attribute, domain,tuple, entities, DBA and Responsibilities of DBA , Relational Model: Structure of Relational Database, Relational Algebra.

**Unit 2: Structured Query Language (SQL) (11)**

SQL: Data types-fixed length, variable length, ex., Data Constraints-Primary key, Foreign key, Null, Check, DefaultClauses-(select, where, group by, order by). , SQL Operators: Logical, Relational, Special-In, Between,Like Sub Queries and Join-Sub queries and Nesting sub queries, Join:Equi join, Simple join, Outerjoin, self-join, Views, Indexes, Sequence

**Unit 3: Introduction to MySQL (14)**

Basic Concepts , Creating a Database and Tables, Inserting, Selecting, Ordering, Limiting, Grouping, Analyzing and Manipulating Data, Changing, Deleting, Searching, Database and Table Schema Statements, Data Manipulation Statements and Functions, Table Statements and Functions, Replication Statements and Functions. Aggregate Clauses, Aggregate Functions, String Functions, Date and Time Functions, Mathematical Functions.

**Unit 4: Introduction to PL-SQL (10)**

Comparison between SQL & PL-SQL, Structure of PL-SQL block. , Benefits of PL/SQL over SQL, Control structure: if statement, case statement, Loops-Simple looping, For, While., Need of Iterative and looping statements in data handling

**Learning Outcomes:**

1. Improving skill about data operation.
2. Ability to handle database.
3. Ability to design& develop proper database.
4. SQL/MY-SQL helps to get knowledge about data operations.

**Reference book-**

1. Data base system concept-KorthSilberschartz. (Unit-I, II, III,)
2. SQL-PL/SQL by Ivan Bayross BPB Publications. (Unit-I, II, III)
3. Structure query language-By Osborne(Unit-I,II,III)
4. Learning MySQL by O'reilly(Unit-IV)

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**B.Sc. Computer Science (Entire) Part-II: Semester- III**

**BCSE-302: Computer Science Paper –VI: Object Oriented Programming using C++**

**Learning Objectives:**

1. To study the concept Object Oriented Programming
2. To understand the operators and control structure in C++
3. To study the constructors and destructors
4. To understand the concept of Inheritance, Polymorphism and it's types

**Unit 1: Object Oriented Concepts (12)**

Difference between POP and OOP, Concepts of OOP- Data abstraction, Encapsulation, Inheritance- Polymorphism, Basics of C++: Terminology-Tokens, Keywords, Identifiers, constants, Basic data types, Structure of C++ program, Input and output streams.

**Unit2: Introduction to C++, Classes and Objects (12)**

Operators in C++: Dynamic Memory allocation (New and Delete), this pointer, Dynamic initialization of variable, reference variables. Control structures-Branching and looping statements, Features of OOP:

Classes and objects: Definitions, class declaration, Member function-Access modifiers : private, public and protected, Defining member functions, static data members, Array of objects, passing object as parameter, inline function, reference arguments, Friend function and friend class.

**Unit3: Constructors, Destructors and Operator overloading(10)**

Constructors: Definition, types- Default constructor, Copy constructor, Parameterized constructor. Destructors, Operator overloading-Definition, Overloading unary and binary operators, Overloading operators using friend function, Rules for overloading operator.

**Unit 4: Inheritance and Polymorphism (11)**

Inheritance-Defining base and derived class, Types of Inheritance –Single, multiple, multilevel, hierarchical, hybrid, Polymorphism-Definition, Types of polymorphism, Virtual function.

**Learning outcomes:**

The student should -

1. Understand basic concepts of object oriented programming.
2. Able to use various control structures to improve programming logic.
3. Design classes and objects.
4. Able to use constructor and destructor.
5. Utilize the OOP techniques like operator overloading, inheritance, and polymorphism.

**Reference Books:**

1. Object oriented programming By E. Balagurusamy. (Unit-I, II,III,IV)
2. C++ Programming –By D. Ravichandran (Unit-I, II,III,IV)
3. Let Us C++ By Yashawant Kanetkar. (Unit-I, II, III,IV)
4. Object Oriented Programming in C++ - Dr. G. T. Thampi, Dr. S. S. Mantha
5. Mastering C++ -By Venugopal.

