# Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

**(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur)**

**SCHEME OF INSTRUCTION & SYLLABI**

**Programme: Computer Science Engineering**

**Scheme of Instructions: Final Year B.Tech. in Computer Science and Engineering**

**Semester–VIII**

| Sr. No. | Course Category | Course Code | Course Title | L | T | P | Contact Hrs/Wk | Credits | Exam Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | CT-1 | CT-2 | CA | ESE | TOTAL |
| 1 | PCC | BCS34801 | Information and Cyber Security | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 60 | 100 |
| 2 | RM | BCS34802 | Research Methodology | 4 | - | - | 4 | 4 | 15 | 15 | 10 | 60 | 100 |
| 3 | Project | BCS34803 | Project | - | - | 8 | 8 | 4 | - | - | 50 | 50 | 100 |
| 5 | PEC | BCS34804-09 | Program Elective - V | 4 | - | - | 4 | 4 | 15 | 15 | 10 | 60 | 100 |
| 6 | MDM | BEC34811 | Introduction to IOT | 4 | - | - | 4 | 4 | 15 | 15 | 10 | 60 | 100 |
| 7 | PCC | BCS34810 | Information and Cyber Security Lab | - | - | 2 | 2 | 1 | - | - | 25 | 25 | 50 |
| | | | **Total** | **19** | | **10** | **27** | **24** | | | | | **650** |

L-Lecture SL-Self Learning P-Practical NHL-Notional Hrs/Wk (Total Notional Hrs)
CT1-ClassTest1 TA/CA-Teacher Assessment/Continuous Assessment
CT2-ClassTest2 ESE-End Semester Examination (For Laboratory End Semester Performance)

| Course Category | BSC/ESC (Basic Science Course/Engineering Science Course.) | PCC (Programme Core courses) | PEC (Programme Elective courses) | OEC (Open Elective Course) | Multi-disciplinary courses | VSEC (Skill Course) | VEC (Value Education Courses) | Humanities Social Science & Management | | Experiential Learning Courses | CC (Liberal Learning Courses) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | AEC (Ability Enhancement Course) | IKS (Indian Knowledge System) | | |
| Credits | | 04 | 6 | - | 2 | - | - | - | | 8 | |
| Cumulative Sum | 16/13 | 48 | 20 | 8 | 14 | 8 | 4 | 10 | | 22 | 4 |

PROGRESSIVE TOTAL CREDITS: 147+20=167

| | | | | | |
|---|---|---|---|---|---|
| HOD | Dean Academics | Vice Principal (Academics) TGPCET, NAGPUR | Dr. Premanand Naktode Principal TGPCET, Nagpur | Apr., 2025 | 1.00 | Applicable for AY 2025-26 Onwards |
| **Chairman** | **Dean Academics** | | | **Date of Release** | **Version** | |

# TULSIRAMJI GAIKWAD PATIL College of Engineering & Technology, Nagpur

SCHEME OF INSTRUCTION & SYLLABI

Program: Computer Science & Engineering

**List of Electives offered by**

**Computer Science & Engineering**

| Course Code | Professional Elective- I | Course Code | Professional Elective- II |
|---|---|---|---|
| | Semester V | | Semester VI |
| BCS33506 | Artificial Intelligence | BCS33605 | Neural Network and Fuzzy Logic |
| BCS33507 | Principles of Distributed Systems | BCS33606 | Cloud Computing |
| BCS33508 | Design Patterns | BCS33607 | Software Project Management |
| BCS33509 | Introduction to Data Science | BCS33608 | Data Visualization Techniques |

| Course Code | Professional Elective- III | Course Code | Professional Elective- IV |
|---|---|---|---|
| | Semester VI | | Semester VII |
| BCS33609 | TCP/IP | BCS34702 | Natural Language Processing |
| BCS33610 | Computer Graphics | BCS34703 | Parallel and Distributed Database |
| BCS33611 | Network Security | BCS34704 | Software Testing and Quality Assurance |
| BCS33612 | Blockchain and Distributed Ledger Technology | BCS34705 | Big Data Analytics |

| Course Code | Professional Elective- V |
|---|---|
| | Semester VIII |
| BCS34804 | Deep Learning |
| BCS34805 | Cloud Computing & Big Data Analytics |
| BCS34806 | Software Maintenance |
| BCS34807 | Predictive Analytics |
| BCS34808 | DevOps |
| BCS34809 | Full Stack Development |

# TULSIRAMJI GAIKWAD PATIL College of Engineering & Technology, Nagpur

SCHEME OF INSTRUCTION & SYLLABI

Program: Computer Science & Engineering

**List of Open Electives offered by**

**Computer Science & Engineering**

| Course Code | Subject |
|---|---|
| BCS32306 | Object Oriented Programming |
| BCS32406 | Introduction DBMS |
| BCS33504 | Software Engineering |

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## Fourth Year (Semester-VIII) B.Tech. (CSE)

Course Code:BCS34801 (Information and Cyber Security)

| Teaching Scheme | |
|---|---|
| **Lectures** | 3 Hrs/week |
| **Tutorial** | - |
| **Total Credit** | 3 |

| Examination Scheme | |
|---|---|
| **CT-1** | 15 Marks |
| **CT-2** | 15 Marks |
| **CA** | 10 Marks |
| **ESE** | 60 Marks |
| **Total** | 100 Marks |
| Duration of ESE: 03Hrs 00Min. | |

**Course Objective:**

| | |
|---|---|
| 1 | To understand the fundamentals, legal and ethical aspects, and management standards of information security. |
| 2 | To learn symmetric and asymmetric cryptographic techniques, key management, and encryption practices used in industry. |
| 3 | To explore authentication methods, hashing, digital signatures, and identity management systems. |
| 4 | To implement and analyse network, transport-layer, and perimeter security mechanisms with practical tools. |
| 5 | To study and apply web, email, and e-commerce security techniques aligned with modern cyber practices. |

