

SEMESTER 1

261SECUBC101: Fundamentals of Programming Using C++ (SEC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

261SECUBC101.01: Analyse the problem-solving process, focusing on problem analysis, design, programming languages, translators, and debugging.

261SECUBC101.02: Apply C++ fundamentals, structure, data types, operators, and basic input/output operations.

261SECUBC101.03: Apply decision-making, loops, and arrays in C++, including initialization, operations, and string manipulation.

261SECUBC101.04: Apply OOP concepts in C++ using classes, objects, access specifiers, constructors, destructors, and static members.

261SECUBC101.05: Implement C++ functions, recursion, pointers, dynamic memory, structures, and unions.

261CCRUBC101: Digital Fundamentals (CC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

261CCRUBC101.01: Perform conversions between popular positional number systems (Decimal, Binary, Octal, Hexadecimal) and apply binary arithmetic

261CCRUBC101.02: Analyse the working of logic gates and solve expressions using laws of Boolean algebra.

261CCRUBC101.03: Illustrate POS and SOP expressions, simplify Boolean expressions using KMAP and implement circuits using the Universal Gates.

261CCRUBC101.04: Illustrate the design and applications of combinational logic circuits.

261CCRUBC101.05: Analyse sequential logic circuits, including various types of flip-flops (RS, JK, T, D), their triggering mechanisms, and the concept and functioning of registers.

261SECUBC102: Software Lab in C++ (SEC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

261SECUBC102.01: Apply fundamental data types, variables, operators, and type conversions in C++ for computations.

261SECUBC102.02: Implement control structures, loops, and arrays for efficient data handling and decision-making in C++.

261SECUBC102.03: Develop C++ programs using functions, recursion, and object-oriented programming concepts to model real-world scenarios.

261CCRUBC102: Discrete Mathematics (CC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

261CCRUBC102.01: Apply rules of inferences for propositional logic to solve logical and mathematical problems

261CCRUBC102.02: Demonstrate comprehension of fundamental concepts related to sets, set operations, and functions

261CCRUBC102.03: Analyze the relations to classify them based on their properties.

261CCRUBC102.04: Analyze matrices, their operations, determinants, inverses, and ranks.

261CCRUBC102.05: Solve the system of linear equations.

261MDEUBC101: Cyber Laws and Security (MDE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

261MDEUBC101.01: Describe the foundational principles of cyber laws, the IT Act, data protection laws, and the value-based framework of the Indian Knowledge System (IKS).

261MDEUBC101.02: Analyse different types of cybercrimes and explore effective prevention strategies.

261MDEUBC101.03: Analyse security protocols for online transactions and financial operations.

261MDEUBC101.04: Illustrate basic cryptographic techniques and importance of cyber forensic.

SEMESTER 2

262CCRUBC101: Mathematics Foundation to Computer Science (CC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

262CCRUBC101.01: Determine eigenvalues and eigenvectors of a matrix

262CCRUBC101.02: Analyze different types of graphs and their properties

262CCRUBC101.03: Apply shortest path algorithms, including Dijkstra's, Floyd's, and Warshall's, to solve optimization problems in networks.

262CCRUBC101.04: Solve linear programming problems using graphical and simplex methods, including special cases and duality.

262CCRUBC101.05: Solve transportation problems using various methods.

262CCRUBC102: Data Structures (CC)**Course Outcomes(CO):**

Upon successful completion of this course, students should be able to:

262CCRUBC102.01: Illustrate the fundamental concepts of Data Structures, the Representation of single and two-dimensional arrays and the implementation of various operations on them

262CCRUBC102.02: Analyse the representation of stacks and queues using arrays, operations on them and application of these data structures in problem-solving.

262CCRUBC102.03: Demonstrate the ability to implement and manipulate various types of linked lists (singly, doubly, and circular)

262CCRUBC102.04: Demonstrate the basic concepts of Graphs and Trees and the operations on Binary search trees.

262CCRUBC102.05: Implement Data Structures using C++ programming language.

262CCRUBC103: Operating Systems (CC)**Course Outcomes(CO):**

Upon successful completion of this course, students should be able to:

262CCRUBC103.01: Describe the structure, types, and services of operating systems.

262CCRUBC103.02: Analyze the performance of various process Scheduling Algorithms.

262CCRUBC103.03: Appraise various techniques for process synchronization and deadlock handling.

