An Autonomous Institute Affiliated to RTM Nagpur University

SCHEME OF INSTRUCTION & SYLLABI

Programme: Computer Science & Engineering

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

Semester - VII

| Sr. | Course Course | | Course Title | LT | | P | Contact | Credits | EXAM SCHEME | | | | |
|-----|---------------|--|-------------------------------------|----|---|---|---------|---------|-------------|-----|-------|-----|-------|
| No. | Category | Code | Course Title | L | I | Γ | Hrs./Wk | Credits | CT1 | CT2 | TA/CA | ESE | TOTAL |
| 1 | PCC | BCS4701 | Distributed Operating System | 3 | ı | ı | 3 | 3 | 15 | 15 | 10 | 60 | 100 |
| 2 | PCC | BCS4702 | Information & Computer Security | 3 | - | - | 3 | 3 | 15 | 15 | 10 | 60 | 100 |
| 3 | PCC | BCS4703 | Distributed Operating System Lab | - | - | 2 | 2 | 1 | ı | ı | 25 | 25 | 50 |
| 4 | PCC | BCS4704 | Information & Computer Security Lab | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 25 | 25 | 50 |
| 5 | PROJ | BCS4705 Seminar based on Emerging Courses* | | - | 1 | 2 | 2 | 2 | - | - | 25 | 25 | 50 |
| 6 | PEC | BCS4706-09 | Professional Elective-V | 3 | 1 | ı | 3 | 3 | 15 | 15 | 10 | 60 | 100 |
| 7 | PEC | BCS4710-13 Professional Elective-VI | | 3 | ı | - | 3 | 3 | 15 | 15 | 10 | 60 | 100 |
| 8 | OEC | B\$\$XX01-14 Open Elective-III | | 3 | ı | ı | 3 | 3 | 15 | 15 | 10 | 60 | 100 |
| 9 | OEC | B\$\$XX01-14 Open Elective-IV | | 3 | 1 | ı | 3 | 3 | 15 | 15 | 10 | 60 | 100 |
| 10 | MCC | BAU4707 Behavioral and Interpersonal Skills | | 2 | - | ı | 2 | Audit | ı | ı | - | - | - |
| | | | Total | 20 | - | 6 | 26 | 22 | 90 | 90 | 135 | 435 | 750 |

^{*}There will be two presentations, based on seminar topic to be selected in consultation with guide preferably based on emerging trends.

L-Lecture T-Tutorial P-Practical

CT1- Class Test 1 TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2 ESE- End Semester Examination (For Laboratory End Semester performance)

| Course Category | HSMC (Hum., Soc. Sc, Mgmt.) | BSC (Basic Sc.) | ESC (Engg. Sc.) | PCC (Programme Core courses) | PEC (Programme Elective courses) | OEC (Open Elective courses from other discipline) | Project / Seminar / Industrial Training | MCC (Mandatory Courses) |
|-----------------|--------------------------------|--------------------|-----------------------|---------------------------------|-------------------------------------|--|---|----------------------------|
| Credits | | | - | 08 | 06 | 06 | 02 | Yes |
| Cumulative Sum | 06 | 26 | 18 | 59 | 18 | 12 | 06 | |

PROGRESSIVE TOTAL CREDITS: 123+22 =145

Deptt (CSE) Tulsiramji Galkwad-Patil College of Engineering & Technology Unbagaon, Washer Road, Nagpur

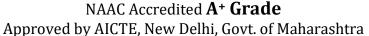
Dean Academics
Tulsiramji Gaikwad-Patil
College Of Engineering
and Technology, Nagpur

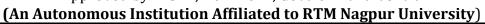
Primeina bal Tulsiramji Gaikwad-Patil College Of Engineering &



Wardha Road, Nagpur-441 108





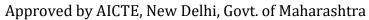


| | | Fourth ` | Year B. Tech (Sev | en Semester) | | | | |
|----------|---------------|---|---|---------------------------|---------------------|--|--|--|
| | | I | BCS4701: Distributed | Operating System | | | | |
| Teachi | ing Sch | | | Examination | n Scheme | | | |
| Lectur | es | 4 Hr / Week | | ESE | 60 Marks | | | |
| Tutori | al | - | | CIE | 40 Marks | | | |
| Practio | cal | - | | Total | 100 Marks | | | |
| Theory | y Cred | its: 4 | | Duration of | Exam: 3 Hours | | | |
| Course | e Obje | ctives | | - | | | | |
| The Ob | ojective | es of this course is: | | | | | | |
| 1 T | o Unde | erstand Distributed OS | . like models, features | , concept, design issues | and foundation | | | |
| 1. of | f distri | buted systems. | | | | | | |
| 2. T | o Unde | erstand distributed mu | ual exclusion. | | | | | |
| 3. T | o Anal | yze the deadlock detec | ction and Distributed se | cheduling of distributed | OS. | | | |
| 4. H | lave Su | ifficient knowledge ab | out file access and dist | ributed shared memory | • | | | |
| Course | e Outc | omes | | | | | | |
| At the | end of | the unit, students will | be able to: | | | | | |
| BCS47 | ′01 .1 | Understand concept, | design issues and four | ndation of distributed sy | stems. | | | |
| BCS47 | 701 .2 | Demonstrate distribu | ited mutual exclusion. | | | | | |
| BCS47 | 701 .3 | Analyze the deadlock | detection and Distrib | uted scheduling of distri | buted OS. | | | |
| BCS47 | '01 .4 | Discuss file access ar | d distributed shared m | emory. | | | | |
| BCS47 | 01.5 | Identify fault toleran | ce and failure recovery | ·. | | | | |
| | <u> </u> | | Course Contents | 5 | | | | |
| | | Fundamentals: I | ntroduction, Models | and Features, Concep | ot of Distributed | | | |
| | | Operating system, Issues in Design of a Distributed Operating System. | | | | | | |
| Un | nit I | Foundations of Distributed System: Limitations of Distributed Systems, | | | | | | |
| | | Lamport's logical clocks, Vector clocks, Causal ordering of messages, Global state recording, Cuts of a Distributed Computation, Termination Detection. | | | | | | |
| | | - | Distributed Mutual Exclusion: Requirement of Mutual Exclusion Algorithm, Non- | | | | | |
| Uni | it II | Token Based Algorithms, Token Based Algorithms, Comparative Performance Analysis. | | | | | | |
| | | Distributed Dead | lock Detection: Intro- | duction, Deadlock Hand | dling strategies in | | | |
| Uni | 4 TTT | Distributed System | , Centralized and Dist | ributed Deadlock Detec | tion Algorithms. | | | |
| Unit III | | Distributed Schedu | Distributed Scheduling: Introduction, Issues in Load Distributing, Components of a | | | | | |
| | | Load Distributing A | Load Distributing Algorithm, Load Distributing Algorithms. | | | | | |
| | | | • | to Distributed File Syst | em, Architecture, | | | |
| ∐ni | it IV | | r Building Distributed | • | | | | |
| | | | • | Architecture of DSM | systems, Memory | | | |
| | | coherence and Coh | erence Protocols. | | | | | |
| Un | it V | | • | oncurrent systems, Co | | | | |
| Unit V | | Checkpoints, Synchronous check pointing and Recovery, Asynchronous check | | | | | | |



