Bharatiya Vidya Bhavan

BHAVAN'S VIVEKANANDA COLLEGE

Department of Computer Science

Sainikpuri, Secunderabad

Autonomous College – Affiliated to Osmania University, w.e.f. 2020-2021

M.Sc. [Computer Science] I Year, I Semester

	Code	Paper Title	PPW		Max Marks		Max Marks		Credits
			TH	PR	TH	TH-CIA	PR	PR-CIA	
I	CS101	Advanced Java Programming	4		70	30			4
II	CS102	Operating Systems	4		70	30			4
III	CS103	Software Engineering	4		70	30			4
IV	CS104	Discrete Mathematics	4		70	30			4
V	CS105(AECC)	Personality Development and Soft Skills		2			50		1
VI	CS101P	Advanced Java Lab		6			75		3
VII	CS102P	Operating Systems Lab		4			50		2
VIII	CS103P	Software Engineering Lab		4			50		2
		Total	16	16	280	120	225		24

SEMESTER – II

Paper	Code	Paper Title	PPW		Max Marks		Max Marks		Credits
			TH	PR	TH	TH-CIA	PR	PR-CIA	
I	CS201	Programming in Python	4		70	30			4
II	CS202	Computer Networks	4		70	30			4
III	CS203	Design and Analysis of Algorithms	4		70	30			4
IV	CS204	Automata Theory	4		70	30			4
V	CS201P	Python Lab		6				75	3
VI	CS202P	Computer Networks Lab		6				75	3
VII	CS203P	Design and Analysis of Algorithms Lab		4				50	2
		Total	16	16	280	120		200	24

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Department of Computer Science

PROGRAM NAME: M.Sc.(Computer Science) (w.e.f 2020-21)

COURSE NAME: ADVANCED JAVA PROGRAMMING

PAPER CODE: CS101 | **PPW: 4**
YEAR/SEMESTER:I/I | **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of programming to develop Client/Server based applications.

UNIT-WISE COURSE OBJECTIVES:

COb1: To inculcate knowledge on AWT and Swing API.
COb2: To demonstrate the concepts of Java Servlets and Java Server Pages.
COb3: To inculcate knowledge on JDBC and Hibernate
COb4: To illustrate the concepts of RMI and JSF.

UNIT-I 15Hrs

Review of Core Java: Class Object, Object Oriented Concepts with respect to Java, Interfaces, Packages and Exception Handling, Applets, Overview of Collection Framework (No question to be set from above topics).
AWT: Introduction, AWT Class Hierarchy, Creating Container, Adding Components, Layout, Using Panel, Text Field, Text Area, List, Checkbox, Check Box Group, Choice, Event Handling, Dialog Boxes, ScrollBar, Menu.
Swing: Containment Hierarchy, Adding Components, JTextField, JPasswordField, JTable, JComboBox, JProgressBar, JList, JTree, JColorChooser, Dialogs.
(Chapter – 9)

UNIT-II 15Hrs

Servlet: Server-Side Java, Servlet Alternatives, Servlet Strengths, Servlet Architecture, Servlet Life Cycle, GenericServlet, HttpServlet, Servlet Example, Passing Parameters to Servlets, Retrieving Parameters, Cookies, Filters.
Java Server Pages (JSP): Introduction, JSP Engines, How JSP Works, JSP and Servlet, Anatomy of a JSP Page, JSP Syntax, JSP Components, Beans, Session Tracking, Users Passing Control and Data between Pages, Sharing Session and Application Data. (Chapter – 20, 21)

UNIT-III 15Hrs

Java Database Connectivity (JDBC): Introduction, JDBC Drivers, JDBC Architecture, JDBC Classes and Interfaces, Loading a Driver, Making a Connection, Execute SQL Statement, SQL Statements, Retrieving Result, Getting Database Information, Scrollable and Updatable Resultset, Result Set Metadata.

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Hibernate: Introduction, Writing POJO Class, Creating a Table, Writing a Hibernate Application, Compiling and Running Application, Book Application Using Annotation, Object Life Cycle, HQL, Using Native SQL Query, Named Queries, Generating DDL, Generator Class, Hibernate Tools.
(Chapter –22, 23)

UNIT-IV **15Hrs**

Remote Method Invocation (RMI): Introduction, Remote Method Invocation, Java RMI Interfaces and Classes, an Application, Compiling the Program, Generating Stub Classes, Running the Program, Callback with an Application.
Overview of J2EE, Introduction to JavaBeans, Advantages of JavaBeans, Properties of JavaBeans with examples, JavaBeans API, Enterprise JavaBeans (EJB), Applications using Session Beans and Entity Beans.
Java Server Faces (JSF): Introduction, Request Processing Life-Cycle, Basic JSF Tags.
(Chapter – 14, 26, 28)

Prescribed Book:

Uttam K. Roy, *Advanced Java programming*

Reference Books:

1. HerberttSchildt, *Java CompleteReference.*
2. CayS.Horstmans,GrayCoronell,*CoreJavaVol.II–AdvancedFeatures*
3. Sharanam Shah, Vaishali Shah, *Java EE 7 forBeginners*

COURSE OUTCOMES:

At the end of the course students will be able to:

CS101CO1: Develop window based applications using AWT and Swing.
CS101CO2: Develop programs using Java Servlets and Java Server Pages
CS101CO3: Develop programs using JDBC and Hibernate.
CS101CO4: Develop programs using RMI and JSF.

Employability aspect:: It is employable course into software development.

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PROGRAM NAME: M.Sc.(Computer Science) (w.e.f. 2020-21)
COURSE NAME: Operating Systems

PAPER CODE: CS102 | **PPW: 4**
YEAR/SEMESTER:I/I | **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of Operating Systems and their features comparing with other operating system features.

UNIT-WISE COURSE OBJECTIVES:

COb1: To include the knowledge of OS structures and process management.
COb2: To demonstrate the CPU scheduling and deadlock management.
COb3: To inculcate the knowledge on storage structures and memory management
COb4: To illustrate the file management and security issues.

Unit – I

Introduction: Computer-System Architecture, Operating-System Structure, Operating-System Operations, Process Management, Memory Management, Storage Management, Protection- Security, Kernel Data Structures, Computing Environments, Open-Source Operating Systems.**Operating-System Structures**: Operating-System Services, User Interface for Operating-System, System Calls, Types of System Calls, Operating-System Design and Implementation, Operating-System Structure, Operating- System Debugging.**Process Management**: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication, Examples of IPC Systems, Communication in Client–Server Systems.**Threads**: Overview, Multithreading Models, Threading Issues.

