SYLLABUS

Department	Department of Computer Science	**Program**	M.Sc.(Computer Science)
Level	PG	**Semester**	I
Course Code		**Course Type**	Core Course
Paper	I	**Course Title**	Computer Architecture and Operating System
Credit	6	**Session**	2026-2027

Course Outcomes

CO1. Understand basic computer architecture, instruction set and assembly language programming.

CO2. Classify different types, design, and architecture of operating systems.

CO3. Understand various types of operating systems functions.

UNIT	Content	Duration
1	A simple computer organization and instruction set, instruction formats, addressing modes, instruction cycle, instruction execution in terms of microinstructions, concepts of interrupt and simple I/O organization, Interrupt Driven data transfer, DMA (Direct Memory Access)., Concept of bus, data movement among registers, conditional data transfer, and data movement from/to memory. Design of simple Arithmetic & Logic Unit & Control Unit, and arithmetic and logical operations. Overview of Architecture of 8086 and assembly language programming.	12
2	Introduction: Evolution of operating systems (History of evolution of OS with the generations of computers), Types of operating systems, Multitasking, Timesharing, Multithreading, Multiprogramming and, Real time operating systems. Different views of the operating system, System Programmer's view, User's view, Operating system concepts and Structure, Layered Operating Systems, Monolithic Systems. Processes: The Process concept. The process control block, Systems programmer's view of processes, Operating system services for process management, Scheduling algorithms. First come first serve, Round Robin, Shortest run time next, Highest response ratio next, Multilevel Feedback Queues, Performance evaluation of scheduling algorithms stated above	12
3	Memory Management: Memory management without swapping or paging, Concepts of swapping and paging, Page replacement algorithms namely, Least recently used, Optimal page replacement, Most recently used, Clock page replacement, First in First out (This includes discussion of Belady's anomaly and the category of Stack algorithms), Modeling paging algorithms, Design issues for paging system, Segmentation, Segmented Paging, Paged Segmentation	12

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4	Inter-process Communication and Synchronization: The need for inter process synchronization, Concept of mutual exclusion, binary and counting semaphores, hardware support for mutual exclusion, queuing implementation of semaphores, Classical problems in concurrent programming, Dining Philosopher's problem, Bounded Buffer Problem, Sleeping Barber Problem, Readers and Writers problem, Critical section. critical region and conditional critical region, Monitors and messages. Deadlocks: Concepts of deadlock detection, deadlock prevention, deadlock avoidance. Banker's Algorithm.	12
5	File System: File systems, directories, file system implementation, security protection mechanisms. Input/output: Principles of I/O Hardware: I/O devices, device controllers, direct memory access. Principles of I/O software: Goals interrupt handlers, device drivers, and device independent I/O software. User space I/O Software. Disks: Disk hardware, Disk scheduling algorithms (namely First come first serve, shortest seek time first, SCAN, C-SCAN, LOOK and C-LOOK algorithms) Error handling. track-at-a-time caching, RAM Disks. Clocks: Clock hardware, memory-mapped terminals, I/O software.	12

Assessment Scheme

Component	Credit	Internal	External	Total
Theory	6	40	60	100

Reference Books

- Computer Organization and Design — David A. Patterson & John L. Hennessy
- Computer Architecture: A Quantitative Approach — John L. Hennessy & David A. Patterson
- Operating System Concepts — Abraham Silberschatz, Peter B. Galvin & Greg Gagne
- Modern Operating Systems — Andrew S. Tanenbaum & Herbert Bos

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SYLLABUS

Department	Department of Computer Science	**Program**	M.Sc.(Computer Science)
Level	PG	**Semester**	I
Course Code		**Course Type**	Core Course
Paper	II	**Course Title**	Computer Oriented Optimization Techniques
Credit	6	**Session**	2026-2027

Course Outcomes

CO1. Get exposure to operations research and linear programming

CO2. Solve optimization problems

CO3. Design cost effective and efficient solutions using optimization techniques

CO4. Understand the concept of Game theory and Job sequencing.

CO5. Apply AI concept on Optimization Techniques.