262CCRUBC103.04: Analyze the methods employed for memory management in computer systems

262CCRUBC103.05: Analyse various disk scheduling and understand file system concepts.

262SECUBC101: Web Technologies (SEC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

262SECUBC101.01: Apply the concepts and architecture of the World Wide Web, to design and develop efficient web solutions.

262SECUBC101.02: Design and deploy dynamic, responsive web application

262VACUBC101: Indian Constitution: Legal and Ethical Perspectives for IT (VAC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

262VACUBC101.01: Explain the Indian Constitution's structure, key principles, and governance mechanisms at the union, state, and local levels.

262VACUBC101.02: Evaluate the influence of Information Technology on democratic governance, digital transparency, and public accountability, and critically examine emerging technologies through constitutional and ethical perspectives rooted in Nitishastra and Indian philosophical thought.

SEMESTER 3

263CCRUBC201: Quantitative Techniques (CC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

263CCRUBC201.01: Describe the fundamental concepts of statistics, including data types, collection methods, and representation techniques, to analyse and interpret data effectively for decision-making in various fields.

263CCRUBC201.02: Compute and interpret central tendency and dispersion measures to summarize datasets, assess variability, and make data-driven decisions

263CCRUBC201.03: Evaluate relationships between variables using correlation coefficients, construct regression models for prediction, and interpret the association between correlation and regression.

263CCRUBC201.04: Apply fundamental probability concepts to solve real-world problems involving uncertainty and decision-making

263CCRUBC202: Database Management Systems (CC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

263CCRUBC202.01: Explain DBMS concepts, data models and ER model.

263CCRUBC202.02: Demonstrate relational data model and apply relational algebra operations.

263CCRUBC202.03: Apply SQL DDL and DML commands to define and manage databases.

263CCRUBC202.04: Demonstrate Normalization Techniques, Transaction Management Principles and NoSQL database concepts

263CCRUBC202.05: Implement SQL queries and administer MongoDB databases.

263CCRUBC203: Software Engineering (CC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

263CCRUBC203.01: Illustrate the software development lifecycle and its application in contemporary software engineering practices.

263CCRUBC203.02: Analyse project management methodologies and strategic decision making for successful software project execution.

263CCRUBC203.03: Analyse software design, development, and testing processes to produce robust and efficient software solutions.

263CCRUBC204: Design and Analysis of Algorithms (CC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

263CCRUBC204.01: Analyse algorithms based on complexities and devise efficient algorithms using divide and conquer technique.

263CCRUBC204.02: Apply greedy and dynamic programming design techniques to solve optimization problems.

263CCRUBC204.03: Apply backtracking to solve combinatorial problems and demonstrate graph traversal techniques.

263SECUBC201: Python Programming (SEC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

263SECUBC201.01: Apply Python programming concepts

263SECUBC201.02: Apply Python Data structures and modules like math and NumPy to perform data manipulation and computation.

263SECUBC201.03: Apply Python functions and file handling techniques.

263SECUBC201.04: Apply exception handling techniques and create data visualizations.

263SECUBC201.05: Solve real-world problems by designing and implementing Python Programs.

263DSEUBC201A: Basics of Data Analytics Using Spreadsheet (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

263DSEUBC201A.01: Understand the basics of data analytics and its applications.

263DSEUBC201A.02: Develop proficiency in using spreadsheet software for data manipulation and analysis.

263DSEUBC201A.03: Build and use spreadsheet models for decision making & Communicate data insights effectively

263DSEUBC201B: Feature Engineering (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

263DSEUBC201B.01: Explain the types and importance of features in machine learning.

263DSEUBC201B.02: Apply pre-processing techniques for numerical and categorical features.

263DSEUBC201B.03: Analyze methods for feature selection and dimensionality reduction.

263DSEUBC201B.04: Apply feature engineering techniques using Python libraries and real-world datasets.

263DSEUBC201C: Interactive Web Application Development Using PHP and MySQL (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

263DSEUBC201C.01: Demonstrate an understanding of PHP syntax, control structures, and array operations to create basic server-side scripts.

263DSEUBC201C.02: Apply PHP form handling techniques and procedural MySQL connectivity to perform basic database operations.

263DSEUBC201C.03: Develop dynamic and interactive web applications integrating form data and database-driven content using PHP and MySQL.

263DSEUBC201D: Introduction to Cyber Security (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

263DSEUBC201D.01: Illustrate fundamental concepts of information and cybersecurity, including CIA triad and key terminologies.