Process Synchronization: Concept, Critical-Section Problem, Peterson's Solution, Synchronization, Classic Problems of Synchronization, Semaphores, Monitors. (Ch : 1.3 – 1.12, 2.1 – 2.8, 3.1-3.6, 4.1,4.2, 4.6, 5.2 – 5.8)

Unit – II

CPU Scheduling: Concepts, Scheduling Criteria, Scheduling Algorithms, Thread Scheduling, Real-Time CPU Scheduling, Algorithm Evaluation.**Deadlocks**: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.
(Ch : 6.1 – 6.8, 7.1 – 7.7)

Unit – III

Memory Management: Main Memory, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table. **Virtual Memory**: Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files.**Mass-Storage Structure:** Overview, Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management, RAID Structure, Stable-Storage Implementation. (Ch : 8.1 – 8.6, 9.1 – 9.7, 10.1 – 10.8)

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Unit – IV

File Systems: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, Protection. File- System Structure and Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Recovery, Network File System.**Protection and Security:** Goals of Protection, Principles of Protection, Domain of Protection,Access Matrix, Access Control, Revocation of Access Rights, The Security Problem, Program Threats, System and Network Threats, Cryptography as a Security Tool, User Authentication, Implementing Security Defenses, Firewalling to Protect Systems and Networks, Computer-Security Classifications.

(Ch : 11.1 – 11.6, 12.1 – 12.8, 14.1 – 14.7, 15.1 – 15.8)

Textbook

AbrahamSilberschatz,PeterBaerGalvin,GregGagne,*Operating System Concepts* (9e)

References

1. Thomas W. Doeppner, *Operating systems indepth*
2. Andrew S. Tanenbaum, *Modern OperatingSystems*
3. WilliamStallings,*OperatingSystems–InternalsandDesignPrinciples*
4. Dhananjay M. Dhandhere, *Operating Systems-A Concept BasedApproach*

COURSE OUTCOMES:

At the end of the course students will be able to:

CS102 CO1: Understand the OS structures and process management issues.
CS102 CO2: Understand different CPU scheduling algorithms and deadlock handling methods.
CS102 CO3: Understand the Types of memory management and storage structures.
CS102 CO4: Understand different file systems, protection and security issues.

Employability aspect:: It is employable course. A required course for any employability.

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PROGRAM NAME: M.Sc.(CS) (w.e.f. 2020-2021)(w.e.f. 2020-21)

COURSE NAME: SOFTWARE ENGINEERING

PAPER CODE: CS103 PPW: 4
YEAR/SEMESTER: I/I NO. OF CREDITS: 4

COURSE OBJECTIVE: To impart the knowledge of software concepts, importance of software development within time and budget.

UNIT-WISE COURSE OBJECTIVES:

COb1: To enable students learn the basics of software, its process and types of process Models.
COb2: To enable students learn about Requirements Engineering, design concepts and Architectural styles of Software Engineering.
COb3: To enable students learn about Software Quality and software testing strategies.
COb4: To enable students learn about Software Configuration Management process, software Risks and reverse engineering.

Unit – I 15 Hrs.

Software Engineering: The Nature of Software, Changing Nature of Software, Defining the Discipline, Software Process, Software Engineering Practice.
The Software Process: A Generic Process Model, Defining a Framework Activity, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Models, Unified Process, Personal and Team Process Models. Defining Agility, Agile Process, Extreme Programming, Psychology of Software Engineering, Software Team Structures, Software Engineering Using the Cloud, Global Teams.
(CH: 1.1, 2.2, 2.3, 3.1, 3.2, 3.5, 4.1, 4.2, 4.3, 5.1 5.3, 5.4, 6.7, 6.9)

Unit – II 15 Hrs.

Requirements: Core Principles of Modeling, Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Analysis Model, Requirements Analysis, UML Models That Supplement the Use Case, Identifying Analysis Classes, Specifying Attributes, Defining Operations, Class- Responsibility-Collaborator Modeling, Associations and Dependencies, Analysis Packages.
Design Concepts: Design within the Context of SE, Design Process, Design Concepts, Design Model, Software Architecture, Architectural Styles, Architectural Design, Component, Designing Class-Based Components, User Interface Design Rules.
(CH: 7.1, 8.1, 8.2, 8.3, 8.4, 8.5, 9.1, 9.3, 10.4, 10.5,10.6)(CH: 12.1, 12.3, 12.5, 13.1, 13.3,13.6,14.2,, 15.1)

Unit –III 15 Hrs.

Quality Management: Quality, Software Quality, Software Quality Dilemma, Achieving Software Quality, Defect Amplification and Removal, Reviews, Informal Reviews, Formal Technical Reviews, Elements of Software Quality Assurance, SQA Tasks, Goals, and Metrics, Software Reliability,
Software Testing: Strategic Approach to Software Testing, Test Validation Testing, System Testing, Debugging, Software Testing Fundamentals, White-Box Testing, Black-Box Testing, Object- Oriented

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Testing Strategies& Methods, Security Engineering Analysis, Security Assurance, Security Risk Analysis.

(CH: 19.1,19.2,19.3,19.4,20.2,20.3,20.5, 21.2, 21.4, 21.7, 22.1,22.7,22.8,22.9,23.1, 23.3,23.6,24.3,24.4,27.3, 27.4,27.5)

Unit – IV **15 Hrs.**

Software Configuration Management:SCM Process, Managing Software Projects: The Project Management Spectrum, W5HH Principle, Metrics in the Process and Project Domains, Software Project Estimation, Decomposition Techniques,

Project Scheduling: Basics, scheduling, Software Risks, Risk Mitigation, Monitoring, and Management, Software Maintenance, Software Reengineering, Reverse Engineering, Forward Engineering.

(CH:29.1, 29.3,31.1, 31.6,32.1,33.5, 33.6,34.1, 34.2, 35.2, 35.6, 36.1, 36.5, 36.6, 36.8)

Text: RogerSPressman,BRMaxim,SoftwareEngineeringAPractitioner'sApproach(8e)

References

1. Ian Sommerville, SoftwareEngineering
2. Hans Van Vliet, SoftwareEngineering
3. D.Bell,SoftwareEngineeringforStudents
4. K. Aggarwal, Y. Singh, SoftwareEngineering
5. R.Mall,FundamentalsofSoftwareEngineering
6. PankajJalote,AnIntegratedApproachtoSoftwareEngineering

COURSE OUTCOMES:

At the end of the course students will be able to:

CS103 CO1: Understand the basics of software, its process and types of process models

CS103 CO2: Interpret about Requirements Engineering, design concepts and Architectural styles of Software Engineering.

CS103 CO3: Analyze about Software Quality and software testing strategies.

CS103 CO4: Interpret about Software Configuration Management process, software Risks and reverse engineering.

Employability COB: Can be implemented in their profile as Software developer or Software Tester

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PROGRAM NAME: M.Sc.(CS) (w.e.f. 2020-2021)(w.e.f. 2020-21)

COURSE NAME: DISCRETE MATHEMATICS

PAPER CODE: CS104 **PPW: 4**

YEAR/SEMESTER: I/I **NO. OF CREDITS: 4**

Unit-wise Course Objectives:

COb1 :To familiarize the students with concepts of propositions, logic, truth tables and Boolean Algebra.

COb2: To familiarize the students with basic structures and recursion.

COb3: To familiarize the students with basic principles of counting.

COb4: To familiarize the students with graph theory.

Unit – I

Mathematical Logic: propositional logic, propositional equivalences, predicates & quantifiers, rule of inference, direct proofs, proof by contraposition, proof by contradiction.**Boolean Algebra**: Boolean functions and its representation, logic gates, minimizations of circuits by using Boolean identities and K-map.