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| Ī | pointin | g and Recove | ery. | | | | | |
|---|---------|-------------------|---------------|--------|------------|--------|--------|-----------|
| | Fault | Tolerance: | Introduction, | Commit | Protocols, | Static | Voting | Protocol, |
| | Dynam | ic Voting Pro | otocol. | | | | | |

| Text Book | Text Books | | | | | |
|-----------|--|--|--|--|--|--|
| Т 1 | Advanced Concepts in Operating Systems, Mukesh Singhal and Niranjan Shivaratri, | | | | | |
| 1.1 | Tata McGraw Hill, 2001. | | | | | |
| Т 2 | Distributed Systems - Concepts and Design, Coulouris, Dollimore and Kindberg, 5th Edition, | | | | | |
| 1.2 | Addison-Wesley, 2012. | | | | | |
| Reference | Reference Books | | | | | |
| R.1 | Distributed Operating System, Andrew S. Tanenbaum, Pearson Education, 2003. | | | | | |

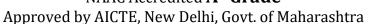
| Ī | Useful Links | | | |
|---|--|--|--|--|
| | 1 https://nptel.ac.in/courses/106/106106168/ | | | |
| | 2 | https://onlinecourses.nptel.ac.in/noc21_cs87/preview | | |

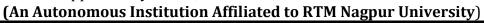
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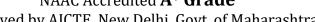


| | | Fourth | Year B.Tech (Seven Sei | nester) | |
|------------------|----------------|---|---|--|--|
| | | E | CS4702: Information & Co | omputer Security | |
| Teaching S | cheme | | | Examination Sche | eme |
| Lectures | | 4 Hr / Week | | ESE | 60 Marks |
| Tutorial | | - | | CIE | 40 Marks |
| Practical | | - | | Total | 100 Marks |
| Theory Cr | edits: 4 | | | Duration of Exam | : 3 Hours |
| Course Ob | jectives | | 1 | | |
| The Object | ives of th | nis course is: | | | |
| 1. Expla | in the ob | jectives of infor | mation security | | |
| 2. Disco contro | | explain variou | s authentication and author | rization methods wi | ith the access |
| 3. Learn develo | | t be able to ap | ply various cryptographic | techniques to secur | e the systems |
| 4. Discu | ss Web s | security and Fire | walls | | |
| Course Ou | tcomes | | | | |
| At the end | of the un | it, students will | be able to : | | |
| BCS4702.1 | Under Encry | | of Information Security, OSI | Security Architecture | e, Conventional |
| BCS4702.2 | Analy | ze of various cryp | ptography algorithms, key mana | igement. | |
| BCS4702.3 | | | epts of message Authentications, PKI Architecture, Certificate | | ns, Public Key |
| BCS4702.4 | | ate different Netv | | Authentication. | |
| BCS4702.5 | | | nerability, Electronic Payment, | Electronic Mail Securi | ty |
| | | | Course Contents | | |
| Unit I Conventi | | tributes of s thorization, integ SI Security Arc curity services, A conventional End ssical ciphers, S | drity, non-reproduction. hitecture: attacks, services and model of Internetwork Security architecture. | access control, on mechanisms. Security. ion Techniques and | confidentiality, curity Attacks, l Problems on |
| Unit II I | | Introduction to Secret key and cryptography: Encrypt given messages using DES, AES, IDEA, Problems on cryptography algorithms, Principles, finite fields, stream cipher, block cipher modes of operation, DES, Triple DES, AES, IDEA, RC5, key distribution. Introduction to Public key and Cryptography: Encrypt given messages using ECC, Problems on key generation, cryptography algorithms Principles, Introduction to number theory, RSA- algorithm, security of RSA, Key management- Diffie-Hellman key exchange, man-in-the-middle attack, Elliptical curve cryptography | | | |



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| Unit III | Message Authentication and Hash Functions: Authentication Requirements and Functions, Hash Functions and their Security, MD5 Message Digest Algorithm, Kerberos. Key Management: Digital Certificates-Certificate types, X.509 Digital | | | |
|----------|---|--|--|--|
| | Certificate format, Digital Certificate in action, Certificate Authentication. | | | |
| Unit IV | Introduction to Network Security: Network, Transport and Periphery Security, Study of IPSEC, TLS, and SSL. Firewalls - design principles, trusted systems, Intrusion Detection System, Intrusion Prevention System. Implementation and analysis of IPSEC, TLS and SSL, Introduction to cryptography - Classical cryptography. | | | |
| Unit V | Software Vulnerability: Phishing, Buffer Overflow, Cross-site Scripting (XSS), SQL Injection. Electronic Payment: Payment Types, Enabling Technologies-Smart Cards and Smart Phones, Cardholder Present E-Transaction-Attacks, Chip Card Transactions, Payment over Internet-Issues and Concerns, Secure Electronic Transaction, Online Rail Ticket Booking. Electronic Mail Security: Pretty Good Privacy, S/MIME. | | | |

| Text Books | Text Books | | | | | |
|---|---|--|--|--|--|--|
| T.1 Cryptography and network security - principles and practices, William Stallings, Pearson Education, 2002. | | | | | | |
| T.2 | T.2 Network Security and Cryptography, Bernard Menezes, Cengage Learning. | | | | | |
| Reference | Reference Books | | | | | |
| R.1 | Information System Security, Nina Godbole, Wiley India, 2008. | | | | | |
| R.2 | Network security, private communication in a public world, Charlie Kaufman, Radia Perlman and Mike Speciner, Prentice Hall, 2002. | | | | | |

| Useful | Useful Links | | | |
|--------|--|--|--|--|
| 1 | https://nptel.ac.in/courses/108/104/108104139/ | | | |
| 2 | http://nptel.ac.in/courses/117107095 | | | |
| 3 | http://nptel.ac.in/courses/117103064 | | | |