**BCSE-308:LAB9-COMPUTER :( RDBMS and CPP)**  
**Based on BCSE-301 and BCSE- 302**

**Part A: (BCSE-301)**

1. Create student master and student detailed table with appropriate field to apply following Constraint on field.
  - a. Primary Key
  - b. Foreign Key
  - c. Not null key
  - d. default key
  - e. Check constraint etc.
2. Create student table with appropriate field and do.
  - a. Insert 10 appropriate records
  - b. Update any record
  - c. Delete record
  - d. Alter table
  - e. drop table
3. Use any tables and do select operations using Operators.
4. Use any tables and do select operations using different clauses,
  - a. where
  - b. group by
  - c. order by etc
5. Use any tables and do select operations using different aggregate functions.
6. Use any tables and do sub queries and join operator.
7. Use any tables and do select operations using different string functions.
8. To show the table Index, View on existing table.

**Part B:(BCSE-302)**

1. Programs based on branching and looping statements.
2. Programs based on constructor and destructor.
3. Programs based on inheritance concept
4. Programs based on function overloading concept
5. Programs based on operator overloading concept
6. Programs based on member functions.
7. Programs based on use of constructor and destructor
8. Programs based on friend function.
9. Programs based on inheritance.
10. Programs based on polymorphism

**B.Sc. Computer Science (Entire) Part-II: Semester- III**

**BCSE-303: Electronics Paper-V: Computer Organization for Electronics**

**Learning Objectives:**

1. To Study the Computer Systems
2. To Understand Computer Architecture and Organization
3. To study the Memory organization
4. To study the I/O Organization

**Unit 1: Computer Systems (12)**

Hardware and Software components, Generation and timeline of Computers, Chronology of Microprocessor Development w.r.t CISC/ RISC families' viz. Intel, Power PC, Overview of Operating Systems, Computer booting process, Instruction set architectures, Operating system case study: DOS, UNIX.

**Unit 2 : CPU with reference to 8085 (12)**

Programmer's Model: CPU registers- Arithmetic and Logic Units, GPR's and SFR's, Stack, Addressing Modes, Instruction formats and categories- Program flow control, data movement, data Processing, miscellaneous Instructions.

**Unit 3 : Memory Organization (reference 8085, 80286) (11)**

Memory Width, Interfacing memory with microprocessor, data (Scratchpad RAM, Storage EEPROM) and Code memory, Address generation, Memory Management, MMU responsibilities and features.

**Unit 4: I/O Organization (reference 8085) (10)**

Computer Peripherals and Interfacing (Peripheral Control Signals), Peripheral Mapping- Memory Mapped, I/O Mapped. Modes of Transfer- byte block. Ports- Parallel and Series.

**Reference Books:**

1. Computer Organization – J.P.Hays TMH(Unit-I&Unit-III)
2. Computer System Architecture - Morris Mano, Prentice-Hall of India(Unit-IV)
3. Microprocessor and Microcontroller- Krishna Kant(Unit-I&Unit-II&Unit-III)
4. The Pentium Microprocessor- James Antonakos(Unit-I)

**Learning Outcomes:**

1. Student will be able to understand computer system/operating system.
2. Student will be able to understand memory organization
3. Student will be able to use of computer peripherals.
4. Design and analyze the programmer's model

**B.Sc. Computer Science (Entire) Part-II: Semester- III**

**BCSE-304: Electronics Paper-VI: Computer Instrumentation**

**Learning Objectives:**

1. To Study the Operational Amplifier and its Applications
2. To study the Concept of Signal Conditioning
3. To Understand Data Convertors and methods of conversion
4. To understand concept of Transducers and Sensors

**Unit 1: Operational Amplifier (12)**

Ideal OP-AMP, OP-AMP as an amplifier, OP-AMP as Instrumentation Amplifier, OP-AMP as Comparator: Virtual ground concept, OP-AMP Applications- Inverting amplifier, Unity gain Inverting amplifier, non-inverting amplifier, Buffer, Adder, Subtractor, Integrator, Differentiator, Phase Shift Oscillator using OP-AMP.

**Unit 2: Signal Conditioning (13)**

Introduction to signal conditioning; Signal conditioning of passive sensors using bridge circuit: Wheatstone's bridge, Level Shifter, Amplifier, Three OP-amp instrumentation amplifiers, filters; Active and passive filters, Concept of Order of filters. Working principle of Single order Op-Amp Based Low Pass Filter, High Pass Filter, Band Pass Filter, Notch Filter, Band reject filter; Working of Voltage to frequency Converter using Op-Amp.