[Ch : 1.1,1.3,1.4,1.6,12.1 –12.4]

Unit – II

Basic Structures: Sets representations, set operations, functions, sequences and summations. Division algorithm, modular arithmetic, solving congruences, applications of congruences.**Recursion**: Proofs by mathematical induction, recursive definitions, structural induction, generalized induction, recursive algorithms.

[Ch : 2.1 –2.4,4.1,4.4,4.5,5.1,,5.3]

Unit – III

Counting: Basic counting principle, inclusion-exclusion for two-sets, pigeonhole principle, permutations and combinations, Binomial coefficient and identities, generalized permutations and combinations.**Recurrence Relations**: introduction, solving linear recurrence relations, generating functions, principle of inclusion-exclusion, applications of inclusion-exclusion.**Relations**: relations and their properties, representing relations, closures of relations, equivalence relations, partial orderings.

[Ch : 6,8.1, 8.2,8.4 –8.6, 9.1,9.3 -9.6]

Unit – IV

Graphs: Graphs definitions, graph terminology, types of graphs, representing graphs, graph isomorphism, connectivity of graphs, Euler and Hamilton paths and circuits, Dijkstra's algorithm to find shortest path, planar graphs–Euler's formula and its applications, graph coloring and its applications. **Trees**: Trees definitions–properties of trees, applications of trees–BST, Huffman Coding, tree traversals: pre- order, in-order, post-order, prefix, infix, postfix notations, spanning tress–DFS, BFS, Prim's, Kruskal's algorithms. [Ch : 10,11]

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TextBook : KennethH.Rosen,*DiscreteMathematicsanditsApplications*(7e)

References

1. Ralph P. Grimaldi, *Discrete and CombinatorialMathematics*
2. Stein, Drysdale, Bogart, *Discrete Mathematics for ComputerScientists*
3. J.P.Tremblay,R.Manohar,*DiscreteMathematicalStructureswithApplicationstoComputerScience*
4. JoeL.Mott,AbrahamKandel,TheoderP.Baker,*DiscreteMathematicsforComputerScientists and Mathematicians*

COURSE OUTCOMES:

At the end of the course students will be able to:

CS104 CO1: The students would learn the concepts of logics and laws of Boolean Algebra.

CS104 CO2: The students will get acquainted with sets, division algorithm, mathematical induction.

CS104 CO3: Students will be able to appreciate the very fine differences between permutations and combinations. They will be able to solve recurrence relations.

CS104 CO4: Students will be able to understand graph theory which is of great use in computers.

Employability aspect: Data analytics or logic developer.

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PROGRAM NAME: M.Sc.(Computer Science) (w.e.f. 2020-21)

COURSE NAME: ADVANCED JAVA LAB

PAPER CODE: CS101P **YEAR/SEMESTER:I/I**

Week 1:

1. Create GUI to present a set of choices for a user to select stationary products and display the price of Product after selection from thelist.

Week 2:

2. Create GUI to demonstrate typical Editable Table which describing Employee for a softwarecompany.
3. Create GUI to demonstrate swing components using student registrationform.

Week 3:

4. Create a Remote Object for simple arithmetic operators. Use AWT/SWING to create userinterface.

Week 4:

5. Write an RMI application using call backmechanism

Week 5:

6. Develop Servlet Question-Answer Application using HttpServletRequest and HttpServletRequestinterfaces.

Week 6:

7. Develop Servlet application to accept HTNO of a student from client and display the memorandum of marks from the server

Week 7:

8. JSPPrograms
   a. Create a JSP page that prints temperature conversion (from Celsius to Fahrenheit)chart
   b. Create a JSP page to print current date andtime
   c. Create a JSP page to print number of times page is referred after the page isloaded.

Week 8:

9. Write a simple JSP application to demonstrate the use of implicit object (at least5).

Week 9:

10. Develop a Hibernate application to Store Feedback of Website Visitors in MySQLDatabase.

Week 10:

11. Develop a JSP Application to accept Registration Details from the user and store databasetable.

Week 11:

12. Develop a JSP Application to Authenticate User Login as per the Registration Details. If Login Success then forward User to Index Page otherwise show Login failureMessage.

Week 12:

13. Develop a web Application to add items in the inventory usingJSF.

Week 13:

14. Write EJB applications using stateless session beans and state-full sessionbeans.

Week 14:

15. Develop a Room Reservation System Application using EntityBeans.
16. Create Three-tire application using Servlets, JSP,EJB.

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Department of Computer Science

PROGRAM NAME: M.Sc.(Computer Science) (w.e.f. 2020-21)

COURSE NAME: OPERATING SYSTEMS LAB

PAPER CODE: CS102P **YEAR/SEMESTER: I/I**

Week-1:

1. Write shell programs using 'case', 'then' and 'if' & 'else'statements.

Week-2:

2. Write shell programs using while, do-while and for loopstatements.

Week -3:

3. Write a program to create a child process using fork(), exec() system calls and use other systemcalls.

Week-4:

4. Write a program to convert upper case to lower case letters of a given ASCIIfile.
5. Write a program to program to search the given pattern in afile.

Week-5:

6. Write a program to implementation of Signals inUNIX.

Week-6:

7. Write a program to simulate UNIX commands like ls, grep,cp.
8. Write a program to demonstrate FCFS and SJF process schedules on the givendata.

Week-7:

9. Write a program to demonstrate CPU Priority and Round Robin Scheduling on the given burst time and arrivaltimes.

Week – 8:

10. Write a program to simulate Inter Process Communication usingpipes.

Week-9:

11. Write a program to implementing Producer and Consumer problem usingSemaphores.

Week-10:

12. Write a program to simulate Bankers Algorithm for Dead LockAvoidance

Week-11:

13. Write a program to simulate Bankers Algorithm Dead LockPrevention.

Week-12:

14. Write a program to simulate Paging Techniques of memorymanagement.

Week-13:

15. Write a program to simulate FIFO, LRU, LFU Page replacementalgorithms.

Week-14:

16. Write a program to simulate Sequential, Indexed, and Linked file allocationstrategies.

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PROGRAM NAME: M.Sc.(Computer Science) (w.e.f. 2020-21)

COURSE NAME: SOFTWARE ENGINEERING LAB

PAPER CODE: CS103P **YEAR/SEMESTER:I/I**

Practical:4Hours/Week Credits:2

Study case tool Requirements:

Week: 1

1. Implementationofrequirementsengineeringactivitiessuchaselicitation,validation,management using casetools Analysis and Design

Week: 2

2. Implementation of Analysis and design using casetools

Week: 3

3. Study and usage of software project management tools such cost estimates andscheduling

Week: 4

4. Documentation generators –Study and practice of Documentationgenerators

Week: 5

5. Data Modeling using automatedtools

Week: 6

6. Practice reverse engineering and re-engineering usingtools

Week: 7

7. Exposure towards test plan generators, test case generators, test coverage and softwaremetrics.

Week: 8

8. Meta modeling and software life cycle management.

Week: 9 Case Studies: Structure charts, Data Flow Diagrams, Decision tables and ER diagramsfor

Week: 10

a. Railway ReservationSystem

Week: 11

b. Hotel managementsystem

Week: 12

c. Inventory ControlSystem

Week: 13

d. Library managementsystem

Week: 14

e. BankingSystem

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Note: The teacher should define the boundaries for the above case study problems and make the practice of problems mentioned.