263DSEUBC201D.02: Classify common types of cyber threats, attack techniques, and system/network vulnerabilities.

263DSEUBC201D.03: Explain the basic principles of cryptography and apply them to secure communications and data.

263DSEUBC201D.04: Analyze risk assessment methodologies and security controls.

263DSEUBC201D.05: Illustrate cybersecurity policies, legal frameworks, and ethical responsibilities.

263DSEUBC201D.06: Describe foundational security principles and identify common threats and controls in domains such as network security, cloud security, and ethical hacking.

SEMESTER 4

264CCRUBC201: Artificial Intelligence (CC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

264CCRUBC201.01: Describe the characteristics of rational agents and gain insights about problem-solving agents.

264CCRUBC201.02: Analyse Uninformed and informed search techniques.

264CCRUBC201.03: Apply knowledge representation using Propositional logic and Predicate calculus for inference/reasoning and handling uncertainty through probabilistic reasoning and fuzzy sets.

264CCRUBC201.04: Illustrate AI domains and their applications and examine the legal and ethical issues of AI.

264CCRUBC201.05: Apply search strategies, solve constraint-based problems, build rule-based systems, evaluate optimization methods, and use basic NLP techniques in intelligent systems.

264VACUBC201A: Entrepreneurship and Startup Ecosystem (VAC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

264VACUBC201A.01: Understand entrepreneurship concepts and family business traits; evaluate business opportunities through idea generation and feasibility analysis.

264VACUBC201A.02: Understand key elements of starting a venture and ecosystem support; identify government schemes and sources of technology and funding in India.

264VACUBC201B: IT and Environmental Sustainability (VAC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

264VACUBC201B.01: Describe the components of the environment, natural resources, and ecosystems, and explain sustainable practices for their conservation.

264VACUBC201B.02: Identify types of pollution and waste, explain sustainable development goals, and summarize key environmental laws and their impact on society and businesses.

264VACUBC201B.03: Explain key social issues, environmental laws, and the role of population dynamics in promoting sustainable development.

264SECUBC201: Object Oriented Programming using Java (SEC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

264SECUBC201.01: Develop simple Java programs using classes, objects, and control statements.

264SECUBC201.01: Apply arrays, strings, constructors, and polymorphism concepts in Java programming.

264SECUBC201.03: Apply inheritance, interfaces, and packages for code reusability in Java.

264SECUBC201.04: Implement exception handling and multithreading using Java constructs.

264SECUBC201.05: Develop Java programs using OOP, Swing GUI, and JDBC connectivity.

264SECUBC202: Probability Distributions and Statistical Inference (SEC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

264SECUBC202.01: Illustrate and formulate probability density functions and distribution functions for random variables.

264SECUBC202.02: Apply key theoretical distributions to model real-world data

264SECUBC202.03: Create awareness on case studies based on statistical tools.

264SECUBC202.04: Apply various statistical testing procedures in practical problems for forecasting and decision making.

264SECUBC203: Design Thinking and Innovation (SEC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

264SECUBC203.01: Propose real-time innovative product designs and choose appropriate frameworks, strategies, techniques during prototype development

264SECUBC203.02: Know wicked problems and how to frame them in a consensus manner that is agreeable to all stakeholders using appropriate frameworks, strategies, techniques during prototype development.

264SECUBC203.03: Analyze emotional experience and inspect emotional expressions to better understand users while designing innovative products.

264DSEUBC201A: Data Visualization (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

264DSEUBC201A.01: Analyze the fundamentals of data visualization and its importance.

264DSEUBC201A.02: Compare and contrast different types of visualizations and their appropriate uses.

264DSEUBC201A.03: Use Power BI to create and customize various types of visualizations

264DSEUBC201B: Introduction to Machine Learning (DSE)**Course Outcomes(CO):**

Upon successful completion of this course, students should be able to:

264DSEUBC201B.01: Explain the fundamental concepts, types, and applications of Machine Learning and differentiate between regression and classification tasks in supervised learning

264DSEUBC201B.02: Apply machine learning algorithms including regression, classification, and support vector machines, and evaluate model performance using standard metrics such as Accuracy, Precision, Recall, F1 Score, and AUC

264DSEUBC201B.03: Analyze unsupervised learning techniques including clustering algorithms, interpret clustering validation measures, and examine ethical concerns and real-world applications of Machine Learning.