**Unit 3: Data Convertors (10)**

DAC- R-2R ladder, ADC- Dual Slope, Successive Approximation, Flash, ADC Characteristics- Linearity, Accuracy, Resolution, Monotonicity. Study of IC 0808, 0804, DAC 0809

**Unit 4: Transducers and Sensors (10)**

Transducers, Sensors, Classification of transducers, Characteristics of Transducers, Temperature Transducers, Pressure Transducers, Force Transducers, Optical Transducers, Selection criterion for Transducers.

**Learning Outcomes:**

1. Student will be able to understand Operation amplifier.
2. Student will be able to understand Signal conditioning and DAS system.
3. To study the characteristics of Data converters IC.
4. To study the operation/working of Transducer and sensor.
5. To learn data conversion network.
6. To apply knowledge of Analog system in different application

**Reference Books:**

1. Electronic Instrumentation- Kalsi TMH.(Unit-I)
2. Transducer and Instrumentation – Murthy.(Unit-II&Unit-IV)
3. Instrumentation Devices and system – Rangan,Sarma,Mani(Unit-III)

**BCSE-309:LAB10-ELECTRONICS:**  
**(Computer Organization for Electronics & Computer Instrumentation)**  
**Based on BCSE-303 and BCSE-304**

**Part A: (BCSE-303)**

1. Study the architecture of 80186/286/386 and Pentium Series
2. Arithmetical operation using 8085 microprocessor.
3. Shifting of data 8 bit numbers using 8085 microprocessor.
4. To find smallest and largest number from the given series in 8085 microprocessor.
5. Write assembly language code in 8085 microprocessor to find factorial of a given number.
6. Write assembly language code in 8085 microprocessor to implement stack and branch instruction.

**Part B:(BCSE-304)**

1. Study of OPAMP as Adder
2. Study of OPAMP as Subtractor
3. Study of Instrumentation amplifier using OPAMP
4. D/A Converter(R-2R ladder)
5. ADC(3- bit Flash)
6. Study of Temperature Sensor using LM35
7. OPAMP Parameters

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**B.Sc. Computer Science (Entire) Part-II: Semester- III**

**BCSE-305: Mathematics Paper-V: Linear Algebra**

**Learning Objectives:**

1. To study the concept of Linear equations and Matrices
2. To understand the Vector Spaces
3. To study the Concept of Diagonalization.
4. To study Linear Transformation.

**Unit 1 : Linear Equations and Matrices (12)**

Matrices, Matrix Transformations, Linear systems, Results on system of linear equations and invertible matrices(statements only), Solutions of Systems of Linear Equations, Gaussian Elimination method Gauss-Jordan method, LU- Factorization method, Homogeneous Systems, The Rank of a Matrix and Applications

**Unit 2: Real Vector spaces (13)**

Vector Spaces, Subspaces, Linear Independence, Basis and Dimension, Homogeneous Systems, Coordinates, Inner Product Spaces: Definition and examples, Properties of inner product, Orthonormal Basis in  $R$ , Gram-Schmidt process.

**Unit 3: Eigen values, Eigen vectors and diagonalization (10)**

Eigen values and Eigen vectors, Diagonalization, Cayley Hamilton theorem (Statement only) and examples.

**Unit 4 : Linear Transformations and Inner product space (10)**

Definitions and Examples, The Kernel and Range of a Linear transformation, The Matrix of a Linear Transformation, Inner product space, Definition and examples, Properties of inner product, Orthonormal Basis in  $\mathbb{R}$ , Gram-Schmidt process

**Learning Outcomes:**

1. Student will able to understand Linear equations and Matrices.
2. Students will able to understand vector space.
3. Student will able to understand Eigen values and diagonalization
4. Student will able to understand linear transformation.

**Reference Books:**

1. A textbook of Linear Algebra, Nirali Prakashan.
2. A textbook of Linear Algebra , Vision Publication.
3. Elementary Linear Algebra with Applications, Howard Anton, Chris Rorres, John Wiley and sons. 7th Edition (1994).
4. Linear Algebra , Schaum Series.
5. A textbook of Matrices, Shanti Narayan, P. K. Mittal, S. Chand.
6. Topics in Algebra- Hurstin.
7. Linear Algebra, R. Kunze and K. Hoffman.

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**B.Sc. Computer Science (Entire) Part-II: Semester- III**

**BCSE-306: Mathematics Paper-VI: Computational Methods****Learning Objectives:**

1. To study the concept of Linear equations and Matrices
2. To understand the Vector Spaces
3. To study the Concept of Diagonalization.
4. To study Linear Transformation.