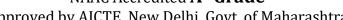
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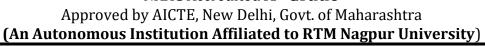
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| | Fourth Year B.Tech. (Seven Semester) | | | | | | | |
|--|---|--|------------------------------------|--|----------------|--|--|--|
| BCS4706: Full Stack Developer | | | | | | | | |
| Teaching S | Scheme | | | Examination Scl | neme | | | |
| Lectures | | 4Hr / Week | | ESE | 60 Marks | | | |
| Tutorial | | - | | CIE | 40 Marks | | | |
| Practical | | - | | Total | 100 Marks | | | |
| Theory Cr | edits: 4 | | | Duration of Exa | m:3 Hours | | | |
| Course Ob | jectives | | | | | | | |
| The Object | ives of th | nis course is: | | | | | | |
| 1. Under | stand the | e concept of .NE | T full Stack Development using | g C#, ASP, MVC C | Controller. | | | |
| 2. Apply | the con | cept in .NET full | stack development. | | | | | |
| | n various | annlications usir | g .NET framework. | | | | | |
| Course Ou | | applications usin | ig .ivE1 framework. | | | | | |
| | | it, students will l | a abla to : | | | | | |
| BCS4706.1 | | | ramework its architecture, and it | e role in modern so | ftware | | | |
| DC54700.1 | | opment. | ranicwork its arcintecture, and it | s fole in modern so | itwaic | | | |
| BCS4706.2 | | Explore database objects such as tables, views, stored procedures, functions, and | | | | | | |
| | trigge | | | | | | | |
| BCS4706.3 | _ | Implement interactivity with JavaScript programming fundamentals, including variables, | | | | | | |
| BCS4706.4 | | functions and event. Apply best practices best practices in MVC development, including code organization, | | | | | | |
| DC34700.4 | | separation of concerns, dependency injection, and testability, to build robust and | | | | | | |
| | - | maintainable MVC applications. | | | | | | |
| BCS4706.5 | Apply | data validation te | chniques in ASP.NET Core API c | ontrollers to validate | request data. | | | |
| | l | | Course Contents | | | | | |
| Unit I | | | Γ: Introduction NET, application | on and structure o | f application, | | | |
| | | Object Oriented Programming Concept in C#. | | | | | | |
| Unit II | | Introduction to Database: LINO, SQL Sever, DataBase Object introduction, Sql, Triggers | | | | | | |
| | Int | <u></u> | rontand: ADO NET HTMI | CSS III and Fro | nt End Java | | | |
| Unit III | | Introduction to Frontend: ADO.NET, HTML, CSS, UI and Front End, Java Script | | | | | | |
| I In:4 IX | MVC: What is MVC components Interaction among components Prog | | | | | | | |
| Unit IV | | and StartUp.cs file, Configure Server, Controllers, Creating first app in MVC | | | | | | |
| WT 1. WT | | | Data Validation: Implementing | | | | | |
| Unit V | | and Validation Summary and Exception handling mechanism in MVC, API | | | | | | |
| routing, parameter binding Text Books | | | | | | | | |
| TCAL DOUR | | nd NET 5 Ma | dern Cross-Platform Davalonm | ent: Ruild intallice | ent appe | | | |
| | | | | n Cross-Platform Development: Build intelligent apps, ASP.NET Core 5, Blazor, and Entity Framework Core | | | | |
| T.1 | | | | <u> </u> | | | | |
| | _ | using Visual Studio Code" by Mark J. Price - This book covers the introduction to .NET, object-oriented programming in C#, and ASP.NET Core MVC development. | | | | | | |
| T.2 | | • | 2019: A Beginner's Guide, Sev | | • | | | |



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Department of Computer Science and Engineering

| | Petkovic - This book provides a solid introduction to SQL Server, database objects, | | | | | |
|-----------|--|--|--|--|--|--|
| | SQL querying, and triggers | | | | | |
| T.3 | "HTML and CSS: Design and Build Websites" by Jon Duckett - This book offers a beginner-friendly introduction to HTML and CSS for frontend web development. | | | | | |
| 1.5 | beginner-friendly introduction to HTML and CSS for frontend web development. | | | | | |
| Reference | Books | | | | | |
| | Book Title: "C# 9 and .NET 5 – Modern Cross-Platform Development: Build | | | | | |
| R.1 | intelligent apps, websites, and services with ASP.NET Core 5, Blazor, and Entity | | | | | |
| | Framework Core using Visual Studio Code" Author: Mark J. Price | | | | | |
| R.2 | Book Title: "Microsoft SQL Server 2019: A Beginner's Guide, Seventh | | | | | |
| K.2 | Edition"Author: Dusan Petkovic | | | | | |

| Useful | Links |
|--------|---|
| 1 | https://www.youtube.com/watch?v=HOhW3BcD4y8 |
| 2 | https://www.youtube.com/watch?v=bMd1sw-2RGg |