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PROGRAM NAME: M.Sc.(Computer Science) II SEMESTER (w.e.f. 2020-21)

COURSE NAME: PROGRAMMING IN PYTHON

PAPER CODE: CS201 **PPW: 4**
YEAR/SEMESTER:I/II **NO. OF CREDITS: 4**

COURSE OBJECTIVE : To enable students with the concepts of programming to develop python scripts.

UNIT-WISE COURSE OBJECTIVES:

COb1: To explain conditional and looping statements.
COb2: To demonstrate the concepts of functions, files and exceptions.
COb3: To describe the functionalities of lists, tuples, strings, dictionaries and sets.
COb4: To illustrate object oriented concepts and GUI controls.

Unit – I **- 15 Hrs.**

Introduction to Python Programming: How a Program Works, Using Python, Program Development Cycle, Input,Processing, and Output, Displaying Output with the Print Function, Comments, Variables, Reading Input from theKeyboard, Performing Calculations (Operators. Type conversions, Expressions), More about Data Output.**Decision Structures and Boolean Logic:** if, if-else, if-elif-else Statements, Nested Decision Structures, ComparingStrings, Logical Operators, Boolean Variables.Repetition Structures: Introduction, while loop, for loop, Calculating a Running Total, Input Validation Loops,Nested Loops.

(Ch – 1.4, 1.5, 2.1 – 2.8, 3.1-3.6, 4.1 – 4.4, 4.6-4.7)

Unit – II **- 15 Hrs.**

Functions: Introduction, Defining and Calling a Void Function, Designing a Program to Use Functions, LocalVariables, Passing Arguments to Functions, Global Variables and Global Constants, Value-Returning Functions-Generating Random Numbers, Writing Our Own Value-Returning Functions, The math Module, StoringFunctions in Modules.**File and Exceptions:** Introduction to File Input and Output, Using Loops to Process Files, Processing Records,Exceptions.

(Ch – 5.1 – 5.10, 6.1-6.4)

Unit – III **- 15 Hrs.**

Lists and Tuples: Sequences, Introduction to Lists, List slicing, Finding Items in Lists with the in Operator, ListMethods and Useful Built-in Functions, Copying Lists, Processing Lists, Two-Dimensional Lists, Tuples.**Strings:** Basic String Operations, String Slicing, Testing, Searching, and Manipulating Strings.**Dictionaries and Sets:** Dictionaries, Sets, Serializing Objects.**(Ch – 7.1-7.9, 8.1-8.3, 9.1 – 9.3)**

Unit – IV **– 15 Hrs.**

Object-Oriented Programming: Procedural and Object-Oriented Programming, Classes, Working with Instances,Techniques for Designing Classes, Inheritance, Polymorphism.**GUI Programming:** Graphical User Interfaces, Using the tkinter Module, Display text with Label Widgets,Organizing Widgets with Frames, Button Widgets and Info Dialog Boxes, Getting Input with Entry Widget, UsingLabels as Output Fields, Radio Buttons, Check Buttons.

(Ch – 10.1 – 10.4, 11.1, 11.2, 13.1 – 13.8)

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Text Book

Tony Gaddis, Starting Out With Python (3e)

Reference Books

1. Kenneth A. Lambert, Fundamentals of Python
2. James Payne, Beginning Python using Python 2.6 and Python 3
3. Paul Gries, Practical Programming: An Introduction to Computer Science using Python 3
4. Charles Dierach, Introduction to Computer Science using Python
5. Clinton W. Brownley, Foundations for Analytics with Python

COURSE OUTCOMES: At the end of the course students will be able to:

CS201CO1: Develop programs using conditional and looping statements.
CS201 CO2: Develop programs using functions, files and exceptions.
CS201 CO3: Develop programs using lists, tuples, strings, dictionaries and sets.
CS201 CO4: Develop programs using object oriented concepts and using GUI controls.

Employability aspect: Data Analyst/Software Developer.

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BOS in Computer Science
Bhavan's Vivekananda College
Sainikpuri

Bharatiya Vidya Bhavan

BHAVAN'S VIVEKANANDA COLLEGE

OF SCIENCE, HUMANITIES AND COMMERCE
(Accredited with 'A' Grade by NAAC)
Autonomous College – Affiliated to Osmania University
Department of Computer Science

PROGRAM NAME: M.Sc.(Computer Science), II SEM. (w.e.f. 2020-21)

COURSE NAME: COMPUTER NETWORKS

PAPER CODE: CS202 **PPW: 4**
YEAR/SEMESTER: I/II **NO. OF CREDITS: 4**

Course Objective : This course provides the overview of networking. It deals with the seven layers of OSI/ISO Model in detail and gives an idea to a student as how the Message reaches to the recipient handset device from the handset device.

UNIT-WISE COURSE OBJECTIVES:

COb1: To illustrate some basic concepts of networks in hardware and software terminologies and describe some of the functionalities of Physical Layer.
COb1: To describe the various functionalities of Data Link Layer and switching devices.
Cob3: To describe the various functionalities of Network Layer.
Cob4: To describe the various functionalities of Transport Layer and few services provided by the Application Layer.

Unit – I **15 Hrs.**

Computer Networks Fundamentals: Network Hardware, Network Software, Reference models– OSI Model, TCP/IP Reference Model, Comparison of OSI and TCP/IP Reference Model.
Physical Layer: Guided Transmission Media, Wireless Transmission, Multiplexing – Frequency Division Multiplexing, Time Division Multiplexing, Switching.
(Chapters 1.2, 1.3, 1.4.1, 1.4.2, 1.4.4, 2.2, 2.3, 2.5.3, 2.5.4, 2.6.5)

Unit – II **15 Hrs.**

Data Link Layer: Design Issues, Error Detection, Elementary Data Link Protocols, Sliding Window Protocol.
Multiple Access Sub layer: ALOHA, CSMA, Collision Free Protocols, Ethernet – Classic Ethernet Physical Layer, Classic Ethernet MAC Sub layer Protocol, Fast Ethernet.
Data Link Layer Switching– Repeaters, Hubs, Bridges, Switches, Routers, Gateways.
(Chapters 3.1, 3.2.2, 3.3, 3.4, 4.2.1, 4.2.2, 4.2.3, 4.3.1, 4.3.2, 4.3.5, 4.8.4)

Unit – III **15 Hrs.**

Network Layer: Design Issues, Routing Algorithms – Shortest path, Flooding, Distance Vector Routing, Link State Routing, Hierarchical, Broadcast Routing, Multicast Routing; Congestion Control Algorithms - Traffic Throttling, Load Shedding.
Internetworking: Tunneling, Internetwork Routing, Packet Fragmentation, IP Version 4 Protocol, IP Addresses, IP Version 6, Internet Control Protocols–ICMP, ARP, RARP, DHCP.
(Text Book 1: Chapter 5.1, 5.2.2, 5.2.3, 5.2.4, 5.2.5, 5.2.6, 5.2.7, 5.2.8, 5.3.4, 5.3.5, 5.5.3, 5.5.4, 5.5.5, 5.6.1 to 5.6.4)

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Unit – IV **15 Hrs.**

Transport Layer: Services provided to the upper layers, Elements of Transport Protocols.
The Internet Transport Protocols: Introduction to UDP&RPC, The Internet Transport Protocols–TCP, TCP Service Model, TCP protocol, TCP Segment Header, TCP Connection Establishment, TCP Connection Release, Modeling TCP Connection Management, TCP Sliding Window, TCP Time Management.
Application Layer: DNS - Name Space, Domain Name Space, Distribution of Name Space, DNS in the internet, Resolution, DNS Messages, Types of Records.
TELNET, E-Mail, FTP.