**Course Contents**

| | |
|---|---|
| **Unit I** | **Foundations of Information Security:** Need of information security, legal/ethical issues, attributes of security, OSI security architecture, attacks, services, and mechanisms, Security policy, standards, lifecycle, classical cryptography. Industry Standards: ISO/IEC 27001, NIST Cybersecurity Framework, GDPR compliance. Tools: Wireshark (traffic analysis), Nmap (vulnerability scanning). Case Study: Security governance implementation in IT firms (e.g., IBM, Infosys). |
| **Unit II** | **Cryptography and Key Management** DES, AES, IDEA, RC5, RSA, ECC, Diffie Hellman, cryptography principles. Introduction to Tools: OpenSSL, CrypTool, VeraCrypt, encryption/decryption. Modern Cryptography: Quantum-resistant algorithms (post-quantum cryptography overview). Cloud Security: Encryption in cloud storage (AWS KMS / Azure Key Vault). Case Study: Data encryption strategy in banking systems or cloud infrastructure. |
| **Unit III** | **Authentication, Hashing, and Digital Signatures:** MD5, SHA, HMAC, DSA, PKI, Kerberos, X.509 certificates. Introduction to Tools: Hashcat (password cracking demo), OpenSSL (digital certificate creation). Applications: Identity and Access Management (IAM) using Okta/Azure AD. Modern Authentication: OAuth 2.0, JWT (JSON Web Tokens), Multi-factor Authentication (MFA). Case Study: Authentication architecture in Google Workspace / AWS Cloud. |
| **Unit IV** | **Network, Transport & Perimeter Security:** IPSec, TLS/SSL, Firewalls, IDS/IPS. Security tools overview: pfSense (Firewall), Snort/Suricata (IDS/IPS), Wireshark (Packet Analysis). DevSecOps: Secure CI/CD pipelines with Jenkins & SonarQube. Cloud Security: Security Groups & VPC Firewall rules (AWS/Azure). Case Study: Incident detection using SIEM tools (Splunk, QRadar). |

| | |
|---|---|
| **Unit V** | **Web, Email, and E-CommerceSecurity:** Web & email security, PGP, S/MIME, SET, smart cards. Introduction tosecurity tools: Burp Suite (web vulnerability scanning), OWASP ZAP, Metasploit (ethical testing). Industry Standards: OWASP Top 10 vulnerabilities, PCI-DSS for payment security. Modern Topics: API Security, Zero Trust Architecture, Cloud Web App Firewalls (AWS WAF). Case Study: Cyber fraud detection in e-commerce systems (e.g., Amazon Pay, Razorpay). |
| **Text Books** | |
| T1 | William Stallings "Cryptography and network security, 8th Edition principles and practices", Pearson. |
| T2 | Robert Bragge, Mark Rhodes, Keith Straggberg "Network Security, The Complete Reference", Tata McGraw Hill Publication |
| **Reference Books** | |
| R1 | Bernard Menezes, —Network Security and Cryptography, Cengage Learning |
| R2 | Nina Godbole, Information System Security, Wiley India Pvt., ISBN978-81-265-1692-6. |
| R3 | Charlie Kaufman, Radia Perlman and mike speciner, "Network security, private communication in a public world" |
| **Useful Links** | |
| 1 | https://www.infosecinstitute.com/resources/network-security-101/a-deep-dive-into-network-security-protocols-safeguarding-digital-infrastructure-2024/ |
| 2 | "The Web Application Hacker's Handbook" — for understanding underlying attack techniques (injection, XSS, auth flaws, etc.) |
| 3 | "Exploring network security: Firewalls, IDS, IPS and VPNs" — blog post summarizing perimeter security components & tools. |
| 4 | https://docs.aws.amazon.com/vpc/latest/userguide/vpc-security-groups.html |
| 5 | https://nptel.ac.in/courses/106/105/106105031/ |
| 6 | https://nptel.ac.in/courses/106/106/106106129/ |
| 7 | National Institute of Standards and Technology (NIST) Special Publication — An Introduction to Information Security (PDF) — https://doi.org/10.6028/NIST.SP.800-12r1NIST Publications |
| 8 | E-Commerce Security & Controls (PDF excerpt) — https://cdn.taxmann.com/BookshopFiles/bookfiles/9789357788458_sampleNew7b891b192827.pdfcdn.taxmann.com |
| 9 | Principles of Information Security by Whitman &Mattord — details & edition info — https://www.cengage.co.in/book-list/print/principles-of-information-security-with-mindtap-7e-ac |

| Sr. no. | Course Outcomes | CL | Class Session |
|---|---|---|---|
| 1 | **Explain** the principles, legal aspects, and architecture of information security and prepare a basic security policy aligned with industry standards. | 2 | 9 |
| 2 | **Implement** symmetric and asymmetric encryption techniques and demonstrate secure key management using standard tools. | 2 | 9 |
| 3 | **Apply** authentication and hashing techniques and configure digital signatures and identity management systems. | 4 | 9 |
| 4 | **Configure** and analyze firewalls, IDS/IPS, and secure communication protocols for enterprise networks. | 4 | 9 |
| 5 | **Evaluate** and implement web, email, and e-commerce security mechanisms using industry tools and frameworks. | 4 | 9 |

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| | | | | Date of Release | Version | |

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## Fourth Year (Semester-VIII) B.Tech. (CSE)

### Course Code:BCS34802(Research Methodology)

| Teaching Scheme | |
|---|---|
| **Lectures** | 4Hrs/week |
| **Tutorial** | - |
| **Total Credit** | 4 |

| Examination Scheme | |
|---|---|
| **CT-1** | 15 Marks |
| **CT-2** | 15 Marks |
| **CA** | 10 Marks |
| **ESE** | 60 Marks |
| **Total** | 100 Marks |
| Duration of ESE: 03Hrs 00Min. | |

**Course Objective:**

| | |
|---|---|
| 1 | Enable students to comprehend the meaning, objectives, motivation, and utility of research in academic and industrial contexts. |
| 2 | Introduce learners to essential research concepts such as theory, empiricism, constructs, definitions, and variables. |
| 3 | Provide insights into the nature of the scientific method and familiarize students with the terminology, logic, and reasoning used in research. |
| 4 | Train learners in identifying, defining, and formulating research problems, and in developing relevant research and investigation questions. |
| 5 | Explain the concept, formulation, and testing of hypotheses, including the importance of null and alternative hypotheses, and the criteria for a good hypothesis. |