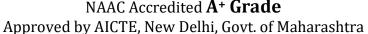
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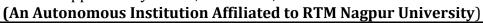
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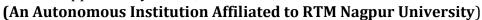
| | | Fourth Year B.Tech | . (Seventh Semester) | | | | |
|---------|------------------------------------|--|--|--|--|--|--|
| | | BCS4707: Software | Project Management | | | | |
| Tea | Teaching Scheme Examination Scheme | | | | | | |
| Lec | ctures | 3 Hr / Week | ESE | 60 Marks | | | |
| Tut | torial | - | CIE | 40 Marks | | | |
| Pra | ectical | - | Total | 100 Marks | | | |
| The | eory Credits | s:3 | Duration o | of Exam: 3 Hours | | | |
| Cor | urse Object | ives | - | | | | |
| The | Objectives | of this course is: | | | | | |
| 1. | To unders | tand the Software Project Planning | g and Evaluation techniques an | d plan and manage | | | |
| 1. | | each stage of the software develo | | | | | |
| 2. | | bout the activity planning and risk nd control software deliverables. | management principles and m | anage software | | | |
| | 1 3 | p skills to manage the various pha | ses involved in project manage | ment and neonle | | | |
| 3. | | ent and to deliver successful softw | | | | | |
| | goals. | | | | | | |
| Cor | urse Outcon | nes | | | | | |
| | | e unit, students will be able to: | | | | | |
| F | BCS4707.1 | | Understand Project Management principles while developing software. | | | | |
| F | BCS4707.2 | Classify extensive knowledge about the basic project management concepts, | | | | | |
| | | framework and the process models. | | | | | |
| E | 3CS4707.3 | Adapt adequate knowledge about software process models and software effort | | | | | |
| | | estimation technique | | | | | |
| F | 3CS4707.4 | Apply project reporting structure, project progress and tracking mechanisms | | | | | |
| | | | using project management principles. | | | | |
| E | BCS4707.5 | Evaluate risks involved in various project activities. | | | | | |
| - | | | Contents | 0.00.00 | | | |
| Unit I | | Management (SPM), Need Ider Management Cycle, SPM Object Software Project Planning, Plan plan, Structure of a Software | roduction and Software Project Planning: Fundamentals of Software Project nagement (SPM), Need Identification, Vision and Scope document, Project nagement Cycle, SPM Objectives, Management Spectrum, SPM Framework tware Project Planning, Planning Objectives, Project Plan, Types of project, Structure of a Software Project Management Plan, Software project mation, Estimation methods, Estimation models, Decision process. | | | | |
| Unit II | | Project Organization and Sc Structure (WBS), Types of WE Cycle and Product Life Cycle, Scheduling Objectives, Buildin and techniques, Network Diagra Gantt Charts. (SPI), Interpretation Software Reviews, Types of R Code Reviews, Pair Programmin | SS, Functions, Activities and Ways to Organize Personnel g the project schedule, Schedus: PERT, CPM, Bar Charts ion of Earned Value Indicato deview: Inspections, Deskchedus | Tasks, Project Life , Project schedule, duling terminology : Milestone Charts, rs, Error Tracking, | | | |



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Department of Computer Science & Engineering

| | Project Monitoring and Control: Dimensions of Project Monitoring & Control, |
|----------|--|
| | Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work |
| Unit III | Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost |
| | Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of |
| | Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: |
| | Inspections, Deskchecks, Walkthroughs, Code Reviews, Pair Programming. |
| | Software Quality Assurance and Testing Objectives: Testing Principles, Test |
| | Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program |
| | Correctness, Program Verification & validation, Testing Automation & Testing |
| Unit IV | Tools, Concept of Software Quality, Software Quality Attributes, Software |
| | Quality Metrics and Indicators, The SEI Capability Maturity Model CMM), SQA |
| | Activities, Formal SQA Approaches: Proof of correctness, Statistical quality |
| | assurance, Cleanroom process. |
| | Project Management and Project Management Tools Software Configuration |
| | Management: Software Configuration Items and tasks, Baselines, Plan for |
| | Change, Change Control, Change Requests Management, Version Control, Risk |
| Unit V | Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk |
| | Management Process: Risk identification, Risk analysis, Risk planning, Risk |
| | monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE |
| | Tools, Planning and Scheduling Tools, MS-Project. |

| Text Books | Text Books | | | | |
|------------|--|--|--|--|--|
| T.1 | T.1 M. Cotterell, Software Project Management, Tata McGraw-Hill Publication. | | | | |
| T.2 | Royce, Software Project Management, Pearson Education | | | | |
| T.3 | Kieron Conway, Software Project Management, Dreamtech Press | | | | |
| Reference | Reference Books | | | | |
| R.1 | R.1 S. A. Kelkar, Software Project Management, PHI Publication. | | | | |
| R.2 | Harold R. Kerzner, Project Management "A Systems Approach to Planning, Scheduling, and Controlling" Wiley. | | | | |
| R.3 | Mohapatra, Software Project Management, Cengage Learning. | | | | |

| Useful Links | | | | | | |
|--------------|---|---|--|--|--|--|
| | 1 | https://nptel.ac.in/courses/106/105/106105218/ | | | | |
| | 2 | https://freevideolectures.com/course/4071/nptel-software-project-management | | | | |

Course Coodinator – BCS4707

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| | | Fourt | Year B.Tech (Seve | en Semester) | | | |
|---|---|---|---|--|--|--|--|
| | BCS4708: Fundamental of Augmented and Virtual Reality | | | | | | |
| Teaching Scheme | | | | Examination | n Scheme | | |
| Lectures | | 3 Hr / Week | | ESE | 60 Marks | | |
| Tute | orial | - | | CIE | 40 Marks | | |
| Pra | ctical | - | | Total | 100 Marks | | |
| The | ory Cre | dits:3 | | Duration of | Exam: 3 Hours | | |
| Cou | rse Obj | ectives | 1 | 1 | | | |
| The | Objecti | ves of this course is: | | | | | |
| 1. | | | l reality and virtual en | vironment and able to | Classify 3D user | | |
| 1. | | ce input hardware | | | | | |
| 2. | | o analyze software ages of augmented rea | | and Describe features, | , technology and | | |
| 3. | Exami | ne various 3D interac | ion techniques, design a | nd developing 3D user i | nterface | | |
| Cou | rse Out | comes | | | | | |
| At tl | he end o | f the unit, students wi | l be able to: | | | | |
| BCS | 54708 .1 | Understand virtua | reality and virtual envir | onment | | | |
| BCS | 54708 .2 | Classify 3D user interface input hardware | | | | | |
| BCS | 54708 .3 | Analyze software technologies processes | | | | | |
| BCS | 54708 .4 | Examine various 3 | O interaction techniques | , design and developing | 3D user interface | | |
| BCS4708.5 Discuss features, technology and challenges of augmented reality | | | | | | | |
| | | 1 | Course Contents | S | | | |
| Unit I Virtual Reality And Scientific landmarks of simulation, Virtual environment of the simulation | | Computer Graphics, avironments, Requireme ogies For 3d User | Real-time computer nts for VR, benefits of V | graphics, Flight Virtual reality. isplays Auditory | | | |
| Unit II 3D User Interface Input Hardware: Input device characteristics, I devices, Tracking Devices, 3D Mice, Special Purpose Input Devices, I Input, Home - Brewed Input Devices, Choosing Input Devices for 3D Interface | | es, Desktop input es, Direct Human | | | | | |
| Unit III | | Software Technolo Environment, Object Volume, Scripts and Data, LODs, Cullers Feedback, Graphical Room / Stage / Ar Available software in | gies: Database - Wo ts - Geometry, Position other attributes, VR E and Occluders, Lights and User Interface, Control tea Descriptions, World the market | rld Space, World Co on / Orientation, Hier Environment - VR Data and Cameras, Scripts, Into Panel, 2D Controls, Ha Authoring and Playba | pordinate, World varchy, Bounding abase, Tessellated eraction - Simple, ardware Controls, ack, VR toolkits, | | |
| Unit IV 3D Interaction Techniques: 3D Manipulation tasks, Manipulation Techniques are Input Devices, Interaction Techniques for 3D Manipulation, Deign Guidelines - 3 Travel Tasks, Travel Techniques, Design Guidelines - Theoretical Foundations | | | | Guidelines - 3D | | | |