UNIT	Content	Duration
1	Optimization and Indian Knowledge System: Introduction of operation research. LP Formulations, Graphical method for solving LP's with 2 variables, Simplex method, Duality theory in linear programming and applications, dual simplex method.	12
2	Assignment problem. Hungarian method, Sequencing Models: Johnson's Algorithm for processing n jobs through 2 machines, Algorithm for processing n jobs through 3 or more machines, Processing 2 jobs through n machines.	12
3	Introduction to Game Theory: Strategy, Minimax and Maximin Criteria, Existence of Saddle Point, Game without Saddle Point, Mixed strategies, Solution of 2x2 games, Rectangular games, Concept and general rules for dominance, Two person zero sum game, Solution of a game by Simplex method.	12
4	Replacement problems, group replacement, Network models: PERT and CPM, Non-Linear Programming Techniques Kuhn - Tuker conditions with Non negative constraints,	12
5	Quadratic programming. Wolfe's Simplex method, Beal's method.Dynamic Programming: Basic Concepts, Bellman's optimality principles, Applications of computer oriented optimization, Optimization in AI and ML,	12

Assessment Scheme

Component	Credit	Internal	External	Total
Theory	6	40	60	100

Reference Books

- S.D.Sharma, "Operations Research",
- P.K. Gupta & D.S. Hira, "Operations Research", S.Chand& Co.
- Dr.S.Vijayakumari Saradha, "Computer Oriented Optimization Techniques".

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SYLLABUS

Department	Department of Computer Science	**Program**	M.Sc.(Computer Science)
Level	PG	**Semester**	I
Course Code		**Course Type**	Practical
Paper	PRC	**Course Title**	Object Oriented Programming using C++
Credit	4	**Session**	2026-2027

Course Outcomes

CO1. Understand and implement basic C++ concepts.(Understand , Apply)

CO2. Use Object-Oriented Features.(Apply)

CO3. Learn and work with operators, functions, pointers and overloading.(Understand , Apply)

CO4. Understand and implement classes and objects.(Understand , Analyze , Apply)

CO5. Apply inheritance, polymorphism, and exception handling.(Apply)

CO6. Handle File Operations. (Understand)

Theory to supplement Practical

Introduction to Object Oriented Programming Overview of structured programming approach, Object oriented programming approach, Characteristics of object oriented languages. Basics of C++ programming :C++ Program Structure, Character Set and Tokens, Data Type, Type Conversion, Preprocessor Directives, Namespace, Input/Output Streams and Manipulators, Dynamic Memory Allocation with new and delete, Control Statements. Functions: Function Overloading, Inline Functions, Default Argument, Pass by Reference, Return by Reference, Scope and Storage Class. Pointers: Pointer variables declaration & initialization, Operators in pointers, Pointers and Arrays, Pointer and Function. Classes & Objects A Simple Class and Object, Accessing members of class, Initialization of class objects: (Constructor, Destructor), Default Constructor, Parameterized Constructor, Copy Constructor, The Default Copy Constructor, Objects as Function Arguments,Returning Objects from Functions, Structures and Classes, Memory allocation for Objects, Static members, Member functions defined outside the class. Operator Overloading :Fundamental of operator overloading, Restriction on operator overloading, Operator functions as a class members, Overloading unary and binary operator, Data Conversion (basic to basic, basic to user-defined, user-defined to basic, user-defined to user-defined) Inheritance :Introduction to inheritance, Derived Class and Base Class, Access Specifiers (private, protected, and public), Types of inheritance, Public and Private Inheritance, Constructor and Destructor in derived classes, Aggregation Virtual Function, Polymorphism, and miscellaneous C++ Features :Concept of Virtual functions, Late Binding, Abstract class and pure virtual functions, Virtual Destructors, Virtual base class, Friend function and Static function, Assignment and copy initialization, Copy constructor, This pointer, Concrete classes, Polymorphism and its roles. Function Templates and Exception Handling: Function templates, Function templates with multiple arguments, Class templates, templates and inheritance, Exceptional Handling (Try, throw and catch), Use of exceptional handling. File handling :Stream Class Hierarchy for Console Input /Output, Unformatted Input /Output, Formatted Input/Output with ios Member functions, Formatting with Manipulators, Stream Operator Overloading, File Input/output with Streams, Opening and Closing files, Read/Write from File, File Access Pointers and their Manipulators, Sequential and Random Access to File, Testing Errors during File Operations.