**Course Contents**

| | |
|---|---|
| **Unit I** | Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method Understanding the language of research, Concept, Construct, Definition, Variable. Research Process |
| **Unit II** | Problem Identification & Formulation: Research Question, Investigation Question Measurement Issues Hypothesis Qualities of a good Hypothesis Null Hypothesis & Alternative Hypothesis. Hypothesis Testing , Logic & Importance. |
| **Unit III** | Research Design: Concept and Importance in Research Features of a good research design, Exploratory Research Design, concept, types and uses, Descriptive Research Designs concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. |
| **Unit IV** | Qualitative and Quantitative Research: Qualitative research, Quantitative research Concept of measurement, causality, generalization, replication. Merging the two approaches. Paper presentation activities based assignments, |
| **Unit V** | Measurement: Concept of measurement– what is measured? Problems in measurement in research Validity and Reliability. Levels of measurement Nominal, Ordinal, Activities & hands on session for various research Tools. |

**Text Books**

| | |
|---|---|
| T1 | Research Methodology: Methods and Techniques by C.R. Kothari & Gaurav Garg (New Age International) |
| T2 | Business Research Methods by Donald R. Cooper & Pamela S. Schindler (McGraw-Hill) |

| | |
|---|---|
| T3 | Research Methodology: A Step-by-Step Guide for Beginners by Ranjit Kumar (SAGE) |
| | **Reference Books** |
| R1 | The Craft of Research by Wayne C. Booth, Gregory G. Colomb & Joseph M. Williams excellent for understanding how to frame research questions, structure arguments, and write research reports. |
| R2 | Research Methods for Business Students by Mark N.K. Saunders et al. offers applied, business-oriented examples of research design, measurement and data analysis |
| | **Useful Links** |
| 1 | https://www.youtube.com/watch?v=Z-ZkmpQBIFo |
| 2 | https://www.youtube.com/watch?v=aJElYbfkccU |

| Sr. no. | Course Outcomes | CL | Class Session |
|---|---|---|---|
| 1 | **Explain** the fundamentals of research, including meaning, purpose, motivation, and utility of research. | 2 | 9 |
| 2 | **Distinguish** between theory, empiricism, inductive and deductive reasoning, and apply concepts related to the scientific method. | 2 | 9 |
| 3 | **Interpret** basic research terminology such as concepts, constructs, variables, and definitions used in academic research. | 2 | 9 |
| 4 | **Identify** and formulate research problems, research questions, and hypotheses with an understanding of measurement issues and characteristics of good hypotheses. | 4 | 9 |
| 5 | **Demonstrate** an understanding of hypothesis testing, its logic, importance, and application in research. | 3 | 9 |

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## Fourth Year (Semester-VIII) B.Tech. (CSE)

### Course Code:BCS34804 (Deep Learning)

| Teaching Scheme | |
|---|---|
| **Lectures** | 4Hrs/week |
| **Tutorial** | - |
| **Total Credit** | 4 |

| Examination Scheme | |
|---|---|
| **CT-1** | 15 Marks |
| **CT-2** | 15 Marks |
| **CA** | 10 Marks |
| **ESE** | 60 Marks |
| **Total** | 100 Marks |
| Duration of ESE: 03Hrs 00Min. | |

| **Course Objective:** | |
|---|---|
| 1 | To introduce the basic concepts, definitions, and importance of deep learning and its relationship with Artificial Neural Networks (ANNs). |
| 2 | To understand the working of various optimization algorithms used for training deep models efficiently. |
| 3 | To explore Convolutional Neural Networks (CNNs) for image-based applications and understand architectures such as LeNet, AlexNet, VGG, and ResNet. |
| 4 | To understand Recurrent architectures like LSTM, GRU, and Encoder–Decoder models for sequence learning tasks. |
| 5 | To introduce Generative models such as Generative Adversarial Networks (GANs) and Auto encoders for data generation and reconstruction. |

| **Course Contents** | |
|---|---|
| **Unit I** | Deep Neural Network: Types, Perceptron Training Rule, ANN Forward Neural network: Forward Neural Networks, Back propagation neural network, Gradient Descent & Back Propagation Algorithm: Gradient Descent, Stochastic Gradient, Vanishing Gradient problem |
| **Unit II** | Introduction to deep learning: Definition, Importance, Types of Deep Learning Networks Feed forward neural network (FFNN), Multi-layer Perceptron (MLP) Radial basis function Neural networks, Multi-layer perceptron, Convolution neural network (CNN), Recurrent. neural network. Application of Deep learning in real time. |
| **Unit III** | Deeplearningarchitectures:LSTM,GRU,Encoder/DecoderArchitectures, Long Short Term Memory Networks (LSTMs) Deep learning types of Auto encoders and Denoising Auto encoders, Adversarial Generative Networks, Autoencoder and Deep Belief Model DBM |
| **Unit IV** | Types of Algorithms used in Deep Learning: Image Classification, Object Detection, Recurrent Neural Networks (RNNs), Generative Adversarial Networks (GANs), Restricted Boltzmann's machine (RBM), Radial Basis Function Networks (RBFNs), Multilayer Perceptron's (MLPs), Self-Organizing Maps (SOMs), Deep Belief Networks (DBNs) |
| **Unit V** | Convolutional Neural Networks: CNN Architectures, Convolution, Pooling Evolution from LeNet and AlexNet to VGG, ResNet Layers,Variants of the Basic Convolution Function, Structured Outputs, DataTypes, Efficien tConvolution Algorithms, Random or Unsupervised Features, LeNet, AlexNet |

| **Text Books** | |
|---|---|
| T1 | Simon Haykin, Charu C. Aggarwal, Satish Kumar,The Principles of Deep Learning Theory |
| T2 | Nikhil Buduma & Nicholas Locascio, Neural Networks and Deep Learning, |