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Department of Computer Science & Engineering

| | Way finding, User Centered Way finding Support, Environment Centered Way | | | | |
|---|--|--|--|--|--|
| | finding Support, Evaluating Way finding Aids, Design Guidelines - System Control | | | | |
| Classification, Graphical Menus, Voice Commands, Gestrual Commands, | | | | | |
| | Mutimodal System Control Techniques, Design Guidelines, Case Study: Mixing | | | | |
| | System Control Methods, Symbolic Input Tasks, symbolic Input Techniques, Design | | | | |
| | Guidelines, Beyond Text and Number entry. | | | | |
| | Augmented and Mixed Reality, Taxonomy, technology and features of augmented | | | | |
| | reality, difference between AR and VR, Challenges with AR, AR systems and | | | | |
| Unit V | functionality, Augmented reality methods, visualization techniques for augmented | | | | |
| Cint v | reality, wireless displays in educational augmented reality applications, mobile | | | | |
| | projection interfaces, marker-less tracking for augmented reality, enhancing | | | | |
| | interactivity in AR environments, evaluating AR systems. | | | | |

| Text Book | Text Books | | | | |
|-----------|---|--|--|--|--|
| T.1 | T.1 Alan B Craig, William R Sherman and Jeffrey D Will, "Developing Virtual Reality Applications: Foundations of Effective Design", Morgan Kaufmann, 2009. | | | | |
| T.2 | Gerard Jounghyun Kim, "Designing Virtual Systems: The Structured Approach", 2005. | | | | |
| T.3 | Doug A Bowman, Ernest Kuijff, Joseph J LaViola, Jr and Ivan Poupyrev, "3D User Interfaces, Theory and Practice", Addison Wesley, USA, 2005. | | | | |
| Reference | Books | | | | |
| R.1 | Oliver Bimber and Ramesh Raskar, "Spatial Augmented Reality: Meging Real and Virtual Worlds", 2005 | | | | |
| R.2 | William R Sherman and Alan B Craig, "Understanding Virtual Reality: Interface, Application and Design (The Morgan Kaufmann Series in Computer Graphics)". Morgan Kaufmann Publishers, San Francisco, CA, 2002 | | | | |

| Useful Links | |
|--------------|--|
| 1 | https://nptel.ac.in/courses/106/106/106106138/ |

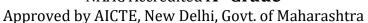
Course Coodinator – BCS4708

H.O.D



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| Fourth Year B.Tech (Seven Semester) | | | | | | |
|--|---|--|---------------------------|---------------------|---|--|
| | BCS4709: Deep Learning | | | | | |
| Teaching Scheme Examination Scheme | | | | | n Scheme | |
| Lectures | 3 Hr / | Week | | ESE | 60 Marks | |
| Tutorial | | - | | CIE | 40 Marks | |
| Practical | | - | | Total | 100 Marks | |
| Theory Cred | lits: 3 | | | Duration of | Exam: 3 Hours | |
| Course Obje | ectives | · | | • | | |
| The Objectiv | es of this cour | se is: | | | | |
| 1. Underst | and complexi | ty of Deep Learni | ng algorithms and tl | neir limitations | | |
| 2. Be capa | ble of perforn | ning distributed c | omputations; | | | |
| • | | ning experiments | in Deep Learning us | sing real-world | data | |
| Course Outo | | | | | | |
| At the end of | the unit, stude | ents will be able t | 0: | | | |
| BCS4709.1 | Analyze the | Machine Learnin | g and Categorize N | eural network | | |
| BCS4709.2 | Evaluate De | ep learning types | and application in r | eal time | | |
| BCS4709.3 | Illustrate De | eep learning archi | tecture | | | |
| BCS4709.4 | BCS4709.4 Differentiate the Algorithm used in Deep learning | | | | | |
| BCS4709.5 | BCS4709.5 Estimate CNN and Tools for Deep learning: Keras, Numpy | | | | | |
| Course Contents | | | | | | |
| Unit I Deep Neural Network: Types, Perceptron Training Rule, Forward network: Forward Neural Networks, Back propagation neural network Descent & Back Propagation Algorithm: Gradient Descent, Stochastic Vanishing Gradient problem | | | network, Gradient | | | |
| Unit II | Introduction to deep learning: Defination, Importance, Types of Deep Learning Networks Feed forward neural network, Radial basis function neural network | | | on neural networks, | | |
| Unit III Deep learning typ | | ning types of Au | | | oder Architectures, coders, Adversarial | |
| Unit IV Types of Algorithms used in Deep Learning: Convolutional (CNNs),Long Short Term Memory Networks (LSTMs),I Networks (RNNs),Generative Adversarial Networks (Boltzmans machine (RBM),Radial Basis Function Networks (RPerceptrons (MLPs), Self-Organizing Maps (SOMs),Deep (DBNs) | | Recurrent Neural (GANs), Restricted RBFNs), Multilayer | | | | |
| Unit V Convolutional Neural Networks: CNN Architectures, Convolution, Poolin Layers, Variants of the Basic Convolution Function, Structured Outputs, Dat Types, Efficient Convolution Algorithms, Random or Unsupervised Features LeNet, AlexNet | | | | ured Outputs, Data | | |