Assessment Scheme

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Component	Credit	Internal	External	Total
Theory	N/A	N/A	N/A	N/A
Practical	4	40	60	100
Total	**4**			**100**

Practical List

P1. USE of IKS in programming Basic C++ Programs Swap two numbers, Find the Size of (int, float, double, and char), Fahrenheit to Celsius, Find Simple Interest, Area And Perimeter of Rectangle Control Flow Programs Factorial of a Number, Reverse a Number, Whether a Number is a Palindrome or Not, Check Armstrong Number, For Fibonacci Number, Make a Simple Calculator Pattern Printing Programs Print Simple Full Pyramid Pattern, Inverted Pyramid, Triangle Pattern Function Programs Prime Numbers Between Two Intervals Using Function, Check Whether a Number Can be Express as Sum of Two Prime Numbers.

P2. Calculate the Factorial of a Number Using Recursion Array Programs Check if Two Arrays Are Equal or Not, Maximum and Minimum in an Array, Average of all the Elements Present in an Array Matrix Programs Add Two Matrices, Check Whether Two Matrices Are Equal or Not, Compute the Sum of Diagonals of a Matrix.

P3. Pointers Programs : Array of Pointers, void Pointer, Function Pointer, this Pointer String Programs : Find the Length of a String, Replace a Character in a String, Compare Two Strings

P4. Class and Object Programs Create a Class and Object, Encapsulation, Abstraction in Class, Show Data Hiding in Class, Access Modifier, This Keyword in Class, Static keyword Structures Programs Pass or Return a Structure to/from a Function, Store Information of a Student in a Structure

P5. Overload Increment ++ and Decrement--, Overload Binary Operator + and -, Show Inheritance

P6. Polymorphism in Class, Function Overloading, Function Overriding, Friend Functions, Virtual Destructor, Abstract Class, Create an Interface Exception Handling Programs Show Runtime Exceptions, Handle the Exception Methods.

P7. File Handling Programs Create a New File, Create a Temporary File, Write Into a File, Rename a File, Make a File Read- Only, Copy one File into Another File, Append the Content of One Text File to Another

Reference Books

- E. Balagurusamy, "Object-Oriented
- Robert Programming with C++", TMH 2013, 7th Edition.
- Herbert Lafore, Object Oriented Programming in C++, Fourth Edition, SAMS publications.
- Schildt, C++ The Complete Reference, Fourth Edition, Tata McGraw Hill Publication.
- The C++ Programming Language by Bjarne Stroustrup.
- Deitel and Deitel, C++ How to Program, Third Edition, Pearson Public

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SYLLABUS

Department	**Department of Computer Science**	**Program**	M.Sc.(Computer Science)
Level	PG	**Semester**	I
Course Code		**Course Type**	Practical
Paper	PRC	**Course Title**	Information Security
Credit	4	**Session**	2026-2027

Course Outcomes

CO1. Get hands on experience on Cipher problem related programming

CO2. Get exposure to various Information and Cyber security related techniques

CO3. Use cryptography algorithms and protocols to develop secured systems.

Theory to supplement Practical

Introduction to Information Security : Information Security Mindset, Key characteristics of security mindset, Benefit of security mindset, Attacks, Vulnerability, Security Goals, Security Services and mechanisms. Conventional Cryptographic Techniques : Conventional substitution and transposition ciphers, One-time Pad, Block cipher and Stream Cipher, Steganography. Symmetric and Asymmetric Cryptographic Techniques :DES, AES, RSA algorithms Authentication and Digital Signatures : Use of Cryptography for authentication, Secure Hash function, Key management- Kerberos Program Security : Non malicious Program errors - Buffer overflow, Incomplete mediation, Time-of-check to Time-of- use Errors, Viruses, Trapdoors, Salami attack, Man-in-the- middle attacks, Covert channels Security in Networks : Threats in networks, Network Security Controls Architecture, Encryption, Content Integrity, Strong Authentication, Access Controls, Wireless Security, Honeypots, Traffic flow security, Firewalls - Design and Types of Firewalls, Personal Firewalls, IDS, Email Security-PGP,S/MIME

Assessment Scheme

Component	Credit	Internal	External	Total
Theory	N/A	N/A	N/A	N/A
Practical	4	40	60	100
Total	**4**			**100**

Practical List

P1. Caesar Cipher

P2. Affine Cipher with equation = 3x+12

P3. Play fair Cipher with key entered by user.

P4. Poly alphabetic Cipher

P5. AutoKey Cipher

P6. Hill Cipher.

P7. Railfence technique

P8. Simple Columnar Transposition technique

P9. Advanced Columnar Transposition technique.