| **Reference Books** |
|---|

| | |
|---|---|
| R1 | Francois Chollet, Michael Nielsen,Adrian Rosebrock, |
| R2 | Rajalingappaa Shanmugamani, Christopher Bishop, |
| | **Useful Links** |
| 1 | http://digimat.in/nptel/courses/video/106105215/L60.html |
| 2 | https://onlinecourses.nptel.ac.in/noc25_cs106/preview?utm_source=chatgpt.com |

| Sr. no. | Course Outcomes | CL | Class Session |
|---|---|---|---|
| 1 | **Understand** the fundamental concepts of Artificial Neural Networks (ANN) and Deep Neural Networks (DNN). | 2 | 9 |
| 2 | **Apply** Forward Propagation and Back Propagation algorithms, along with Gradient Descent and its variants. | 3 | 9 |
| 3 | **Analyze** and differentiate between various Deep Learning architecturesand LSTM. | 4 | 9 |
| 4 | **Model** advanced deep learning modelsGRU, Autoencoders, Denoising Autoencoders, Generative Adversarial Networks (GANs) | 3 | 9 |
| 5 | **Implement** and interpret various Deep Learning algorithms including CNN, RNN, GAN, AlexNet, LeNet | 3 | 9 |

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|---|---|---|---|---|---|---|
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## Fourth Year (Semester-VIII) B.Tech. (CSE)

## Course Code: (BCS34805) Cloud Computing & Big Data Analytics

| Teaching Scheme | |
|---|---|
| **Lectures** | 4 Hrs/week |
| **Tutorial** | - |
| **Total Credit** | 4 |

| Examination Scheme | |
|---|---|
| **CT-1** | 15 Marks |
| **CT-2** | 15 Marks |
| **CA** | 10 Marks |
| **ESE** | 60 Marks |
| **Total** | 100 Marks |
| Duration of ESE: 03Hrs 00Min. | |

**Course Objective:**

| | |
|---|---|
| 1 | Understand the foundational concepts and architecture of cloud computing and big data systems. |
| 2 | Explore major cloud service and deployment models, and understand how big-data platforms operate on cloud infrastructure. |
| 3 | Implement and manage big data storage, processing and analytics using cloud and distributed frameworks. |
| 4 | Design scalable, fault-tolerant pipelines for ingesting, storing, processing and visualizing large volumes of data. |
| 5 | Analyze real-world case studies of cloud-based big data systems and derive best practices for deployment, security, governance and optimization. |

**Course Contents**

| | |
|---|---|
| **Unit I** | **Foundations of Cloud Computing & Big Data: -** Introduction to cloud computing: definitions, characteristics, benefits, history. Cloud service models (IaaS, PaaS, SaaS) and deployment models (public, private, hybrid). Virtualization basics, resource pooling, utility computing. Introduction to Big Data: definition, vs traditional data, the "4 V's", data growth & challenges. Relationship between cloud computing and big data: why clouds enable big data. |
| **Unit II** | **Cloud Architecture & Big Data Storage: -** Cloud data centre architecture: compute, storage, networking, virtualization layers. Storage models in cloud: block storage, file storage, object storage. Distributed file systems for big data: e.g., HDFS (Hadoop Distributed File System). NoSQL databases and storage for big data: key-value stores, columnar databases, document stores (e.g., MongoDB, Cassandra). Data ingestion and pre-processing: pipelines, batch vs stream |
| **Unit III** | **Big Data Processing Frameworks on Cloud:** -MapReduce programming model: map, reduce tasks, execution, YARN, scheduling. Apache Spark: RDDs, DataFrames, Spark SQL, MLlib. Cloud deployment of big-data processing: using AWS (EMR), Azure HDInsight, GCP Dataflow, etc. Batch vs real-time/stream processing; introduction to streaming frameworks (e.g., Spark Streaming, Kafka) |
| **Unit IV** | **Analytics, Machine Learning &Visualization for Big Data: -** Big data analytics: exploratory data analysis, data mining, clustering, classification, recommendation systems. Machine Learning on large data: using Spark MLlib, scalable algorithms, outlier detection, regression, collaborative filtering. Data visualization and dash boarding: tools like Tableau, Power BI, Kibana for big data. Case studies: Web content analytics, social network analytics, text and web mining |

| | |
|---|---|
| **Unit V** | Security, Governance, Cost Optimization& Emerging Trends: -Security and privacy in cloud and big-data systems: encryption, access control, data lifecycle, compliance (GDPR, HIPAA). Governance, data quality, metadata management, data lineage. Performance, scalability, cost management in cloud big-data solutions: resource scheduling, fault-tolerance, auto-scaling. Emerging trends: edge/fog computing, server less big data, IoT data streams, federated learning in big data systems. |
| **Text Books** | |
| T1 | Raj Kamal &PreetiSaxena, Big Data Analytics: Introduction to Hadoop, Spark, and Machine Learning, McGraw Hill Education, 2018. ISBN 978-9353164966. |
| T2 | Tom White, Hadoop: The Definitive Guide (4th Edition), O'Reilly Media, 2015. |
| **Reference Books** | |
| R1 | Boris Lublinsky, Kevin T Smith, Alexey Yakubovich, *Professional Hadoop Solutions*, Wrox Press, 2014 |
| R2 | ArshdeepBahga, Vijay Madisetti, *Big Data Analytics: A Hands-On Approach*, 1st Edition, VPT Publications, 2018. |
| R3 | Holden Karau et al., *Learning Spark: Lightning-fast Data Analysis*, O'Reilly Media. |
| **Useful Links** | |
| 1 | https://www.cs.sjtu.edu.cn/~wuct/bdpt/syllabus.html |
| 2 | https://cloudmesh.github.io/classes/i523/2016/course.html |
| 3 | https://onlinecourses.nptel.ac.in/noc21_cs86/preview |

| Sr. no. | Course Outcomes | CL | Class Session |
|---|---|---|---|
| 1 | **Understand** the architecture, models and key components of cloud computing and link these to big-data challenges. | 2 | 9 |
| 2 | **Perform** various cloud service models (IaaS, PaaS, SaaS) and deployment models (public, private, hybrid) as they pertain to big data workloads. | 3 | 9 |
| 3 | **Apply** distributed storage and processing frameworks (e.g., HDFS, NoSQL, MapReduce, Spark) in a cloud context. | 3 | 9 |
| 4 | **Construct** data-ingestion, preparation, processing and visualization pipelines for large-scale data on cloud platforms. | 5 | 9 |
| 5 | **Evaluate** cloud-based big data solutions considering performance, scalability, security, cost and governance. | 5 | 9 |

| | | | | | | |
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## Fourth Year (Semester-VIII) B.Tech. (CSE)