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Department of Computer Science and Engineering

| Deep learning | tools- | NumPy.,Keras, | TensorFlow, | Installation | of | Keras | and |
|------------------|---------|---------------|-------------|--------------|----|-------|-----|
| TensorFlow for I | Deep le | arning. | | | | | |

| Text Books | | | | | |
|---|--|--|--|--|--|
| T.1 | Goodfellow, I., Bengio, Y., and Aaron Courville, A Deep Learning, MIT Press, 2016. | | | | |
| T.2 Introduction to Artificial Neural Systems BY Jacek M. Zurada | | | | | |
| Reference Books | | | | | |
| R.1 Deep Learning: A Practitioner's Approach by Josh Patterson, Adam Gibson | | | | | |

| Useful | Useful Links | | |
|--------|--|--|--|
| 1 | 1 https://youtu.be/aPfkYu_qiF4?si=xapiw6eRIyj1cXiC | | |
| 2 | 2 https://youtu.be/W3_yaf3HvHU?si=LOal6eF8kkT6IVgy | | |

Course Coodinator-BCS4709

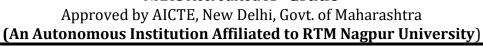
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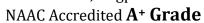




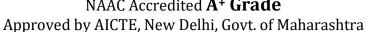
| | | | Fourth Y | ear B.Tech (Seven | Semester) | |
|------------------------------------|---------------|--|---|--|----------------------|---------------------|
| | | | ВС | S4710: Ad-Hoc and S | Sensor Networks | |
| Teaching Scheme Examination Scheme | | | | ion Scheme | | |
| | | | 60 Marks | | | |
| Tutori | al | | - | | CIE | 40 Marks |
| Practio | cal | | - | | Total | 100 Marks |
| Theory | y Credits | s: 3 | | | Duration of | of Exam: 3 Hours |
| | e Objecti | | | 1 | I | |
| | | | course is: | | | |
| 1. | - | | | rireless sensors network | ks and underrated th | he architecture |
| 2. | | | | n wired vs. wireless do | | |
| | | | | of wireless networks, i. | | |
| 3. | | | and wireless sen | | o contain not works, | , 214000011, 114 |
| Course | e Outcon | | ma whereas sen | sor networks. | | |
| | | | students will be | able to: | | |
| | | | | | ESS networks and a | challenges of adhoc |
| BCS4 | 710.1 | Understand the basic concepts of WIRELESS networks and challenges of adhoc and sensor networks | | | | |
| BCS4 | 1710.2 | | Categorize the different types of MAC protocols. | | | |
| D CCC | 1510.2 | Identify and analyze deficiencies in existing wireless protocols for MAC layer | | | | |
| BCS4 | | | and Network layer, and then go onto formulate new and better protocols. | | | |
| RCS/ | 1710.4 | Understand the concepts of network architectures and applications of ad hoc and | | | | |
| DCS4 | 1/10.4 | wireless sensor networks | | | | |
| BCS4 | 1710.5 | Design routing protocols for ad hoc and wireless sensor networks with respect to | | | | |
| | | some protocol design issues | | | | |
| | | I . . | 1 | Course Contents | | 0 11.11 |
| | | Introduction to Sensor networks: application Examples of available sensor | | | | |
| Un | nit I | nodes, Challenges for WSN's, Mobile ad hoc networks and wireless sensor networks, single node architecture. Sensor node hardware overview, Sensors and | | | | |
| | | actuators, Energy consumption of sensor nodes. | | | | |
| | | | | ire : Sensor network se | | rinciples for WSNs. |
| Un | it II | | | of WSNs, Gateway co | U 1 | * |
| | | Low duty cycle and Wakeup concepts, contention and schedule-based protocols. | | | | |
| | | Mac | Protocols For | Ad Hoc Wireless No | etworks: - Issues in | n designing a MAC |
| Uni | it III | Protocol- Classification of MAC Protocols- Contention based protocols- | | | | |
| 0 222 | | | _ | rotocols with Reserva | | |
| | | | | uling Mechanisms – M | | |
| | | | | Networks (Wsns) Anre and software con | | <u> </u> |
| ∐ni | it IV | | | e: typical network arch | • | |
| | | | | yer protocols: self-or | • | |
| | | | | IEEE 802.15.4. | 55, 11, 011 d | und |



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Department of Computer Science and Engineering

| ****** | Routing protocols and content-based networking: Broadcast and multicast protocols Geographic Routing, Mobile nodes, Data centric Routing, Distribution versus gathering of data-In-network processing, Data Aggregation, data centric |
|--------|---|
| Unit V | Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design-Synchronization-Transport Layer issues. |

| Text Book | Text Books | | | |
|--|---|--|--|--|
| T.1 | C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall Professional Technical Reference, 2008. | | | |
| | Protocols ", Prentice Hall Professional Technical Reference, 2008. | | | |
| T.2 Protocols and Architectures for Wireless Sensor Networks, Holger Karl, and Andrewillig, Wiley, 2005. | | | | |
| Т.3 | Wireless Sensor Networks, Cauligi S. Raghavendra, Krishna Sivalingam and Taieb M. | | | |
| 1.5 | Znati, Springer, 2005. | | | |
| Reference | Reference Books | | | |
| R.1 | Wireless and Personal Communications Systems, Vijay K. Grag and Joseph E. Wilkes, | | | |
| Κ.1 | Prentice Hall, 1995. | | | |
| R.2 Routing in the Internet, Christian Huitema, Prentice Hall, 1995. | | | | |

| Usefu | Useful Links | | |
|---|--|--|--|
| 1 https://www.digimat.in/nptel/courses/video/106105160/L01.html | | | |
| 2 | http://www.infocobuild.com/education/audio-video-courses/computer-science/WirelessSensorNetworks-IIT-Kharagpur/lecture-22.html | | |