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P10. Simple RSA Algorithm with small numbers.

P11. Simplified DES

P12. Make a study of one IDS(Forex.Snort)

Reference Books

- Fundamentals of Information Security by Sanil Nadkarni .
- COMPUTER SECURITY, By Dieter Gollmann .
- Security in Computing, Fourth Edition, by Charles P. P fleeger, Pearson Education .
- Cryptography And Network Security Principles And Practice, Fourth or Fifth Edition, William Stallings, Pearson .
- Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall.
- Network Security Essentials: Applications and Standards, by William Stallings. Prentice Hall
- https://swayam.gov.in/explorer
- https://www.vssut.ac.in/lecture_notes/lecture1423183198.pdf
- Suggestive equivalent online courses:
- -- https://nptel.ac.in/courses/106106141
- -- https://alison.com/tag/information-security
- -- https://nayakuch.wordpress.com/wp-content/uploads/2015/08/cryptography-network-security-atul kahate.pdf
- Suggestive online editors
- -- https://www.onlinegdb.com/online_c++_compiler
- -- https://replit.com/languages/cpp

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SYLLABUS

Department	Department of Computer Science	**Program**	M.Sc.(Computer Science)
Level	PG	**Semester**	III
Course Code		**Course Type**	Core Course
Paper	I	**Course Title**	Cloud Computing
Credit	6	**Session**	2026-2027

Course Outcomes

CO1. Understand cloud computing concepts and its evolution.

CO2. Analyze different cloud service models (IaaS, PaaS, SaaS) and deployment models.

CO3. Gain hands-on experience with AWS/Microsoft Azure/ Google Cloud.

CO4. Develop understanding of virtualization, cloud storage, security, resource management and edge computing.

CO5. Plan multi cloud strategies in cloud-based applications

UNIT	Content	Duration
1	Introduction to Cloud Computing, Evolution from Traditional, Computing to Cloud, Cloud Architecture and Components, Deployment Models: Public, Private, Hybrid, Community Cloud Multi-cloud & Hybrid Cloud Strategies, Advantages & Disadvantages of Cloud Computing.	12
2	Cloud Service Models and Virtualization: Service Models- IaaS, PaaS, SaaS Virtualization-Concepts, Types, Hypervisors, Types of hypervisors Overview of AWS, Microsoft Azure, Google Cloud, IBM Cloud Cloud Resource Management &Scheduling, load balancing, autoscaling Case Study: Virtual Machine using VirtualBox /Azure, AWS EC2, Google Compute Engine, Microsoft Azure Virtual Machines	12
3	Cloud Storage, Security & Compliance: Cloud Storage: File, Block, Object Storage, Data Management & Providers (AWS S3/ Google Cloud Storage/ Azure Blob Storage) Cloud Security Challenges: Data Privacy, Threats, Identity & Access Management (IAM), Compliance & Legal Issues in Cloud, Disaster Recovery & Backup Strategies	12
4	Cloud Container Platforms, Serverless Computing, Types of Serverless Computing,AI in Cloud Containers: Docker, Kubernetes, Internet of Things (IoT) and Cloud Computing, Types of Kubernetes deployments/environments,	12
5	Emerging Trends & Future Directions: Edge Computing & Fog Computing, Blockchain & Quantum Computing in Cloud, Green Cloud Computing and Sustainability, Research Trends & Career Opportunities in Cloud Computing	12

Assessment Scheme

Component	Credit	Internal	External	Total
Theory	6	40	60	100

Reference Books

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- "Cloud Computing & Big Data: From the Basics to Practical Use Cases" M Sudheep Elayidom | Sarith Divakar M | Lija Mohan | Tanmay Kumar Pandey | Shubham Agrawal, Cengage Publishers1st Edition 2024
- "Mastering Cloud Computing: Foundations and Applications Programming", Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, McGraw Hill Education India, 2023 (2nd Edition)
- Thomas Erl, "Cloud Computing: Concepts, Technology & Architecture," Pearson
- A. Bahga, V. Madisetti, "Cloud Computing: A Hands-On Approach," University Press Barrie Sosinsky, "Cloud Computing Bible," Wiley, 2010

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SYLLABUS

Department	Department of Computer Science	**Program**	M.Sc.(Computer Science)
Level	PG	**Semester**	III
Course Code		**Course Type**	Core Course
Paper	II	**Course Title**	Theory of Computation
Credit	6	**Session**	2026-2027

Course Outcomes

CO1. Understand computation theory through the use of abstract, formal models.