Course Code:BCS34806 (Software Maintenance)

| Teaching Scheme | |
|---|---|
| **Lectures** | 4 Hrs/week |
| **Tutorial** | - |
| **Total Credit** | 4 |

| Examination Scheme | |
|---|---|
| **CT-1** | 15 Marks |
| **CT-2** | 15 Marks |
| **CA** | 10 Marks |
| **ESE** | 60 Marks |
| **Total** | 100 Marks |
| Duration of ESE: 03Hrs 00Min. | |

**Course Objective:**

| | |
|---|---|
| 1 | To understand software project and program management, project lifecycle, evaluation methods, and Agile practices. |
| 2 | To understand and apply software process models and effort estimation techniques for project planning. |
| 3 | To understand planning of activities, task scheduling, risk management, and project execution optimization. |
| 4 | To understand monitoring of progress, cost control, contract management, and team performance. |
| 5 | To understand teamwork, quality assurance, reporting, and project closure processes. |

**Course Contents**

| | |
|---|---|
| **Unit I** | **Introduction to Software Project Management & Programme Management:** Introduction, Importance, Types of Projects, Contract & Technical Management, SPM Activities, Methods and Methodologies, Project Charter, Stakeholders, Objectives, Business Case, Success and Failure, Management Control, Project Management Life Cycle, Traditional vs. Modern Practices. Project Evaluation & Programme Management: Portfolio Management, Cost–Benefit and Risk Evaluation, Programme Creation, Benefits Management.**Industry Add-ons:** Introduction to Agile Project Management (Scrum Framework): Roles, Sprint Planning, Stand-ups, Retrospectives., Project Tools: Jira, Trello, Asana, MS Project hands-on use, Certifications Overview: PMI-CAPM, PMI-ACP, CSM., Case Study: Infosys Agile Transformation (Success/Failure Analysis). |
| **Unit II** | **Project Approach and Effort Estimation:** Build or Buy, Methodologies and Technologies, Software Process Models (Waterfall, Spiral, Prototype, Incremental, RAD, Agile, XP, Lean), Iterative Process Management, Model Selection. Effort Estimation: Basis, Techniques (Top-down, Bottom-up, Parametric, Expert Judgement, Analogy, Function Point). **Industry Add-ons:** Agile & DevOps Frameworks: SAFe, Agile-DevOps Integration. Modern Estimation Techniques: Story Points, Planning Poker, Velocity Tracking. Tools: Jira Agile Boards, MS Project Estimator, Function Point Workbench. Case Study: Agile vs. Waterfall Effort Comparison (TCS/Accenture). |
| **Unit III** | **Activity Planning and Risk Management:** Activity Planning: Objectives, Scheduling, Network Models, Critical Path, Activity Float, Project Duration Optimization. Risk Management: Identification, Assessment, Planning, Boehm's Top 10 Risks, PERT, Monte Carlo Simulation. **Industry Add-ons:** Tools: MS Project, Wrike, ClickUp, Primavera P6. Agile Sprint & Kanban Planning. AI-Based Risk Tracking (Jira/Confluence). Cybersecurity Risk Management. Case Study: Risk Mitigation in Government IT Projects (UIDAI/GSTN). |

| | |
|---|---|
| **Unit IV** | **Monitoring, Control, and Contract Management:** Monitoring & Control: Framework, Data Collection, Progress Review, Cost Monitoring, Earned Value Analysis, Change Control, SCM.Managing Contracts: Types, Stages, Terms, Acceptance, Contract Management.Managing People: Motivation, Stress, Ethics, Health & Safety. **Industry Add-ons:** *DevOps Monitoring:* CI/CD using Jenkins, GitHub Actions, Azure Boards. *Dashboarding Tools:* Power BI, Tableau.*Agile Team Management:* Distributed & Hybrid Work Models. *Contract Tools:* SAP Ariba, Oracle Procurement Cloud. *Case Study:* Remote Team Management (Infosys/IBM).*Hands-On:* Earned Value Analysis using Excel/MS Project. |
| **Unit V** | **Teamwork, Software Quality, and Project Closure:** Team Formation, Decision Making, Virtual Teams, Communication, Leadership.Software Quality: Importance, Models (ISO 9126), Metrics, Quality Management Systems, Testing, Reliability, Quality Plans.Project Closure: Process, Financial Closure, Closeout Report.**Industry Add-ons:***Agile Team Dynamics:* Cross-functional, Distributed Scrum.*Quality Models:* CMMI, ISO 9001, Six Sigma, TMMi.*QA Tools:* Sonar Qube, Jenkins, Jira, Selenium, JUnit.*Closure Automation:* Confluence Documentation, Retrospectives.*Case Study:* Quality Management in Enterprise Software (Microsoft/IBM).*Hands-On:* Prepare Project Closure Report & Retrospective Summary. |

| **Text Books** | |
|---|---|
| T1 | Software Project Management Bob Hughes, Mike Cotterell, Rajib Mall TMH 6th 2018 |
| T2 | Project Management and Tools & Technologies – An overview Shailesh Mehta SPD 1st 2017 |
| **Reference Books** | |
| R1 | Software Project Management Walker Royce Pearson 2005 |
| R2 | Software Project Management by Bob Hughes, Mike Cotterell, Rajib Mall (Author), Mcgraw Hill Education (Publisher) |
| **Useful Links** | |
| 1 | https://www.youtube.com/watch?v=GczzbyKoeAU |
| 2 | https://onlinecourses.nptel.ac.in/noc22_cs107/preview?utm_source=chatgpt.com |
| 3 | https://onlinecourses.nptel.ac.in/noc24_mg01/preview |