Course Coodinator-BCS4710

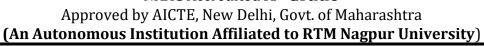
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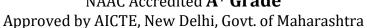
| | | Fourth Y | ear B.Tech (Seven Ser | nester) | |
|--|--|--------------------------|--|------------------|--|
| | BCS4711: Embedded System | | | | |
| Teaching Sc | Teaching Scheme Examination Scheme | | | Scheme | |
| Lectures | | 3 Hr / Week | | ESE | 60 Marks |
| Tutorial | | - | | CIE | 40 Marks |
| Practical | | - | | Total | 100 Marks |
| Theory Cred | lits: 3 | | | Duration of l | Exam: 3 Hours |
| Course Obje | ectives | | | | |
| The Objectiv | es of this | s course is: | | | |
| 1. To giv | e suffici | ent background | for understanding embedde | d systems desig | gn. |
| 2. To un | derstand | connections of | various peripherals with mic | crocontroller-ba | ased systems. |
| 3. To Ar | alyze en | nbedded system | based on RTOS and commi | unication proto | cols. |
| Course Outo | comes | | | | |
| At the end of | the unit | , students will be | e able to : | | |
| BCS4711.1 | Under | stand the conce | pts of Embedded System de | sign. | |
| BCS4711.2 | Analyz | e real time oper | ating systems used to design | n embedded sys | stems. |
| BCS4711.3 | Make l | U se of a microco | ntroller for embedded system | design. | |
| BCS4711.4 | Analyz | e communication | on technique and protocol us | sed in embedde | d. |
| BCS4711.5 Design and interface various devices to the microcontroller. | | | | | |
| Course Contents | | | | | |
| Unit I | Unit I Introduction to an embedded systems design: Microcontroller, Memory Devices, Embedded System Project Management, ESD and Co-design issues in System development Process, Use of software tools for development of an ES, embedding software on target machine. | | | | |
| Unit II | Introduction to real time operating systems: Real Time Operating Systems: OS | | | | |
| Overview of Microcontroller: Microcontroller and Embedded Processors, Overview of 8051 Microcontroller Architecture, basic assembly language programming concepts, The program Counter and ROM Spaces in the 8051, 8051 Register Banks and Addressing Modes, accessing memory, Arithmetic instructions and programs, Logical instructions, Single-bit instruction programming. | | | | | |
| Unit IV | Unit IV Communication with 8051: Basics of Communication, Overview of RS-232, I2C Bus, UART, USB, 8051 connections to RS-232, 8051 serial communication programming, 8051 interrupts, Programming of timer interrupts, Interrupt priority in the 8051. | | | | ew of RS-232, I2C rial communication Interrupt priority in |
| Unit V | | _ | : Interfacing an LCD to the Stepper Motor, 8051 interface. | | _ |



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Department of Computer Science and Engineering

| Text Book | Text Books | | | | |
|---|---|--|--|--|--|
| T.1 | T.1 Raj Kamal, "Embedded Systems", TMH, 2004. | | | | |
| T.2 M.A. Mazidi and J. G. Mazidi, "The 8051 Microcontroller and Embedded Systems", PHI 2004 | | | | | |
| Reference | Reference Books | | | | |
| R.1 Dr. Rajiv Kapadia, "8051 Microcontroller & Embedded Systems", Jaico Press Society, 2015 | | | | | |
| R.2 | K.J. Ayala, "The 8051 Microcontroller", Penram International, 1991. | | | | |

| Useful Links | | |
|--|--|--|
| 1 https://nptel.ac.in/courses/106/105/106105193/ | | |
| 2 https://onlinecourses.nptel.ac.in/noc20_ee98/preview | | |

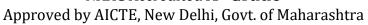
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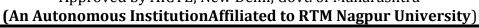
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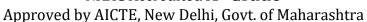


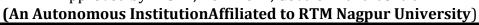
| | Fourth Year B.Tech (Seven Semester) | | | | |
|--|-------------------------------------|--|---|---|---|
| | BCS4712: DevOps | | | | |
| Teaching Scheme Exam | | | Examinatio | on Scheme | |
| Lectures 4Hr / Week ESE 60 N | | | | 60 Marks | |
| Tut | torial | - | | CIE | 40 Marks |
| Pra | ctical | - | | Total | 100 Marks |
| The | eory Cred | lits: 4 | | Duration of | f Exam :3 Hours |
| Cor | urse Obje | ectives | | | |
| The | Objectiv | es of this course is: | | | |
| 1. | into the of the w | DevOps environment, gorking of the DevOps I | Ops over other software do et an overview of differer elivery Pipeline. rform management of file | nt DevOps Tools a | nd Get a picture |
| 2. | remote | repositories | such as git add, git fetch, | | |
| 3. | TestNG | | nte Test Cases in Selenium tute code on several browkins. | | |
| Cou | urse Outo | eomes | | | |
| At t | the end of | the unit, students will b | e able to: | | |
| BCS4712.1 Understand the concepts software development processes | | | | | |
| BC | S4712.2 | Recognize the factors | hat gain insights into the | DevOps environm | ent. |
| BCS4712.3 Make Use of management of files for small as well as large projects | | | S | | |
| BC | S4712.4 | Analyze Continuous D | eploymentSelenium | | |
| BCS4712.5 Analyze the Monitoring tools using DevOps. | | | | | |
| | | | Course Contents | | |
| Unit I Introduction to DevOps Introduction: Architecture, Lifecycle, Wor Principles, DevOps Tools, Concept of Automation, Engineering, Pip Methodology, DevOps Vs Agile. | | = | | | |
| Unit II Continuous Development Code and Build Tools: Version Control Using Control Us | | undoing changes, ch, pull and push. integration, plugin | | | |
| 1 | Unit III | terminology, feature with maven/Jenkin advantage and disa maven, configurati reporting, code and | s Integration/Continuous, limitations, selenium valenkins: Introduction, valentages, architecture: on, management, user raysis, distributed builds, attenance, continuous deports | s QTP, selenium to work flow, continuaster-slave, setu management, pipe automated deploy | ool suite, selenium nuous integration, up with github vs eline, notification, ment, metrics and |