CO2. Analyze and compare models of computation, including finite automata, context-free grammars, and turing machines.

CO3. Learn tools for analyzing the computation models, their strengths and limitations

CO4. Gain experience with creative mathematical problem solving and develop the ability to write correct, clear, and concise mathematical proofs.

UNIT	Content	Duration
1	Theory of Automata: String, Alphabet and Languages, Finite Automata, Finite State machine, Basic Definition. Description of a Finite Automaton, Deterministic Finite Accepters Transition Graphs, Languages, Non-deterministic Finite Accepters- Definition, Finite Automata with ϵ- moves, Equivalence of Deterministic and Nondeterministic Finite Accepters, Conversion of NDFA to DFA, Removal of ϵ transition from ϵ – NDFA, Minimization of Finite Automata –Definition and Construction. Mealy and Moore models Definitions, Transformation of Mealy Machine into Moore Machine andvice-versa.	12
2	Properties of Regular Sets: Pumping lemma for regular set, Closure properties of regular set. Formal Language: Basic Definition, Chomsky Classification of languages, Regular Expression and Connection between Regular Expressions and Regular Languages.	12
3	Regular Grammars – Right and Left Linear Grammars, Equivalence between Regular Languages and Regular Grammars. Context-Free Grammars: Leftmost and Rightmost Derivations, Derivation Trees,Parsing and Ambiguity, Simplification of CFGs. Chomsky Normal Form, Greibach Normal Form, Cocke-Kasami- Younger Algorithm, Properties of Context-Free Languages.	12
4	Pushdown Automata: Definition, Non-deterministic Pushdown Automata, Pushdown Automata for Context Free Languages ContextFree Grammars for Pushdown Automata. Deterministic Pushdown Automata and Deterministic Context-Free Languages.	12
5	Turing Machine: Definition of Standard Turing Machine, Turing Machine as Language Accepters and Transducers. Introduction to complexity theory, The Class P and NP.	12

Assessment Scheme

Component	Credit	Internal	External	Total
Theory	6	40	60	100

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MD

Reference Books

- J. E. Hopcroft, R. Motwani and J.D Ullman, Introduction to Theory, Languages and Computation
- Third Edion, Pearson.
- Mishra and Chandrasekaran, Theory of Computer Science (Automata, language and Computation), Third Ed. 2006, Prentice Hall of India.
- Peter Linz, An Introduction to Formal Languages and Automata, 6/e, 2013.
- Martin, J.C.: Introduction to Languages and the Theory of Computation, Fourth Edition, 2010, Mc Graw Hill

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SYLLABUS

Department	Department of Computer Science	**Program**	M.Sc.(Computer Science)
Level	PG	**Semester**	III
Course Code		**Course Type**	Practical
Paper	PRC	**Course Title**	Data Science using Python
Credit	4	**Session**	2026-2027

Course Outcomes

CO1. Understand the fundamentals of Data Science and its applications.

CO2. Perform data wrangling, data handling, cleaning, and preprocessing techniques using python.

CO3. Develop machine learning models for prediction and classification tasks.

CO4. Apply tools & techniques to utilize real-world datasets for decision-making.

CO5. Apply python based tools & techniques for prediction, analysis, visualisation and classification using real-world datasets