| Sr. no. | Course Outcomes | CL | Class Session |
|---|---|---|---|
| 1 | **Understand** software project management concepts, lifecycle, project charter, portfolio evaluation and Agile-Scrum fundamentals. | 2 | 9 |
| 2 | **Apply** appropriate software process models and effort estimation techniques for various project scenarios. | 3 | 9 |
| 3 | **Develop** project activity plans, scheduling, critical path charts and risk mitigation strategies. | 4 | 9 |
| 4 | **Monitor and control** project progress using cost, earned value analysis, change control and contract handling. | 4 | 9 |
| 5 | **Demonstrate** team collaboration, quality assessment, model compliance and prepare complete project closure documentation. | 4 | 9 |

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## Fourth Year (Semester-VIII) B.Tech. (CSE)

### Course Code: BCS34807 Predictive Analysis

| Teaching Scheme | |
|---|---|
| **Lectures** | 4 Hrs/week |
| **Tutorial** | - |
| **Total Credit** | 4 |

| Examination Scheme | |
|---|---|
| **CT-1** | 15 Marks |
| **CT-2** | 15 Marks |
| **CA** | 10 Marks |
| **ESE** | 60 Marks |
| **Total** | 100 Marks |
| Duration of ESE: 03Hrs 00Min. | |

**Course Objective:**

| | |
|---|---|
| 1 | Understand and Apply Regression Techniques |
| 2 | Master Non-Linear Regression and Model Transformation |
| 3 | Analyze and Interpret Panel Data Models and Dummy Variables |
| 4 | Utilize Forecasting and Time Series Analysis Techniques |
| 5 | Explore Data Mining and Machine Learning for Business Insights |

**Course Contents**

| | |
|---|---|
| **Unit I** | **Simple Regression Analysis**: Concept Fundamentals of Regression Analysis Requirements in Regression Model Building Model Diagnostics Interpretation of Regression results for Management Decision. Multiple Regression Analysis: Concept Significance of Multiple Regression Analysis Structure of Model Estimation Testing Rule of Multiple Regression Analysis |
| **Unit II** | **Non-Linear Regression Analysis:** Concept Types of Non-linear Regression Models-Model Transformation Difference between Linear and Non-linear Regression Models. Diagnostics of Regression Modelling: Model Diagnostics Multicollinearity Autocorrelation |
| **Unit III** | **Dummy modelling and Panel Data Model Dummy modeling:** Dummy independent modelling-linear probability Model-Logit Model-Probit model Panel Data Model: Concept - Panel Data Models Fixed Effects Model Random Effects Model Forms of Panel Data Models - Applications to use Panel Data Models. |
| **Unit IV** | **Forecasting and Machine Learning:** Time Series Forecasting: Concept Forecasting Techniques Measures of Forecast Error Trend Analysis Time Series Models Auto Regressive Model Applications of Time Series Models. Machine Learning: Concept Predictive Analysis under Machine Learning Model of Artificial Neural Networks (ANN) Model of Random Forest Model of Support Vector Machine Assumptions under Machine Learning. |
| **Unit V** | **Data Mining and Simulation:** Data Mining: Concept Data Interpretation Data Reduction Classification and Clustering Techniques Association Rule Mining Cause and Effect Model. |

**Text Books**

| | |
|---|---|
| T1 | Gujarati, D. N., & Porter, D. C. (2020). *Basic Econometrics* (5th Edition). |
| T2 | Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate Data Analysis* (8th Edition). |

| Reference Books | |
|---|---|
| R1 | Wooldridge, J. M. (2020). Introductory Econometrics: A Modern Approach (7th Edition). |
| R2 | James, G., Witten, D., Hastie, T., &Tibshirani, R. (2013). An Introduction to Statistical Learning: With Applications in R. |
| **Useful Links** | |
| 1 | https://nptel.ac.in/courses/111105042 |
| 2 | https://nptel.ac.in/courses/111104074 |
| 3 | http://www.youtube.com/watch?v=oh4hmT-3BWM |
| 4 | http://www.youtube.com/watch?v=5aMc1SKYbox |

| Sr. no. | Course Outcomes | CL | Class Session |
|---|---|---|---|
| 1 | **Understand** and apply various regression techniques to analyze relationships among variables. | 2 | 9 |
| 2 | **Demonstrate** proficiency in non-linear regression and model transformation for complex data patterns. | 3 | 9 |
| 3 | **Analyze** and interpret panel data models and incorporate dummy variables for categorical effects. | 3 | 9 |
| 4 | **Utilize** forecasting and time series analysis methods to predict future trends.. | 4 | 9 |
| 5 | **Apply** data mining and machine learning techniques to derive meaningful business insights | 4 | 9 |

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## Fourth Year (Semester-VIII) B.Tech. (CSE)

### Course Code:BCS34808 (DevOps)

| Teaching Scheme | |
|---|---|
| **Lectures** | 4 Hrs/week |
| **Tutorial** | - |
| **Total Credit** | 4 |

| Examination Scheme | |
|---|---|
| **CT-1** | 15 Marks |
| **CT-2** | 15 Marks |
| **CA** | 10 Marks |
| **ESE** | 60 Marks |
| **Total** | 100 Marks |
| Duration of ESE: 03Hrs 00Min. | |

**Course Objective:**

| | |
|---|---|
| 1 | To understand the fundamental concepts, principles, and benefits of DevOps. |
| 2 | To explore GitHub integration for collaborative software development. |
| 3 | To integrate Selenium with Maven and Jenkins for automated testing. |
| 4 | To explore Docker commands, port binding, storage, volume, registry, compose, and swarm for orchestration. |
| 5 | To develop and customize dashboards in Grafana for pipeline and performance monitoring. |