264DSEUBC201B.04: Implement core machine learning algorithms and models using python, visualize outcomes, and assess performance through hands-on laboratory exercises.

264DSEUBC201C: Web Application Development Using Node.js and Express.js (DSE)**Course Outcomes(CO):**

Upon successful completion of this course, students should be able to:

264DSEUBC201C.01: Understand the Node.js runtime environment, asynchronous programming model, module system, and NPM usage.

264DSEUBC201C.02: Apply Node.js File System and HTTP modules to perform synchronous and asynchronous file and directory operations.

264DSEUBC201C.03: Implement event-driven programming using EventEmitter and perform CRUD operations using database connectivity in Node.js.

264DSEUBC201C.04: Develop web applications using Express.js with routing, static files, user input handling, and templating.

264DSEUBC201D: Network Simulation (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

264DSEUBC201D.01: Visualize how data flows across network layers using simulation tools and illustrate the OSI model.

264DSEUBC201D.02: Design and configure IP addressing schemes, including subnetting and VLSM, in simulated environments.

264DSEUBC201D.03: Simulate routing and switching operations using tools like Cisco Packet Tracer and GNS3

264DSEUBC201D.04: Demonstrate NAT, DNS, and DHCP configuration and verify services in network simulations.

264DSEUBC201D.05: Design and troubleshoot end-to-end network topologies and scenarios in simulation environments.

264DSEUBC201D.06: Build confidence to pursue advanced topics in network administration and security.

SEMESTER 5

265CCRUBC301: Computer Networks (CC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

265CCRUBC301.01: Describe the concepts of Computer Networks, networking devices, circuit-switched and packet-switched networks.

265CCRUBC301.02: Discuss network models, Data link layer and Network protocols.

265CCRUBC301.03: Illustrate network applications, network security issues and emerging trends in networking.

265CCRUBC302: Digital Marketing (CC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

265CCRUBC302.01: Implement both on-page and off-page SEO strategies to improve a website's search engine rankings.

265CCRUBC302.02: Create engaging content, manage social media communities, utilize RPA and marketing automation techniques, build a positive online brand reputation, and track campaign performance using analytics platforms.

265VACUBC301: Disaster Management (VAC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

265VACUBC301.01: Describe the concepts related to disaster management and its importance and role.

265VACUBC301.02: Analyse institutional processes and management strategies to mitigate the impacts of disasters.

265VACUBC301.03: Illustrate different types of emergencies and steps to manage their impact.

265DSEUBC301A: Introduction to Data Science (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

265DSEUBC301A.01: Describe the need, evolution, roles, life cycle, applications, prerequisites, tools, and security issues in data science.

265DSEUBC301A.02: Illustrate data types, sources, collection methods, statistical descriptions, and pre-processing techniques.

265DSEUBC301A.03: Analyse the importance, types, techniques, steps, and tools for performing exploratory data analysis

265DSEUBC301A.04: Analyse the steps in data science modelling.

265DSEUBC301A.05: Implement data analysis using R.

265DSEUBC302A: Time Series Analysis (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

265DSEUBC302A.01: Illustrate basic concepts in time series analysis and forecasting.

265DSEUBC302A.02: Analyse statistical methods and forecasting techniques to analyse, model, and interpret time series data.

265DSEUBC302A.03: Analyse various time series regression models.

265DSEUBC302A.04: Distinguish the ARIMA modelling of stationary and nonstationary time series.

265DSEUBC302A.05: Implement time series analysis with Tableau.

265DSEUBC303A: Machine Learning (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

265DSEUBC303A.01: Describe fundamental concepts of machine learning.

265DSEUBC303A.02: Analyse regression and classification techniques, perform data pre-processing and feature engineering.

265DSEUBC303A.03: Describe the fundamentals of Artificial Neural Networks, Perceptron Learning Algorithm.

265DSEUBC303A.04: Apply clustering algorithms and evaluate their performance using validation measures.

265DSEUBC303A.05: Implement various machine learning algorithms

265DSEUBC301B: Introduction to Deep Learning (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

265DSEUBC301B.01: Illustrate the fundamentals of neural networks, and deep learning frameworks.

265DSEUBC301B.02: Design Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), and analyse transfer learning techniques.

265DSEUBC301B.03: Analyse advanced RNN architectures and reinforcement learning algorithms to solve complex problems.