Theory to supplement Practical

Digital preservation and analysis of ancient text & disease patterns in Ayurveda using Data Science Introduction to Data Science &Python Basics-, Overview of Data Science and its Applications - Python Basics: Data Types, Operators, Control Structures - Functions and Modules in Python - Introduction to Jupyter Notebook and Google Colab Data Handling and Preprocessing - NumPy for Numerical Computing - Pandas for Data Manipulation - Data Cleaning: Handling Missing Values, Outliers, and Duplicates - Exploratory Data Analysis (EDA) ata Visualization and Statistical Analysis - Matplotlib & Seaborn for Data Visualization - Descriptive and Inferential Statistics - Correlation and Hypothesis Testing - Feature Engineering Techniques Machine Learning using Python - Introduction to Machine Learning and its Types - Supervised Learning: Linear & Logistic Regression, Decision Trees - Unsupervised Learning: Clustering (K-Means, DBSCAN) - Performance Metrics (Precision, Recall, F1-Score, ROC Curve, Accuracy) Advanced Topics and Applications - Introduction to Deep Learning with TensorFlow/Keras - Introduction to Image Processing and Natural Language Processing (with specific focus on processing local languages too) - Real-world Case Studies in Data Science - Ethical Considerations and Future Trends in Data Science .Digital preservation and analysis of ancient text & disease patterns in Ayurveda using Data Science Python Basics for Data Science- Introduction to Python, Jupyter Notebook, and Google Colab- Python Libraries: NumPy, Pandas.Data Handling and Cleaning - Data Preprocessing (Missing Values, Outliers, Duplicates) - Data Transformation (Encoding, Normalization, Scaling. Data Visualization and Statistics - Plotting and visualizing data using Matplotlib and Seaborn - Performing statistical analysis and correlation tests. Machine Learning Models - Implementing Linear Regression and Logistic Regression - Decision Trees and Random Forests - Unsupervised Learning (K-Means Clustering).Advanced Applications in Data Science - Working with real-world datasets (Kaggle) - Image Processing and Natural Language Processing with Python - Project in Data Science

Assessment Scheme

Component	Credit	Internal	External	Total
Theory	N/A	N/A	N/A	N/A
Practical	4	40	60	100

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Total	**4**			**100**

Practical List

P1. Write a program in Python for (A) Variables and Data Types (B) Control and Looping statements (C) Functions in Python(inbuilt and user defined) (D)Lists, Tuples and Dictionary

P2. Write a program to make use of NumPy and Pandas libraries for Numerical Computing and Data Manipulation.

P3. Write a program for Data Preprocessing(Missing Values, Outliers, Duplicates)

P4. Write a program for Data Transformation (Encoding, Normalization, Scaling)

P5. Plotting and Visualizing data using Matplotlib and Seaborn

P6. Performing Statistical Analysis and Correlation Tests

P7. Implementing Linear Regression

P8. Implementing Logistic Regression

P9. Program for Decision Trees

P10. Program for Random Forests

P11. Unsupervised Learning (K-Means Clustering)

P12. Working with real-world datasets (Kaggle)

P13. Image Processing and Natural Language Processing with Python

P14. Performance Metrics (Precision, Recall, F1-Score, ROC Curve, Accuracy)

P15. Digital preservation and analysis of ancient text & disease patterns in Ayurveda using Data Science

Reference Books

Not Available

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SYLLABUS

Department	**Department of Computer Science**	**Program**	M.Sc.(Computer Science)
Level	PG	**Semester**	III
Course Code		**Course Type**	Practical
Paper	PRC	**Course Title**	Web Development Using Java and Cloud Computing
Credit	4	**Session**	2026-2027

Course Outcomes

CO1. Develop JAVA programs using the concepts of inheritance, polymorphism, interfaces and packages.

CO2. Apply the concepts of Multithreading and Exception handling to develop efficient and error free codes.

CO3. Get exposure to advanced java concepts.

CO4. Develop web based applications using MVC architecture.

CO5. Implement cloud computing concepts using cloud platforms.

CO6. Develop applications on cloud platforms.

CO7. Configure cloud security, IAM, and monitoring tools.

Theory to supplement Practical

Features of Java, Object-oriented programming overview, Introduction of Java Technologies, How to write simple Java programs, Data Types, Variables, Memory concepts, control statements, looping, Method Call Stack and Activation Record, Argument Promotion and Casting, Scope of declaration and Method Overloading, String Handling: The String constructors, String operators, Character Extraction, String comparison, String Buffer. Arrays: Declaring and Creating Arrays, Enhanced for Statement, Passing Arrays to Method, Multidimensional Arrays, Variable-Length Argument lists, Using Command-line Arguments Inheritance: Extending classes & related things, Packages and Interfaces: Defining a Package, Understanding CLASSPATH, Access Protection, Importing packages, creating own packages Exception Handling: Introduction, overview of doing it and keywords used, when to use it,Multithreading: What are threads, The java Thread model, Thread priorities, Thread life cycle, Thread Synchronization, Applets: Applet basics, Applet Architecture, Applet life cycle methods, Database connectivity: JDBC, The design of JDBC, Typical uses of JDBC Introduction to HTTP, web Server and application Servers, Installation of Application servers, Config files, Web.xml. Java Servlet, Servlet Development Process, Deployment Descriptors, Generic Servlet, Lifecycle of Servlet, Servlet Packages, Classes, Interfaces, and Methods, Handling Forms with Servlet, Various methods of Session Handling, various elements of deployment descriptors. JSP Basics: JSP lifecycle, Directives, scripting elements, standard actions, implicit objects. Connection of JSP and Servlet with different database viz. Oracle, MS-SQL Server, MySQL, java.sql Package, Querying database, adding records, deleting records, modifying records, types of Statement, Separating Business Logic and Presentation Logic, Building and using JavaBean, Session handling in JSP, Types of errors and exceptions handling. MVC Architecture Introduction to Remote Method Invocation, Introduction to Enterprise Java Bean, Types of EJB, Creating and working with Session Bean. Note : The following theory is suggested for implementation of Java practical. The classes for the theory can be conducted during the practical sessions. Theory of Cloud Computing shall be covered under course code CC-31(Cloud Computing).