(Text Book 1 : Chapter 6.1.1, 6.2, 6.4.1, 6.4.2, 6.5.1 to 6.5.9)
(Text Book 2 : Chapter 25.1, 25.2, 25.3, 25.4, 25.5, 25.6, 25.7, 26.1, 26.2, 26.3)

Text Book

1. Andrew S. Tanenbaum, David J Wetherall, Computer Networks, (5e)
2. Behrouz A. Forouzan, *Data Communication and Networking, 4th Edition.*

Reference Books

1. James F. Kurose, Keith W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet
2. Fred Harshall, Data Communications, Computer Networks and Open systems, 4/e, Pearson Education,2005.
3. William Stallings, Data and Computer Communications, 8/e, Pearson Education.,2013.
4. Behrouz A Forouzan, FirouzMosharraf, *Computer Networks A Top-Down Approach*
5. S.S. Shinde, Computer Networks

Course Outcomes: By the end of the course, student will be able

CS202 CO1 : To relate the different network operations with the related layers of OSI and TCP Protocol and analyze the responsibilities of Physical Layer.
CS202 CO1 : To analyze different Data Link Layer operations and access how the Multiple Access sub layer protocols .
CS202 CO3 : To identify the nomenclature used in IP Addresses and analyze the IP Header Format, different Routing Algorithms and Congestion Control Techniques used in Internet.
CS202 CO4 : To analyze how Transport Layer exactly implements a reliable end to end delivery of messages and analyze TCP Header format and also how Transport Layer overcomes Congestion control at its level. To analyze the different services provided by Application Layer

Employability aspect: Network Administrator, System Administrator

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Department of Computer Science

M.Sc.(Computer Science) , II SEMESTER, II SEM. (w.e.f. 2020-21)

COURSE NAME: DESIGN AND ANALYSIS OF ALGORITHMS

Paper Code :**CS203** **PPW : 4**
Year/Semester : I/II No. of Credits: 4

COURSE OBJECTIVE : It helps the student to learn different Sorting- searching algorithms, Divide and Conquer, Dynamic Programming – Back tracking algorithms.

UNIT-WISE COURSE OBJECTIVES

COb1: To acquire the knowledge of different sorting and searching techniques.
Cob2: To describe different problems related to divide and conquer & decrease and conquer.
Cob3: To describe the alternative methods for optimality of Dynamic Programming and Transform and Conquer.
Cob4: To aware of problems related to Greedy Technique and Branch and Bound techniques.

Unit – I **-15 Hrs.**

Introduction: Algorithm, Fundamentals of Algorithmic Problem Solving, Important Problem Types.**Fundamentals of the Analysis of Algorithm:** The Analysis Framework, Asymptotic Notations and Basic EfficiencyClasses, Mathematical Analysis of Non-recursive & Recursive Algorithms. **Brute Force Search:** Selection Sort,Bubble Sort, Sequential Search, Brute-Force String Matching, Exhaustive Search, Depth-First Search, Breadth-First Search.
(Ch- 1.2, 1.3, 2.1, 2.2, 2.3, 2.4, 3.1 – 3.5)

Unit – II **- 15 Hrs.**

Decrease–&–Conquer: Insertion Sort, Topological Sorting, Binary Search, Interpolation Search. **Divide-and-Conquer:** Merge Sort, Quick Sort, Multiplication of Large Integers, Strassen's Matrix Multiplication.
(Ch – 4.1, 4.2, 4.4, 4.5, 5.1, 5.2, 5.4)

Unit – III **- 15 Hrs.**

Transform-and-Conquer: Presorting, Balanced Search Trees, Heaps and Heap Sort, Problem Reduction. Space and Time Trade-Offs, Hashing, B-Trees.
Dynamic Programming: Knapsack Problem, Optimal Binary Search Trees, Warshall's and Floyd's Algorithms.
(CH - 6.1, 6.3, 6.4, 6.6,7.3, 7.4,8.2-8.4)

Unit – IV **- 15 Hrs.**

Greedy Technique: Prim's Algorithm, Kruskal's Algorithm, Dijkstra's Algorithm, Huffman Trees and Codes.**Iterative Improvement:** Simplex Method, Maximum-Flow Problem.**Limitations of Algorithm Power:** Lower-Bound Arguments, Decision Trees, P, NP, and NP-Complete Problems.Backtracking: n-Queens Problem, Hamiltonian Circuit Problem, Subset-Sum Problem. **Branch-and-Bound:**Assignment Problem, Knapsack Problem, Traveling Salesman Problem, Approximation Algorithms for theKnapsack Problem.
(Ch – 9.1-9.4, 10.1, 10.2, 11.1, 11.2, 11.3, 12.1, 12.2, 12.3)
Text Book: Anany Levitin, Introduction to the Design and Analysis of Algorithms (3e)

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References

1. Richard Neapolitan, Foundations of Algorithms
2. Thomas H. Cormen, Introduction to Algorithms
3. E.Horowitz, S. Sahni, Fundamentals of Computer Algorithms
4. A.V. Aho, J.V. Hopcroft, J.D. Ullmann, The Design and Analysis of Computer Algorithms
5. Donald E Knuth, The Art of Programming_Volumes-1, 2, 3, 4

COURSE OUTCOMES: At the end of the course students will be able to:

CS203 CO1: Develop programs using different Sorting and Searching methods.
CS203 CO2: Develop programs using different programs based on Divide and Conquer approach
CS203 CO3: Develop programs related to Dynamic Programming concepts .
CS203 CO4: Develop programs related to Greedy Technique, Branch and Bound related problems

Employability aspect: Application program developer/Application designer.

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PROGRAM NAME: MSc Computer science-II SEM. (w.e.f. 2020-2021)
COURSE NAME: AUTOMATA THEORY

PAPER CODE: CS204 **P PW: 4**
YEAR/SEMESTER: I/II **NO.OF CREDITS: 4**

COURSE OBJECTIVE: This course is intended to teach the fundamentals of DFA's and NFA's, Regular Languages, Context Free Grammars,Pushdown automata and Turing Machine

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UNIT-WISE COURSE OBJECTIVES:

COb1: To understand the behavior of DFA's, NFA's.
COb2:To construct finite automata for a given regular expressions.
COb3:To impart the knowledge of Context Free Grammars,Push Down Automata.
COb4: To design the Turing machines.

Unit – I

Fundamentals – alphabets, strings, languages, problems, graphs, trees.