**Unit 1: Errors and Approximations (8)**

Introduction , Mathematical background, Floating point arithmetic, Significant digit & examples, Accuracy & precision, Errors, Types of Errors-Round - off error, Truncation error, Algorithmic error, Absolute error  
Relative error, Inherent error, Examples

**Unit 2: Numerical Interpolation (13)**

Introduction, Definitions of  $\nabla$  ,  $\Delta$  &  $E$ , Revision of Newton - Gregory Forward & Backward Interpolation  
Newton's divided difference interpolation formula & examples, Central Difference method :-Stirling formula & examples

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**Unit 3: Numerical differentiation and Integration (14)**

Numerical differentiation using Forward interpolation formula and examples, Numerical differentiation using backward interpolation formula and examples, Numerical differentiation using Central difference ( Stirling ) method and examples, Numerical Integration, General quadrature formula ( without proof ) Trapezoidal rule, Simpson's rule, Simpson's rule(without proof), Romberg method & examples Weddle's rule & examples

**Unit 4: Numerical solution of first order ordinary differential equations (10)**

Euler's method, Modified Euler's method, Runge - Kutta Method (Second & fourth order ), Predictor corrector method.

**Learning Outcomes:**

1. To understand & recognize the various kind of numerical errors such as rounding error Truncation error & numerical instability.
2. To understand the mathematical foundation of numerical methods.
3. Understand numerical differentiation and integration.
4. Grasping the basic of numerical method with application to differential equation.

**Reference Books:**

1. A textbook of Numerical Methods, NiraliPrakashan. (Unit-I &II&III& IV)
2. Introductory Methods of Numerical Analysis, S.S. Sastry, 3rd edition, Prentice Hall of India, 1999. (Unit-I &II&III& IV)
3. Finite differences and Numerical Analysis, H.C. Saxena, S. Chand and Company. (Unit-I &II&III& IV)
4. Numerical Analysis, Balguruswamy. (Unit-I &II&III& IV)
5. Calculus of Finite Differences and Numerical Analysis, P. P. Gupta,

**BCSE-310:LAB11: MATHEMATICS:  
(Linear Algebra &Computational Methods)  
Based on BCSE-305 and BCSE-306**

**Part A: (BCSE-305)**

1. Gaussian Elimination Method.
2. Gauss Jordan Method.
3. LU Factorization method.
4. Gram Schmidt process 1
5. Eigen values and Eigen vectors of a matrix and the matrix P that diagonalizes the given matrix if exists.
6. Examples on verification of Cayley Hamilton theorem.
7. Programs on System of Linear equations.

**Part B:(BCSE-306)**

1. Newton's divided difference interpolation
2. Central difference method
3. Romberg method
4. Weddle's rule
5. Numerical differentiation using Forward & Backward interpolation
6. Numerical differentiation using Central difference ( Stirling ) method



7. Euler method & Euler modified method
8. Runge – Kutta method
9. Programs on First order ordinary differential equation.
10. Programs on Numerical Interpolation.

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**B.Sc. Computer Science (Entire) Part-II: Semester- IV**

**BCSE-401: Computer Science Paper -VII: Data structure**

**Learning Objectives:**

1. To study the concept of Data Structure
2. To understand the Searching and Sorting Methods
3. To study the Concept of Stack and Queue.
4. To study Linked list and trees

**Unit 1: Concepts of Data structure, Array (10)**

Concept of Data, Data Object, Types of Data- Atomic Data, Non-atomic Data, Concept of Data Structure, Basic operations of Data structure, Abstract data type (ADT), Array Definition, Array Operations, Applications of Array(Polynomial evaluation and addition of Two polynomials), Multi-dimensional arrays.

**Unit 2: Algorithm Analysis (10)**

Space complexity, time complexity, Asymptotic notation (Big O, Omega  $\Omega$ , Theta  $\Theta$ ), Searching Algorithms- Linear search, binary search and their algorithms, sorting algorithm-Bubble Sort, insertion sort, Selection sort, quick sort and their algorithms.

**Unit 3: Stack and Queue (13)**

Stack, Concept of Stack, Operations on Stack-push, pop, peek, is full, is empty, Array implementation of Stack, Applications of Stack- Recursion, Infix, Prefix, Postfix, Conversion from Infix to Prefix and Infix to Postfix., Queue, Concepts of queue, Operations on Queue-Insert, Delete, peek, Array implementation of queue, Types of Queue- Linear, Circular and Priority, Applications of Queue.