**Course Contents**

| | |
|---|---|
| **Unit I** | **Introduction to DevOps Introduction**: Architecture, Lifecycle, Workflow Principles, DevOps Tools, Concept of Automation, Engineering, Pipeline Methodology, DevOps Vs Agile. |
| **Unit II** | **Continuous Development Code and Build Tools:** Version Control Using GIT: Introduction, Features, benefits, GitHub, staging and commits, undoing changes, inspecting changes, branching and merging, collaborating: fetch, pull and push.<br>Building Tools Mavens: Introduction to maven, Architecture, integration, plugin management, master-slave architecture, delivery pipeline vs declarative pipeline |
| **Unit III** | **Testing/Continuous Integration/Continuous Deployment Selenium:** Basic terminology, features, limitations, selenium vsQTP, selenium tool suite, selenium with maven/Jenkins Jenkins: Introduction, work flow, continuous integration, advantage and disadvantages, architecture: master-slave, setup with github vs maven, configuration, management, user management, pipeline, notification,<br>reporting, code analysis, distributed builds, automated deployment, metrics and trends,servermaintenance,continuousdeployment,Jenkinsmanagingplugin. |
| **Unit IV** | **Operate using Ansible /Puppet/ Docker /Kubernetes/Ansible:** Configuration and orchestration tools include **Ansible, Puppet, Docker and Kubernetes**. Ansible covers workflow, architecture, commands, playbooks, roles, modules and YAML-based automation. Puppet includes architecture, installation, modules, fileserver and classes. Docker focuses on containerization, architecture, CLI, volumes, registry and Compose/Swarm. Kubernetes includes Pods, ReplicaSets, Deployments, scaling, rollbacks, services, ConfigMaps, Secrets and StatefulSets. |
| **Unit V** | **Monitoring Tools: Nagios**: Introduction, features of Nagios, architecture: schedular, GUI, plugin, installation of Nagios core, advantage and disadvantage.<br>**Prometheus and Grafna:** Introduction to Prometheus and Grafana, Prometheus and GrafanaSetup, Monitoring using Prometheus, Dashboard Visualization using Grafana, creating Dashboard to monitor the Pipeline |

| Text Books | |
|---|---|
| T1 | A Practical Guide to Continuous Delivery, Eberhard Wolf, Addison-Wesley 2017 |
| T2 | Devops with windows server 2016, Ritesh Modi ,PACKT Publishing enterprise |
| **Reference Books** | |
| R1 | The Devops 2.0 Tool Kit Vikt or Farcic PACKTBIRMINGHAM-MUMBAI Publishing enterprise |
| R2 | Implementing Devops with Ansible 2 Joathan Mc Allister PACKT BIRMINGHAM-MUMBAI Publishing enterprise |
| **Useful Links** | |
| 1 | https://www.youtube.com/watch?v=sz5gfkwPITE&list=PLhNrFKat_aeIogDQc0xnEiZ2TLDKzZCEM |
| 2 | https://www.youtube.com/watch?v=hQcFE0RD0cQ&list=PL9ooVrP1hQOE5ZDJJsnEXZ2upwK7aTYiX |

| Sr. no. | Course Outcomes | CL | Class Session |
|---|---|---|---|
| 1 | **CO1:** Explain DevOps architecture, lifecycle, workflow and compare with Agile. | 2 | 9 |
| 2 | **CO2:** Utilize Git/GitHub for version control with branching, merging and collaboration. | 2 | 9 |
| 3 | **CO3:** Build projects using Maven with plugins and automated pipelines.. | 3 | 9 |
| 4 | **CO4:** Implement CI/CD using Selenium and Jenkins for automated testing and deployment. | 4 | 9 |
| 5 | **CO5:** Deploy automation/orchestration tools (Ansible, Puppet, Docker, Kubernetes) and monitor with Nagios, Prometheus, Grafana. | 4 | 9 |

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## Fourth Year (Semester-VIII) B.Tech. (CSE)

Course Code:BCS34809 (Full Stack Development)

| Teaching Scheme | |
|---|---|
| **Lectures** | 4 Hrs/week |
| **Tutorial** | - |
| **Total Credit** | 4 |

| Examination Scheme | |
|---|---|
| **CT-1** | 15 Marks |
| **CT-2** | 15 Marks |
| **CA** | 10 Marks |
| **ESE** | 60 Marks |
| **Total** | 100 Marks |
| Duration of ESE: 03Hrs 00Min. | |

**Course Objective:**

| | |
|---|---|
| 1 | To Understand the concept of .NET full Stack Development using C#, ASP, MVC Controller. |
| 2 | To Applytheconceptin.NET full stack development. |
| 3 | To Design various applications using .NET framework. |
| 4 | To develop a basic web application using the ASP.NET MVC framework. |
| 5 | To handle exceptions effectively using MVC's exception-handling mechanisms. |

**Course Contents**

| | |
|---|---|
| **Unit I** | **Introduction.NET:** Introduction NET, application and structure of application, Object Oriented Programming Concept in C#. Overview .NET Core, architecture, CLR, CTS, CLS, application structure and execution process. Fundamental programming concepts in C# including OOP principles such as classes, objects, inheritance, polymorphism, abstraction and encapsulation. Development of basic console applications using namespaces, assemblies and DLLs. |
| **Unit II** | **Introduction to Database:** Introduction concepts of LINQ, SQL Server and database objects including tables, triggers, stored procedures, functions and views. SQL operations covering DDL, DML, DCL, TCL and CRUD functionality. Practical handling of queries, joins, functions, database designing and trigger implementation. |
| **Unit III** | **Introduction to Front end:** HTML webpage construction, CSS styling, layout designing, DOM manipulation and form creation using JavaScript. ADO.NET connectivity for linking .NET applications with databases. Practical work includes frontend interface design, input validation, styling and integration with backend through ADO.NET. |
| **Unit IV** | **MVC:** MVC structure with Model, View and Controller interaction flow, routing mechanism and request-response lifecycle. Configuration through Program.cs and Startup.cs, middleware setup, controller creation and view rendering. Practical development of an MVC application from startup to output screen, including CRUD operations. |
| **Unit V** | **Implementation Data Validation:** Validation techniques using annotations, validation summary, exception handling and structured error flow management. API routing, parameter binding, JSON response generation and Postman-based API testing. Implementation includes validated form submission, custom error handling, Web API creation, route configuration and project-level integration. |