Finite State Systems: definitions, Finite Automaton model, acceptance of strings, and languages, Deterministic finite automaton and Nondeterministic finite automaton, transition diagrams, transition tables, proliferation trees and language recognizers, equivalence of DFA's and NFA's.Finite Automata with ε-moves, significance, acceptance of languages, ε-closure, Equivalence of NFA's with and without ε-moves.**Regular Expressions**: regular sets, regular expressions, identity rules, constructing finite automata for a given regular expressions, conversion of finite automata to regular expressions.

(Ch:1(1.1, 1.2) Pg.no:(1,2) Ch: 2(2.1:2.5) Pg. no:(13-35)

Unit – II

Two-way finite automata: crossing sequence, Finite Automata with output– Moore and Melay machines, equivalence of Moore and mealy machines.

Properties of regular sets:Pumping lemma of regular sets(theorem) and its applications,

closure properties of regular sets (proofs omitted),Decision Algorithms for regular sets (theorem) Minimization of finite automata The Myhillnerode (theorem).

(Ch 2(2.6) Pg. no (36:44) Ch 3(3.1:3.4) Pg. no (55-70)

Unit – III

Context free grammar: derivation trees, sentential forms, right most and leftmost derivation of strings, ambiguity. Simplification of Context Free Grammars

Chomsky normal form, Greiback normal form.

Push Down Automata: PDA definition, model, acceptance of CFL, acceptance by final state and acceptance by empty state and its equivalence.

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Properties of context free languages: Pumping lemma for context free languages and its applications, closure of properties of CFL (proofs omitted).

Ch:4 (4.1:4.3) Pg.no (77 to 98) **Ch** 5(5.1,5.2) Pg. no (107-112)

Ch 6(6.1,6.2) Pg. no (125-130)

Unit – IV

Turing Machine: TM definition, model, design of TM, computable functions, types of Turing machines (only theory-proofs omitted),Church's hypothesis.

Chomsky hierarchy: Regular grammars–right linear and left linear grammars, equivalence between regular linear grammarand finite automata, inter conversion (Only statements)unrestricted grammars, recursively enumerable languages, Context sensitivelanguageandLinear bounded automata.Chomsky hierarchy of languages.

(**Ch** 7(7.1:7.6) Pg. no (146-166) **Ch** 9(9.1:9.3) Pg. no (217-225)

Prescribed Textbook: Introduction to Automata Theory, Languages, and Computation
J. E. Hopcroft, J. D. Ullman.

References

1. Mishra, Chandrashekaran, Theory of ComputerScience.
2. ZviKohav, Niraj K Jha, Switching and Finite AutomataTheory.
3. Perter Linz, An Introduction to Formal Languages andAutomata.
4. JohnC.Martin,IntroductiontoLanguagesandtheTheoryofComputation.

COURSE OUTCOMES:

At the end of the course students will be able to

CO1:Know the behavior of DFA's, NFA's.
CO2:Construct finite automata for a given regular expressions.
CO3: Acquainted with Context Free Grammars,Push down Automata.
CO4:Familiar with the Turing machines.

Employability aspect: Compiler developer/Data Processing Officer.

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Department of Computer Science

PROGRAM NAME: M.Sc.(Computer Science), II SEM. (w.e.f. 2020-21)

COURSE NAME: PYTHON LAB

PAPER CODE: CS201P **YEAR/SEMESTER:I/II**

Week - 1

1. Write a program that displays the following information: Your name, Full address, Mobile number, Collegename, Course subjects.
2. Write a program to find the largest three integers using if-else and conditional operator.

Week - 2

3. Write a program with a loop that asks the user to enter a series of positive numbers. The user should enter anegative number to signal the end of the series. The program should display the numbers in order and theirsum.

Week - 3

4. Write a program to find the product of two matrices [A]mxp and [B]pxr.

Week - 4

5. Write recursive and non-recursive functions for the following:
a. To find GCD of two integers.
b. To find the factorial of positive integer
c. To print Fibonacci Sequence up to given number n

Week - 5

6. Write a program to display two random numbers that are to be added, such as: 247 + 129, the Programshould allow the student to enter the answer. If the answer is correct, a message of congratulations shouldbe displayed. If the answer is incorrect, a message showing the correct answer should be displayed.

Week - 6

7. Write recursive and non-recursive functions to display prime number from 2 to n.

Week - 7

8. Write a program that writes a series of random numbers to a file from 1 to n and display.
9. Write a program to create file, write the content and display the contents of the file with each line proceededwith a line number (start with 1) followed by a colon.

Week - 8

10. In a program, write a function that accepts two arguments: a list and a number n. The function displays all ofthe numbers in the list that are greater than the number n.

Week - 9

11. Write a program with a function that accepts a string as an argument and returns the no. of vowels that the string contains and another function to return no. of consonants.

Week - 10

12. Write a program that opens a specified text file and then displays a list of all the unique words found in thefile. (Store each word as an element of a set.)

Week -11

13. Write a program to analyze the contents of two text files using set operations.

Week - 12

14. Write a program to implement the inheritance and dynamic polymorphism.

Week - 13

15. Write a GUI program that converts Celsius temperatures to Fahrenheit temperatures.

Week - 14

16. Write a GUI program that displays your details when a button is clicked.

Note: Handle the exceptions raised from file operations.

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Department of Computer Science

PROGRAM NAME: M.Sc.(Computer Science), II SEM. (w.e.f. 2020-21)

COURSE NAME: COMPUTER NETWORKSLAB

PAPER CODE: CS202P **PPW: 6**
YEAR/SEMESTER: I/II **NO. OF CREDITS: 3**

Week - 1
1. Program to identify the category of the IP address for the given IP address
2. Program to implement sliding window protocol

Week - 2
3. Program Socket pair system call usage in IPC
4. Program for Socket options using signals

Week - 3
5. Program to implement Echo concurrent Stream Server

Week - 4
6. Program to implement Echo concurrent stream client

Week - 5
7. Program to implement Listener and Talker

Week - 6
8. Program to implement TCP time service

Week - 7
9. Program to implement UDP time service

Week - 8
10. Program to implement Ping service

Week - 9
11. Program to implement Route tracing program

Week – 10
12. Program to implement File Transfer Protocol

Week - 11
13. Program to implement any Shortest path routing Algorithm

Week - 12
14. Program to implement Distance Vector Routing Implementation

Week - 13
15. Program to implement ICMP Error Message simulations

Week - 14
16. Program to implement Reverse Address Resolution Protocol

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Department of Computer Science

PROGRAM NAME: M.Sc.(Computer Science)II SEM, (w.e.f. 2020-21)

COURSE NAME: DESIGN AND ANALYSIS OF ALGORITHMS LAB

PAPER CODE: CS203P **PPW: 6**

YEAR/SEMESTER: I/II **NO. OF CREDITS: 3**

Week - 1

1. Write a program recursive and non-recursive function for thefollowing:
   a) Factorial ofaninteger b) GCD of two integers c) FibonacciSequence

Week - 2

2. WriteaprogramforsortingthegivenlistusingInsertionSort,TopologicalSort.

Week - 3

3. Write a program for sorting the given list using Selection Sort,BubbleSort.
4. Write a program for sorting the given list using MergeSort.