**Unit4: Linked List and Tree (12)**

Linked List, Concept of Linked List, Memory representation of Linked List, Linked List implementation of Stack, , Linked List Implementation of Queue, Operations on Linked List(Insertion, Deletion, Display and Search), Types of Linked List: Singly, Doubly Linked List & Circular Linked List , Applications, Tree, Concept of Tree, Tree terminology (root, child, parent, sibling, descendent, ancestor, leaf/external node, branch node/internal node, degree, edge, path, level, depth, height of node, height of tree, forest), Binary Tree- definition , types (Full/Proper / Plane, Complete, Perfect, Skewed, Balanced) , Binary search tree, Representation, Operations on BST – Create, Insert, Search, Delete, traversals(Preorder, Inorder, Postorder)

**Learning Outcome:**

1. At the end of this course, student should be able understand the most basic aspects of data

- Structures including Stacks, Queue, Linked list and Tree.
- 2.Should able to understand different sorting and searching algorithms.
- 3. Should able to understand implementations of linked list.
- 4.Should able to understand implementations of stack and queue

**Reference Books :**

- 1. Data structure through C++- YashwantKanitkar (BPB Publications)(Unit-I,II,III,IV)
- 2. Principles of Data structures using c++ - Vinu V. Das(New Age International Publication)
- 3. Data Structures with C- SEYMOUR LIPSCHUTZ( Tata McGraw-Hill)(Unit-I,II,III,IV)
- 4. Data structures, Algorithms and Applications in C++, S.Sahni, University Press (India) Pvt.Ltd, 2nd edition, Universities Press Orient Longman Pvt. Ltd. )(Unit-I,II,III,IV)

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**B.Sc. Computer Science (Entire) Part-II: Semester- III**

**BCSE-402: Computer Science Paper -VIII: Cyber Security Essentials**

**Learning Objectives:**

- 1. To study the concept of cyber Security
- 2. To understand the Security Management
- 3. To study the Concept Threats and Access Control.
- 4. To study of Risk Management

**Unit 1: Introduction to Cyber Security**

**(12)**

**Cyber Security:** Definition, Importance, Computer ethics, Cyber Security Policy, Data Security, Mobile Device Security, User Security, File Security, Password Security, Browser Security, Email Security, Phishing Encryption, Decryption, Digital Signature, Firewall, Configuring, Windows Firewall.

**Unit 2: Types of Security and Security Management**

**(12)**

**Types of Security:** Background and Current Scenario, Types of Attacks, DoS attack, Goals for Security, E-commerce Security, dimensions of E-commerce security, Security protocols, Computer Forensics, Steganography,

**Security Management-** Overview of Security Management, Information Classification Process, Security Policy, Risk Management, Security Procedures and Guidelines, Business Continuity and Disaster Recovery, Ethics and Best Practices.

**Unit 3: Security Threats and Access Controls**

**(11)**

**Security Threats:** Definition, Types of Threats - Virus, Worms, Trojan Horse, Malware, Ransom ware, Identity theft etc, Torrent and infected websites, Antivirus-Definition, Types, features, advantages, limitations.

**Access Controls:** Overview of Authentication and Authorization, Overview of Intrusion Detection Systems, Intrusion Detection Systems and Intrusion Prevention Systems.

## Unit 4: Wireless Network Security

(10)

**Wireless Network Security-** Components of wireless networks, Security issues in wireless, Wi-Fi Security, Risk of Using Unsecured Wi-Fi, Bluetooth and its security, Firewall, types of firewall.

### Learning Outcome:

Students who complete this course should be able to:

1. Understand importance of cyber security and security management.
2. Learn different security threats.
3. Understand cyber security laws and importance of security audit.
4. Learn concept of wireless network security.

### Reference Books:

1. Computer Network -AS Tannenbum
2. Cyber Security for Beginners: Everything you need to know about it (Cyber security, Cyber war, Hacking) - Harry Colvin.
3. How NOT To Use Your Smartphone - Rodney D Cambridge.
4. Online Safety: Scams, SPAM, Viruses and Clouds (Cyber Security Community Book -A.M. Perry.
5. Cyber Security Essentials- James Graham, Richard Howard, Ryon Olson (E-book)
6. Network Security Secrets and Solutions – Stuart McClure, Joe Scambray, George Kurtz.
7. Information Assurance Handbook: Effective Computer Security and Risk Management Strategies – Corey Schou, Steven Hernandez.
8. Applied Network Security Monitoring: Collection, Detection, and Analysis – Chris Sanders, Jason Smith.
9. E-Commerce- Indian Perspective- P.T. Joseph S.J.
10. E-Commerce and Security- KjellOrsborn (E-book)