265DSEUBC301B.04: Analyse Generative Adversarial Networks (GANs), including DCGAN and WGAN, as well as clustering and dimensionality reduction techniques.

265DSEUBC301B.05: Implement neural networks, CNNs, GANs, reinforcement learning algorithms, clustering algorithms, and dimensionality reduction techniques.

265DSEUBC302B: Digital Image Processing (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

265DSEUBC302B.01: Illustrate the concepts of digital image formation, image acquisition, sampling, quantization, visual perception, and color models used in digital image processing systems.

265DSEUBC302B.02: Analyse image enhancement techniques including intensity transformations, histogram processing, smoothing, sharpening, and edge detection techniques in the spatial domain.

265DSEUBC302B.03: Analyse morphological image processing operations such as dilation, erosion, opening, closing, and hit-or-miss transformation for noise removal, shape analysis, and pattern detection.

265DSEUBC302B.04: Examine image restoration and segmentation techniques using noise models, adaptive filtering, thresholding methods, edge detection, and region-based segmentation techniques for effective image analysis.

265DSEUBC302B.05: Develop and implement basic digital image processing programs using Python and image processing libraries.

265DSEUBC303B: Natural Language Processing (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

265DSEUBC303B.01: Explain the levels of linguistic analysis, language ambiguity, and linguistic resources used in Natural Language Processing.

265DSEUBC303B.02: Apply NLP techniques for text processing, text representation, linguistic annotation, and analysis of linguistic data.

265DSEUBC303B.03: Analyze natural language structure, syntactic patterns, TreeBank resources, and semantic representation methods.

265DSEUBC303B.04: Analyze word sense disambiguation, discourse processing, reference resolution, and major applications of Natural Language Processing.

265DSEUBC303B.05: Develop and implement basic NLP programs using Python and NLP libraries.

265DSEUBC301C: Web Development with Python - Django/Flask (DSE)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

265DSEUBC301C.01: Build structured Flask applications with dynamic pages and secure form handling.

265DSEUBC301C.02: Design databases, integrate email, develop RESTful APIs, and implement automated testing in Flask.

265DSEUBC301C.03: Apply Django's MVT architecture, configure routing, create models, and manage data with the ORM and Admin interface.

265DSEUBC301C.04: Implement CRUD operations with GCBVs, manage user accounts and permissions, and deploy Django applications securely.

265DSEUBC301C.05: Apply theoretical knowledge through hands-on projects, gaining practical experience in building and deploying Flask and Django applications

265DSEUBC302C: Cross-Platform Application Development with Dart and Flutter (DSE)**Course Outcomes(CO):**

Upon successful completion of this course, students should be able to:

265DSEUBC302C.01: Develop structured Dart programs applying object-oriented principles.

265DSEUBC302C.02: Apply advanced Dart operators to implement asynchronous programming and describe the basics of Flutter.

265DSEUBC302C.03: Build responsive user interfaces, manage application state using Provider and BLoC patterns and implement navigation and routing between pages.

265DSEUBC302C.04: Create smooth animations with Flutter's animation library, handle networking and JSON/XML data parsing, and implement local data persistence using Shared Preferences, SQLite, and Hive.

265DSEUBC302C.05: Develop Dart and Flutter programs, covering collections, exception handling, asynchronous programming, widgets, state management, navigation, animations, and data storage.

265DSEUBC303C: Modern Web Application Development with React.js (DSE)**Course Outcomes(CO):**

Upon successful completion of this course, students should be able to:

265DSEUBC303C.01: Describe React fundamentals, JSX, component architecture, props, and clean code principles.

265DSEUBC303C.02: Apply React Hooks, state management techniques, and handle forms and side effects effectively.

265DSEUBC303C.03: Develop responsive UIs, implement navigation, and manage application state using modern patterns.

265DSEUBC303C.04: Perform data fetching, apply performance optimization, styling strategies, TypeScript, and testing in React applications.

265DSEUBC303C.05: Apply theoretical concepts through hands-on development of complete React applications including CRUD operations, API integration, optimization, and testing.

265SECUBC301: Internship (SEC)

Course Outcomes(CO):

Upon successful completion of this course, students should be able to:

265SECUBC301.01: Analyse workplace practices and task requirements to identify issue, interpret patterns, and propose logical, evidence-based improvements.

265SECUBC301.02: Carry out assigned professional tasks using appropriate tools, methods, or procedures, demonstrating accuracy, efficiency, and responsible work practices.