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Department of Computer Science and Engineering

| | backup plugin. |
|---|--|
| Workflow, architecture, various commands, playbook, roles, modules, shell YAML, file management, ansible vs chef vs puppet. Puppet: architecture, components, applications, installation, coding style, modules, file server, components, applications, installation, coding style, modules, file server, components, applications, type provider, template custom function. Orchestration Tools Docker: Introduction, Architecture, Containerization lifecycle, CLI, port binding, detached and foreground mode, file system, restirage, volume, compose and swarm. Kubernetes: Core Concepts, Understand Pods, replica set and replication Controller, deployments, daemonsets, rolling updates and rollbacks, scaling application, services, persistent vs primitives, secret and configMaps, head services, statefulsets, ingress | |
| Unit V | Monitoring Tools: Nagios: Introduction, features of Nagios, architecture: schedular, GUI, plugin, installation of Nagios core, advantage and disadvantage. Prometheus and Grafana: Introduction to Prometheus and Grafana, Prometheus and Grafana Setup, Monitoring using Prometheus, Dashboard Visualization using Grafana, creating a Dashboard to monitor the Pipeline |

| Text Book | Text Books | | | |
|-----------|---|--|--|--|
| T.1 | A Practical Guide to Continuous Delivery, Eberhard Wolf, Addison-Wesley 2017 | | | |
| T.2 | Devops with windows server 2016, Ritesh Modi ,PACKT Publishing enterprise | | | |
| Reference | Reference Books | | | |
| R.1 | The Devops 2.0 Tool Kit Viktor Farcic PACKT BIRMINGHAM - MUMBAI Publishing enterprise | | | |
| R.2 | Implementing Devops with Ansible 2 Joathan McAllister PACKT BIRMINGHAM - MUMBAI Publishing enterprise | | | |

| Useful | Links |
|--------|---|
| | https://www.youtube.com/watch?v=sz5gfkwPITE&list=PLhNrFKat_aeIogDQc0xnEiZ2TLDKzZCEM |
| | https://www.youtube.com/watch?v=hQcFE0RD0cQ&list=PL9ooVrP1hQOE5ZDJJsnEXZ2upw K7aTYiX |

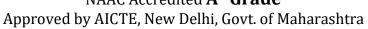
Course Coodinator- BCS4712

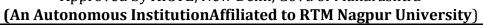
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| Fourth Year B.Tech (Seven Semester) | | | | | | | |
|---|-----------------------------------|---|---|---------------------------|-----------|--|--|
| BCS4713: Big Data Analytics | | | | | | | |
| Teaching Scheme | | | | Examination Scheme | | | |
| Lectures | | 4Hr / Week | | ESE | 60 Marks | | |
| Tutorial | | - | | CIE | 40 Marks | | |
| Practical | | - | | Total | 100 Marks | | |
| Theory Credits: 4 | | | | Duration of Exa | m:3 Hours | | |
| Cou | Course Objectives | | | | | | |
| The | The Objectives of this course is: | | | | | | |
| 1. | Optimiz | te business decisions and create competitive advantage with Big Data analytics | | | | | |
| 2. | Introdu | cing Java concepts required for developing map reduce programs | | | | | |
| 3. | Derive l | ousiness benefit from uns | business benefit from unstructured data | | | | |
| Cou | rse Outo | comes | | | | | |
| At t | he end of | the unit, students will b | be able to: | | | | |
| BCS | 64713.1 | Preparing for data | summarization, query, and a | nalysis. | | | |
| BCS | 54713.2 | Applying data modeling techniques to large data sets | | | | | |
| BCS | 64713.3 | Creating applications for Big Data analytics | | | | | |
| BCS4713.4 | | Building a complete business data analytic solution | | | | | |
| BCS4713.5 Evaluating Local and Distributed Modes of Running Pig Scripts | | | | | | | |
| | | | Course Contents | | | | |
| Unit I | | Data structures in Java: Linked List, Stacks, Queues, Sets, Maps; Generics: Generic classes and Type parameters, Implementing Generic Types, Generic Methods, Wrapper Classes, Concept of Serialization | | | | | |
| Unit II | | Working with Big Data: Google File System, Hadoop Distributed File System (HDFS) — Building blocks of Hadoop (Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker), Introducing and Configuring Hadoop cluster (Local, Pseudo-distributed mode, Fully Distributed mode), Configuring XML files. | | | | | |
| Unit III | | Writing MapReduce Programs: A Weather Dataset, Understanding Hadoop API for MapReduce Framework (Old and New), Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner | | | | | |
| Unit IV | | Hadoop I/O: The Writable Interface, WritableComparable and comparators, Writable Classes: Writable wrappers for Java primitives, Text, BytesWritable, NullWritable, ObjectWritable and GenericWritable, Writable collections, Implementing a Custom Writable: Implementing a RawComparator for speed, Custom comparators | | | | | |
| Unit V | | Pig: Hadoop Programming Made Easier Admiring the Pig Architecture, Going with the Pig Latin Application Flow, Working through the ABCs of Pig Latin, | | | | | |



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Department of Computer Science and Engineering

| Evaluating Local and Distributed Modes of Running Pig Scripts, Checking out the |
|---|
| Pig Script Interfaces, Scripting with Pig Latin |

| Text Books | | | | |
|-----------------|--|--|--|--|
| T.1 | Big Java 4th Edition, Cay Horstmann, Wiley John Wiley & Sons, INC | | | |
| T.2 | T.2 Hadoop: The Definitive Guide by Tom White, 3rd Edition, O'reilly | | | |
| T.3s | Hadoop in Action by Chuck Lam, MANNING Publ. | | | |
| Reference Books | | | | |
| R.1 | Hadoop in Practice by Alex Holmes, MANNING Publ. | | | |
| R.2 | R.2 Hadoop MapReduce Cookbook, SrinathPerera, ThilinaGunarathne | | | |

| Usefu | Useful Links | | |
|-------|---|--|--|
| 1 | Hadoop: http://hadoop.apache.org/ | | |
| 2 | Hive: https://cwiki.apache.org/confluence/display/Hive/Home | | |

Course Coodinator- BCS4712

H.O.D