### **BCSE-408:LAB12: COMPUTER: (Data Structure through C++ and Cyber Security Essentials) Based on BCSE-401 and BCSE-402**

#### Part A:(BCSE-401)

1. Write a C++ programs to implement recursive i) Linear search ii) Binary search
2. Write a C++ programs to implement i) Bubble sort ii) Selection sort iii) quick sort iv) insertion sort
3. Write a C++ programs to implement the following using an array.
  - a) Stack ADT b) Queue ADT
4. Write a C++ programs to implement list ADT to perform following operations:
  - a) Insert an element into a list.
  - b) Delete an element from list
  - c) Search for a key element in list
  - d) count number of nodes in list
5. Write C++ programs to implement the following using a singly linked list.
  - a) Stack ADT b) Queue ADT
6. Write a C++ program to perform the following operations:
  - a) Insert an element into a binary search tree.
  - b) Delete an element from a binary search tree.
  - c) Search for a key element in a binary search tree.
7. Write C++ programs for implementing the following sorting methods: insertion sort, bubble sort , Selection sort, quick sort

## **Part B:(BCSE-402)**

1. Case Study1
2. Case Study2
3. Case Study3
4. Case Study4
5. Case Study5

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### **B.Sc. Computer Science (Entire) Part-II: Semester- III**

#### **BCSE-403: Electronics Paper-VII: Single Board Computer**

##### **Learning Objectives:**

1. To study the basics of 8051 microcontroller.
2. To study the programming interfacing technique of 8051.
3. To Apply knowledge of 8051 to design different application circuits.
4. To introduce the basic concept of advance microcontroller.

#### **Unit 1: Introduction to Microcontroller (14)**

Comparison of Microcontroller & Microprocessor, Survey of 4-Bit, 8-Bit, 16-Bit And 32-Bit Microcontrollers and their application areas, Study of 8051 and it's Family (89C51, DS5000, 8031, 8032, 8052, 8751, Phillips RD2, 89C51VRD2).

Architecture of 8051: Block Diagram of 8051 and Study of Internal Blocks, Reset and Clock, Registers, Flags and Internal Memory, SFR, I/O Ports.

#### **Unit 2: 8051 Instructions Set (11)**

Study of 8051 Instruction Set and Addressing Modes, Data transfer, Arithmetic, Logical, JUMP, Loops & CALL instructions, Bit manipulation Instructions.

#### **Unit 3: Facilities in 8051 (12)**

Timer and Counter: Timer and Counters, Timer modes, Programming the timers in Mode 1 using assembly and C. Time delay generation.

Serial Port: Serial port of 8051, RS-232 standard and IC MAX-232, Baud rate in 8051, programming for transmitting character through serial port using assembly and C.

#### **Unit 4: Interfacing Methods (08)**

Interfacing Stepper Motor, LCD, DC motor (PWM), Respective programming through embedded C.

##### **Learning Outcomes:**

1. Student will able to Understand basics of 8051 microcontroller
2. Student will able to Understand interfacing techniques of 8051 microcontroller
3. Student will able to design different application circuits

##### **Reference Books:**

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1. 8051 microcontroller Second Edition- Mazadi Pearson.(Unit-I&II&III&IV)
2. Microcontroller- Ayala Cengage.(Unit-I&II&III&IV)
3. Microcontroller – Deshmukh TMH.(Unit-I&II&III&IV)

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**B.Sc. Computer Science (Entire) Part-II: Semester- III**

**BCSE-404: Electronics Paper-VIII: Computer Applications**

**Learning Objectives:**

1. To introduce basic concepts of computer peripheral devices
2. To study the Computer Applications in medical industries
3. To learn Computer Networks
4. To Understand Network Components

**Unit 1: Basic Study of Computer Peripheral (12)**

Printers- Dot matrix, Inject, LASER, Line Printer. Scanners- Hand belt, Flat belt. Web Camera, CCTV, IP Camera. Input Peripherals-KeyBoard, Mouse, Touch Screen, Joystick.

**Unit 2: Computer Applications in Medical Industries (10)**

Automobiles, Consumer Electronics, Education, Research Industries

**Unit 3: Fundamentals of Computer Networking (11)**

Need of Computer Network, Network types- LAN, MAN, WAN, Internet, Network Topology, and OSI References.