**Text Books**

| | |
|---|---|
| T1 | C# 9 and .NET 5 – Modern Cross-Platform Development: Build intelligent apps, websites,andserviceswithASP.NETCore5,Blazor,andEntityFrameworkCore using Visual Studio Code" by Mark J. Price - This book covers the introduction to.NET, object-oriented programming in C#,andASP.NET Core MVC development. |

| | |
|---|---|
| T2 | HTML and CSS: Design and Build Websites" by Jon Duckett –This book offer sa beginner-friendly introduction to HTML and CSS for frontend web development. |
| **Reference Books** | |
| R1 | Book Title: "C# 9 and .NET 5 – Modern Cross-Platform Development: Build intelligentapps,websites,andserviceswithASP.NETCore5,Blazor,and Entity Framework Core using Visual Studio Code" Author: Mark J. Price |
| R2 | Book Title:"MicrosoftSQLServer2019:ABeginner'sGuide,Seventh Edition" Author: Dusan Petkovic |
| **Useful Links** | |
| 1 | https://www.youtube.com/watch?v=HOhW3BcD4y8 |
| 2 | https://www.youtube.com/watch?v=bMd1sw-2RGg |

| Sr. no. | Course Outcomes | CL | Class Session |
|---|---|---|---|
| 1 | **CO1:** Understand .NET framework components, CLR, CTS/CLS and OOP principles in C#. | 2 | 9 |
| 2 | **CO2:** Apply OOP concepts to develop basic C# console applications using namespaces and assemblies. | 3 | 9 |
| 3 | **CO3:** Implement SQL Server operations using LINQ, triggers, stored procedures and CRUD queries | 3 | 9 |
| 4 | **CO4:** Design and integrate front-end interfaces using HTML, CSS, JavaScript with ADO.NET connectivity. | 3 | 9 |
| 5 | **CO5:** Develop and validate MVC applications with routing, controllers, CRUD operations, exception handling and Web API testing through Postman. | 3 | 9 |

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## Fourth Year (Semester-VIII) B.Tech. (CSE)

### Course Code: BCS34810 (Information& Cyber Security Lab)

| Teaching Scheme | |
|---|---|
| **Practical** | 2 Hrs/week |
| **Total Credit** | 1 |

| Examination Scheme | |
|---|---|
| **CA** | 25 Marks |
| **ESE** | 25 Marks |
| **Total** | 50 Marks |
| Duration of PCC: 02 Hrs 00 Min. | |

**Course Objective**

Students will be able to

| | |
|---|---|
| 1 | To understand the fundamentals, legal and ethical aspects, and management standards of information security. |
| 2 | To learn symmetric and asymmetric cryptographic techniques, key management, and encryption practices used in industry. |
| 3 | To explore authentication methods, hashing, digital signatures, and identity management systems. |
| 4 | To implement and analyse network, transport-layer, and perimeter security mechanisms with practical tools. |
| 5 | To study and apply web, email, and e-commerce security techniques aligned with modern cyber practices. |

| Sr. No. | List of Experiment | CO |
|---|---|---|
| **1** | To Implement Classical Caesar Cipher and analyze its security weakness using frequency analysis. | 1 |
| **2** | Design and implement Playfair Cipher and evaluate its resistance against brute-force attacks using Python. | 1 |
| **3** | Write a program to Implement RSA encryption/decryption and key generation using Python's cryptography library and OpenSSL | 2 |
| **4** | To Implement secure key exchange between two systems using Diffie–Hellman algorithm. | 2 |
| **5** | Write a program to generate and compare MD5 and SHA256 hashes for a given text. | 3 |
| **6** | Write a program to implement digital signature creation and verification using RSA keys. | 3 |
| **7** | Write a program to implement Create a secure client–server communication channel using SSL sockets. | 4 |

| | | |
|---|---|---|
| 8 | Write a program to detect suspicious packets containing keywords like "login" or "password". | 4 |
| 9 | Write a program to detect SQL injection attempts by scanning input strings. | 5 |
| 10 | Simulate PGP-style encryption and decryption between sender and receiver. | 5 |
| **Text Books** | | |
| 1 | William Stallings "Cryptography and network security, principles and practices", Pearson. | |
| 2 | Robert Bragge, Mark Rhodes, Heithstraggberg "Network Security, The Complete Reference", Tata McGraw Hill Publication | |
| **Reference Books** | | |
| 1 | Bernard Menezes, —Network Security and Cryptography, Cengage Learning. | |
| 2 | Nina Godbole, Information System Security, Wiley India Pvt.Ltd., ISBN978-81-265-1692-6. | |
| 3 | Charlie Kaufman, Radia Perlman and mike speciner, "Network security, private communication in a public world" | |
| **Useful Links** | | |
| 1 | https://nptel.ac.in/courses/106/105/106105031/ | |
| 2 | https://nptel.ac.in/courses/106/106/106106129/ | |

| Sr. no. | Course Outcomes | CL | Class Session |
|---|---|---|---|
| 1 | **Explain** the principles, legal aspects, and architecture of information security and prepare a basic security policy aligned with industry standards. | 2 | 9 |
| 2 | **Implement** symmetric and asymmetric encryption techniques and demonstrate secure key management using standard tools. | 2 | 9 |
| 3 | **Apply** authentication and hashing techniques and configure digital signatures and identity management systems. | 4 | 9 |
| 4 | **Configure** and analyze firewalls, IDS/IPS, and secure communication protocols for enterprise networks. | 4 | 9 |
| 5 | **Evaluate** and implement web, email, and e-commerce security mechanisms using industry tools and frameworks. | 4 | 9 |

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