Week - 4

5. Write a program for sorting the given list using QuickSort.

Week - 5

6. Write a program for sorting the given list using HeapSort.

Week - 6

7. Write a program to find the given number in a list using Sequential Search, BinarySearch.

Week - 7

8. Write a program to find product of two matrices [A]mxp and[B]pxr

Week - 8

9. Write a program to create AVLtree.-

Week - 9

10. Write a program to createB-tree.
11. Write a program to find the Euler circuit and the Hamiltonian circuit for a weightedgraph.

Week - 10

12. Write a program to find the shortest path in a weighted graph using Dijkstra'sAlgorithm.

Week - 11

13. Write a program to solve travelling sales manproblem.-

Week - 12

14. Write a program to solve knapsack problem.

Week - 13

15. Write a program to find the minimum spanning tree for a weighted graph using Kruskal'sAlgorithm.

Week - 14

16. Write a program to find the minimum spanning tree for a weighted graph using Prim'sAlgorithm.

Note: Analyze all the above problems with respect to TimeComplexity.

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Sainikpuri, Secunderabad
Autonomous College – Affiliated to Osmania University
M.Sc. [Computer Science] II Year
CBCS(Choice Based Credit System) w.e.f. 2021-2022
Scheme of Instruction and Examination

SEMESTER-III

Paper	Code	Paper Title	PPW		Max Marks		Max Marks		Credits
			TH	PR	TH	TH-CIA	PR	PR-CIA	
I	CS301	Programming in C#	4		70	30			4
II	CS302	Compiler Design	4		70	30			4
III	CS303(A)	Network Security	4		70	30			4
	CS303(B)	Big Data Analytics							
IV	CS304(A)	Object Oriented Analysis and Design	2		50				2
	CS304(B)	Data Mining							
V	CS305(AECC)	MOOCs (Online SWAYAM Course)	2		75	25			2
VI	CS301P	C# Lab		6			75		3
VII	CS302P	Compiler Design Lab		6			75		3
VIII	CS303(A)P	Network Security Lab		4			50		2
	CS303(B)P	Big Data Analytics Lab							
		Total	16	16	335	115	200		24

SEMESTER – IV

Paper	Code	Paper Title	PPW		Max Marks		Max Marks		Credits
			TH	PR	TH	TH-CIA	PR	PR-CIA	
I	CS401	Computer Organization	4		70	30			4
II	CS402	Cloud Computing	4		70	30			4
III	CS403(A)	Mobile Computing	4		70	30			4
	CS403(B)	Distributed Systems							
IV	CS404(A)	Artificial Intelligence	4		70	30			4
	CS404(B)	Internet of Things							
V	CS405P	Project Work		16			150	50	8
		Total	16	16	280	120	150	50	24

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M.Sc. (Computer Science) IV Semester (CBCS),w.e.f. 2020-2021

CS401 - Compiler Design

PAPER CODE: CS401 **PPW: 4**

YEAR/SEMESTER:II/II **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of compiler and different passes involved in compiler design.

UNIT-WISE COURSE OBJECTIVES:

COb1: To inculcate knowledge on major concept areas of language translation and compiler design.
COb2: To demonstrate the concepts of various phases of compiler and its use, code optimization techniques.
COb3: To inculcate knowledge on machine code generation and use of symbol table.
COb4: To illustrate the concepts of parser by using LL parser and LR parser.

Unit – I: **15 Hrs.**

Introduction To Compiling:-Compilers –Analysis of the source program –Phases of a compiler –Cousins of the Compiler –Grouping of Phases –Compiler construction tools.**Simple One-Pass Compiler**: Overview, syntax definition, syntax directed translation, parsing, a translator for simple expressions. **Lexical Analysis** –The Role of Lexical Analyzer –Input Buffering –Specification of Tokens, Recognition of tokens, a language for specifying lexical analyzers.
(Ch-1,2,3)

Unit – II: **15 Hrs.**

Syntax Analysis -Role of the parser –Top Down parsing (Recursive Descent Parsing ,Predictive Parsers) –Bottom-up parsing –Operator Precedent Parsing–LR Parsers (SLR Parser tables, constructing Canonical LR Parser, LALR Parser), introduction to parser generators.**Syntax – Directed Translation**: Syntax Directed definition, construction of syntax trees.
(Ch-4, 5)

Unit – III: **15 Hrs.**

Run Time Environments: -–Source Language issues –Storage Organization –Storage Allocation strategies –Access to nonlocal names –Parameter Passing, Symbol Tables (Symbol table entries, Data structures to symbol tables, representing scope information).
(Ch-7)

Unit – IV: **15 Hrs.**

Intermediate Code Generation: -Intermediate languages –Declarations –Assignment Statements– Boolean Expressions –Case Statements –Back patching.**Code Generation:** -Issues in the design of code generator –The target machine –Basic Blocks and Flow Graphs –Next-use Information –A simple code generator.
(Ch-8,9)

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Suggested Books:
Alfred V.Aho, Ravi Sethi, JD Ullman, 'Compilers Principles, Techniques and Tools', Pearson Education, 2007.

Reference Books:
1.AlfredV.Aho, Jeffrey D. Ullman, 'Principles of Compiler Design', Narosa publishing
2.Lex&Yacc –John R. Levine, Tony Mason, Doug Brown, O'reilly
3.Modern Compiler Implementation in C-Andrew N. Appel, Cambridge University Press.

COURSE OUTCOMES:
At the end of the course students will be able to:
CS401CO1: Be familiar with major concepts of language translation and compiler design.
CS401CO2: Understand various phases of compiler and its use, code optimization techniques.
CS401CO3: Be familiar with machine code generation and use of symbol table.
CS401CO4: Acquire knowledge on parser by passing LL parser and LR parser.

Employability Aspect : System Developer, Compiler Designer/Developer.

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CS402 - Cloud Computing

PAPER CODE: CS402 **PPW: 4**

YEAR/SEMESTER:II/II **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of cloud computing environment, different services available.

UNIT-WISE COURSE OBJECTIVES:

COb1: To inculcate knowledge on new model of computing environment.
COb2: To demonstrate the concepts of virtual machine and its services.
COb3: To inculcate knowledge on workflow engine for clouds and federated computing.
COb4: To illustrate the concepts of on data security and legal issues related cloud computing.

Unit – I: **15 Hrs.**

Introduction to Cloud Computing: Cloud computing in a nutshell, Roots of cloud computing, Layers and types of clouds, desired feature of a cloud, Cloud infrastructure management – Features, Infrastructure as a service providers – Features, Platform as a service providers-Features, Challenges and risks.

Migrating into a Cloud: Introduction, Broad approaches to migrate into the cloud, The seven - step model of migration into the cloud.

Enriching the 'Integration as a Service' Paradigm for the Cloud Era: An introduction, The onset of knowledge Era, The evolution of SaaS, The challenges of SaaS paradigm, Approaching the SaaS integration Enigma, New integration scenarios, The Integration methodologies.

(Ch-1, 2, 3)

Unit – II: **15 Hrs.**

Virtual machines provisioning and Migrationservices: Introduction & Inspiration, Background & related work, Virtual Machines provisioning and manageability, Virtual Machines migration services.