**Unit 4: Network Components (12)**

Internet, Bridge, Router, Sever, Switch, Fire wound. Communication medium- Cables, Twisted pair , Single Twisted pair, Co-axial Cable, Fiber Optic Cable. Wireless Communication medium- Wi-Fi, Bluetooth

**Learning Outcomes:**

1. Student will able to use computer peripherals
2. Students will able to understand Network components
3. Student will able to understand computer Networking
4. Student will able to understand Applications in Medical Industries.

**Reference Books:**

1. Computer Networking-Vishnu priyashingh.(Unit-III & IV)
2. Computer Networks-Tanenbaum,Andrew.S. (Unit-III & IV)
3. Computer Peripherals and Interfacing-JyotiSnehi.(Unit-I)
4. Data communication-Frouzan(Unit-III & IV)

**BCSE-409:LAB13: ELECTRONICS:  
(Single board computer & Computer Applications)  
Based on BCSE-403 and BCSE-404**

**Part A: (BCSE-403)**

1. Write specification of latest Desktop and Laptop.
2. Printer installation servicing and troubleshooting.
3. Install and configure Scanner, webcam devices with system and troubleshooting the problem.
4. Familiarization with Network component and devices LAN adapter, switches, Routers.
5. Understanding communication Medium.

**Part B:( BCSE-404)**

1. Interfacing of DAC with Microcontroller to generate triangular and square wave.
2. Arithmetic operation using 8051 C (Use 8051 Simulator).
3. Logical operation using 8051 C (Use 8051 Simulator).
4. Time Delay generation using timers 8051 (Use 8051 Simulator).
5. Study of 8051 programmer (Load program on ROM to make LED on/off from computer).
6. Interfacing of 7-segment display with 8051.
7. Study of Parallel Port of PC (port pin access using 'c').
8. Interfacing of LED/Relay/Opt coupler using 8051 C Microcontrollers.

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**B.Sc. Computer Science (Entire) Part-II: Semester- III**

**BCSE-405: Mathematics Paper-VII Computational Geometry**

**Learning Objectives:**

1. To study the concept of two dimensional transformation.
2. To understand the Three dimensional transformations
3. To study the Concept of Parametric curves.
4. To study Space curves.

**Unit 1: Two dimensional transformations**

**(13)**

Introduction, Representation of points, Transformations and matrices, Transformation of points, Transformation of straight lines, Midpoint transformation, Transformation of parallel lines, Transformation of intersecting lines, Transformation: rotations, reflections, scaling, shearing, Combined transformations, Transformation of a unit square, Solid body transformations, Transformation and homogeneous coordinates, Translation, Rotation about an arbitrary point, Reflection through an arbitrary line Projection – a geometric interpretation of homogeneous coordinates, Overall Scaling, Point at infinity.

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**Unit 2: Three dimensional transformations****(12)**

Introduction, Three dimensional – Scaling, shearing, rotation, reflection, translation, Multiple transformation, Rotation about – an axis parallel to coordinate axes, an arbitrary axis in space, Reflection through – coordinate planes, planes parallel to coordinate planes, arbitrary planes, Affine and perspective transformations, Orthographic projections, Axonometric projections, Oblique projections, Single point perspective transformations, Vanishing points.

**Unit 3: Plane Curves****(12)**

Introduction, Curve representation, Non – parametric curves, Parametric curves, Parametric representation of a circle and generation of circle, Parametric representation of an ellipse and generation of ellipse, Parametric representation of a parabola and generation of parabolic segment, Parametric representation of a hyperbola and generation of hyperbolic segment.

**Unit 4: Space curves****(8)**

Bezier Curves – Introduction, Definition, Properties (without proof), Curve fitting (upto  $n = 3$ ), equation of the curve in matrix form (upto  $n = 3$ )

**Learning Outcomes:**

1. To understand & recognize the Transformation like rotations, reflections, scaling, shearing, combined transformations.
2. To understand the Orthographic projections, axonometric projections, Oblique projections, Single point perspective transformations.
3. Understand Non – parametric curves and parametric curves.
4. Grasping the basic of Bezier Curves.

**Reference Books:**

1. A text book of Computational Geometry, Vision Publication.
2. Mathematical elements for computer graphics, F. David and J. Alan Adams (McGraw Hill International Edition)
3. Computer graphics, Schaum series.
4. Computer Graphics handbook, Geometry and Mathematics, M.E.Mortenson, Industrial Press Inc.