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Assessment Scheme

Component	Credit	Internal	External	Total
Theory	N/A	N/A	N/A	N/A
Practical	4	40	60	100
Total	4			100

Practical List

P1. I/O statements, Mathematical Computations, Swapping, Arrays, Control Statements, Looping, String handling, Functions, Method overloading.

P2. Class, CLASSPATH, Packages, Exception Handling, Multithreading, Thread: Life cycle, Synchronization, Applet : Life cycle method, database connectivity, JDBC.

P3. Installation of Application servers, Config files, Web.xml. Java Servlet, Deployment Descriptors Servlet: Generic Servlet, Lifecycle, Packages, Classes, Interfaces, and Methods Forms with Servlet, Session Handling methods, deployment descriptors.

P4. JSP : Lifecycle, Directives, Scripting elements, Implicit objects, JSP and Servlet : Connection with Oracle, MS-SQL Server, MySQL, java.sql Package, Session handling Querying database : Records (Adding, Deleting , Modifying) Errors and Exceptions handling

P5. JavaBean : Enterprise Java Bean (EJB) Session bean : Creation and Working MVC : Remote Method Invocation

P6. Introduction to Cloud Platforms: Creating virtual machine using Virtual Box or VMWare ,Setting up free-tier accounts on AWS/ Google Cloud/ Azure ,Exploring cloud dashboards and services.

P7. Virtualization and Cloud Storage: Creating and managing virtual machines (AWS EC2, Google Compute Engine) ,Implementing cloud storage (AWS S3, Google Cloud Storage).

P8. Cloud Development Deployment and Management Develop web application through PAAS, Deploying web applications through Github/ Github Actions, Serverless computing with AWS Lambda / Google Cloud Functions, Load balancing and auto-scaling. Security & Monitoring in Cloud: Identity and Access Management (IAM), Cloud security groups, encryption, and compliance tools, Cloud monitoring and logging (AWS Cloud Watch/ Google Stackdriver).

Reference Books

- Java2:The Complete Reference by HerbertSchildt,TataMcGraw-Hill,8th Edition, 2011.
- Eeginning JavaEE5: From Novice to Professional by K. Mukhar, WroxPress.
- An Integrated Approach to The Java Programming Language, Ken Arnold, James Gosling, David Holmes,3rd Edition, Person Education, 2000
- Head First Java, Kathy, Sierra, Bert Bates, O'Reilly Publication, 2ndEdiΘon,2005 Suggestive digital Platform web links:
- https://www.geeksforgeeks.org/web-development-using-java-technology-for-beginners/
- https://www.digitalocean.com/community/tutorials/java-web-application-tutorial-for-beginners
- NPTEL Course Video Lectures on "Programming in java" , By Prof. Debasis Samant, IIT Kharagpur
- Swayam Course Video Lectures on "Web Technology", By Prof. Dr. Ashutosh Kumar .Bhat
- Cloud Computing & Big Data: From the Basics to Practical Use Cases
- M Sudheep Elayidom | Sarith Divakar M | Lija Mohan | Tanmay Kumar Pandey | Shubham Agrawal, Cengage Publishers1st Edition 2024
- Mastering Cloud Computing, Rajkumar Buyya.
- Cloud Computing: Concepts & Architecture -,Thomas Erl.
- AWS Academy: https://aws.amazon.com/training/
- Google Cloud Training: https://cloud.google.com/training
- Microsoft Learn - Azure: https://learn.microsoft.com/en-us/training/

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