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**B.Sc. Computer Science (Entire) Part-II: Semester- III**

**BCSE-406: Mathematics Paper-VIII: Operation Research****Learning Objectives:**

1. Student able to apply optimization & learning algorithm to real world problem.
2. Operation research is mainly for industrial decision making.
3. Operation research provides a quantitative technique or a scientific approach to the executive for making better decision for operation.
4. Understand the meaning, purpose, tools of operation research.

**Unit 1: Introduction to operation Research****(5)**

Basics of operation research, Different definitions of operation research, Characteristics, scope, limitations of operation research

**Unit 2: Linear Programming Problem****(12)**

Basic definitions, Feasible solution, basic solution, optimal solution, Solution of L.P.P by Simplex method & examples, Solution of L.P.P by Big-M method & examples Solution of L.P.P by Two phase method & examples

**Unit 3: Transportation and Assignment Problems****(15)**

Introduction to Transportation Problem, Initial solution, North-West corner rule, Matrix-Minima method, Vogel approximation method, optimal solution by MODI method, Maximization in Transportation Problem, Unbalanced Transportation Problem, Introduction to Assignment problem, Hungarian Method & examples, Maximization in assignment problem, Assignment problem with restrictions, unbalanced assignment problem.

**Unit 4: Theory of games****(13)**

Two person zero sum game, pure and mixed strategies, statement of min – max theorem, Saddle point, Solution of 2x2 game by arithmetic and algebraic methods, Principle of dominance and solving some simple games, Sub game method, Graphical method for solving size games, Matrix Method.

**Learning Outcomes:**

1. Describe the history of Operation research.
2. Student be able to formulate L.P.P.
3. Formulation of a Transportation problem.
4. Understand the concept of game.

**Reference Books:**

1. A text book of Operations Research, M. D. Bhagat and others, Nirali Prakashan.
2. Operations Research, S. D. Sharma.
3. Principles of Operations Research, H. M. Wagner, Prentice Hall of India.
4. Operations Research, Gupta and Hira.
5. Operations Research, J K Sharma (second edition).

**BCSE-410:LAB14: MATHEMATICS:  
(Computational Geometry & Operation Research)  
Based on BCSE-405 and BCSE-406**

**Part A:(BCSE-405)**

1. Plane linear transformation Scaling shearing rotation about origin, Reflection through co-ordinate planes.
2. Plane Linear combine transformation
3. Plane Linear rotation about an arbitrary point and reflection about an arbitrary line
4. Space linear transformation Scaling shearing rotation about co-ordinate axes, Reflection through co-ordinate planes.
5. Space linear transformation - parallel to coordinate axis, Rotation through
6. planes which are parallel to co-ordinate planes, Reflection through arbitrary
7. Plan (Algorithm Only).
8. Projections: Orthographic Axonometric Oblique Single point perspective(Examples)
9. Generation of the points on: Circle, Ellipse, Parabola, Hyperbola,(All in Standard form) & algorithm.



10. Write only algorithms for generating points on:
  - a. Circle with arbitrary center.
  - b. Circle through given three points.
  - c. Ellipse with center ad (a,b) and major axis
11. Bezier Curve

**Part B: (BCSE-406)**

- 1) LPP
  - a. Simplex method
  - b. Big-M Method
  - c. Two Phase Simplex method
- 2) Transportation Problem
  - a. North-West corner method
  - b. Matrix minima method
  - c. Vogel Approximation Method
- 3) Assignment problem
  - a. On Maximization and Minimization.
  - b. On Unbalanced and Restricted.
- 4) Game theory
  - a. Two person zero sum game
  - b. Use of dominance principle
  - c. Use of sub-game method
  - d. Use of graphical method
- 5) Computer program on Simplex method.

## B.Sc. Computer Science (Entire) Part-II: Semester–III and IV

### Evaluation Pattern from June 2020

- Semester End Examination(SEE) - 30
  - Continuous Comprehensive Evaluation (CCE) - 10
- .....

#### Semester End Examination SEE (50 Marks)

##### Nature of Question Paper

Total Mark – 50

Duration – 2 Hours

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Q.1 Multiple Choice Questions- 10marks.

Q.2 Broad Question (Attempt Any Two Out of Three) - 20marks.

Q.3 Write short notes (Attempt Any Four out of Six) - 20marks.

#### Continuous Comprehensive Evaluation CCE (20 Marks)

- 1) Offline Test - 10 Marks
- 2) Online Test- 10 Marks

#### Criteria of Passing-(separate heads of passing)

- 1) 04 Marks out of 10 Marks for Internal Evaluation.
- 2) 20 Marks out of 50 Marks for Theory Examination.