Aneka-Integration of private and public clouds: Introduction, Technologies & tools for cloud computing, Aneka Cloud Platform, Aneka Resource provisioning service, Hybrid cloud implementation.

T-Systems Cloud-based solutions for Business applications: Introduction, What enterprises demand of Cloud computing, Dynamic ICT services, Importance of Quality and security in clouds, Dynamic Data Center – producing business – ready, dynamic ICT services.

(Ch-5,9, 11)

Unit – III: **15 Hrs.**

Workflow Engine for Clouds: Introduction, Background, Workflow Management System and clouds, Architecture for Workflow Management system, Utilizing cloud for workflow execution.

An Architecture for Federated Cloud Computing: Introduction, Typical use case, basic principles of cloud computing, A model for federated cloud computing, security consideration.

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Performance Prediction for HPC on Clouds: Introduction, Background, Grid & cloud, HPC in cloud-performance related issues.
(Ch-12,15, 17)

Unit – IV: **15 Hrs.**

Data Security in the Cloud: An introduction to the idea of Data Security, Current state of Data Security in the cloud, HOMO Sapiens and digital information, cloud computing and data security risk, cloud computing and identity, the cloud-digital identity-data security, content level security-pros & cons.

Legal Issues in Cloud computing: Introduction, Data Privacy & security issues, Cloud contracting Models, Jurisdictional issues raised by virtualization & data location, commercial and business considerations-cloud users view point.

Achieving Production Readiness for Cloud Services: Introduction, servic0e management, producer-consumer relationship, cloud service life cycle, production readiness, assessing production readiness.
(Ch-23, 24, 25)

Suggested Books:

Cloud Computing: Principles and Paradigms by Rajkumar Buyya, James Brobergand Andrzej M.Goscinski, 2011,Wiley.

Reference Books:

1. Code in the Cloud: Mark C.Chu-Carroll 2011, SPD.(Second part of IV UNIT)
2. Essentials of cloud computing : K Chandrasekharan CRC Press.
3. Cloud Computing: John W. Rittinghouse, James Ransome, CRC Press.
4. Virtualization Security: Dave shackleford 2013. SYBEX a wiley Brand.
5. Cloud computing and Software Services: Ahson , Ilyas.2011.
6. Cloud Computing Bible: Sosinsky 2012. Wiley India .
7. Cloud Computing: Dan C. Marinescu-2013, Morgan Kaufmann.
8. Distributed and Cloud Computing, Kai Hwang, GeofferyC.Fox, Jack J.Dongarra, Elsevier, 2012.
9 . Fundamentals of Python Kenneth A.Lambert | B.L.Juneja

COURSE OUTCOMES:

At the end of the course students will be able to:

CS402 CO1: Be familiar with major concepts related to traditional computing and cloud computing.

CS402 CO2: Understand virtualization and different types of clouds.

CS402 CO3: Be familiar with workflow engine process and performance predictions.

CS402 CO4: Acquire knowledge on Security, privacy and legal issues related to cloud environment.

Employability Aspect : Skill Enhancement course, Application Developer, Application Support Engineer.

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M.Sc. (Computer Science) IV Semester (CBCS),w.e.f. 2020-2021

CS403(A) - Mobile Computing

PAPER CODE: CS403(A) **PPW: 4**

YEAR/SEMESTER:II/II **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of Mobile devices and their communication mechanisms.

UNIT-WISE COURSE OBJECTIVES:

COb1: To inculcate knowledge on Mobile device components, and media access control.
COb2: To demonstrate the concepts of Wireless LAN and network layer.
COb3: To inculcate knowledge on mobile transport layer and application protocols
COb4: To illustrate the concepts of application protocol and different scripts.

Unit – I: **15 Hrs.**

Introduction: Applications, Wireless Transmission: Frequencies of radio transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulation, Spread Spectrum, Cellular System, **Media access control**: Motivation for a specialized MAC, SDMA, FDMA, TDMA, CDMA, and Comparisons. (Ch-1, 2, 3)

Unit – II: **15 Hrs.**

Wireless LAN: Infrared vs. radio transmission, Infrastructure and ad-hoc networks,IEEE 802.11.
Mobile network layer: Mobile IP, Dynamic host configuration protocol, Ad hoc networks.
(Ch-7.1, 7.2, 7.3, Ch-8)

Unit – III: **15 Hrs.**

Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, fast transmit / fast recovery, Transmission / timeout freezing, Selective re-transmission, and Transaction Oriented TCP.
Wireless Application Protocol: WAP Architecture, Wireless Datagram Protocol, Wireless Transport Security, Wireless Transaction Protocol. (Ch-9.2, Ch-10.3.1, 10.3.2, 10.3.3, 10.3.4)

Unit – IV: **15 Hrs.**

Wireless Application Protocol: Wireless Session Protocol, Wireless Application Environment,Wireless Markup Language (WML), WMLScript, Events, Wireless Telephony Application. Push Architecture, Push/Pull Services, WAP2.0.
(Ch-10.3.5, 10.3.6, 10.3.7, 10.3.8, 10.3.9, 10.3.10, 10.3.11)

Suggested Books:
JochenSchiller, Mobile Communications, Second Edition Pearson Education, 2000.

Reference Books:
The Wireless Application Protocol, Pearson Education, 2001, Sandeep Singhal, Thomas Bridgmam

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COURSE OUTCOMES:

At the end of the course students will be able to:

CS403(A) CO1: Be familiar with mobile environment structure and its types.

CS403(A) CO2: Understand wireless LAN and mobile network layer.

CS403(A) CO3: Be familiar with transport layer and different application protocols.

CS403(A) CO4: Acquire knowledge on WML and WAP 2.0 environment.

Employability Aspect : Apps. Developer, Resource Optimizer.

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CS403(B) -Distributed Systems

PAPER CODE: CS403(B) **PPW: 4**

YEAR/SEMESTER:II/II **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of distributed environment, uses, replications and security issues,

UNIT-WISE COURSE OBJECTIVES:

COb1: To inculcate knowledge on Hardware requirement of distributed systems and communications.
COb2: To demonstrate the concepts of process, and synchronization issues.
COb3: To inculcate knowledge on replication consistency, fault tolerance.
COb4: To illustrate the concepts of security issues, object management and file system.

Unit – I: **15 Hrs.**

Introduction- Distributed Systems, Goals, Hardware Concepts, Software Concepts, Client-server model. **Communication** – Layered Protocols, RPC, Remote object invocation, Message oriented communication. (Ch. – 1,2)

Unit – II: **15 Hrs.**

Processes – Threads, clients, servers, code migration, software agents. **Naming –** Naming entities, locating mobile entities, removing unreferenced entities. **Synchronization –**Clock synchronization, Logical clocks, global state, election algorithms, Mutual exclusion, distributed transactions. (Ch. – 3,4,5)

Unit – III: **15 Hrs.**

Consistency and replication – Introduction, data centric consistency models, client-centric consistency models, distribution protocols, consistency protocols. **Fault Tolerance -** Introduction to fault tolerance, process resilience, reliable client-server communication, reliable group communication, distributed commit, recovery. (Ch. – 6, 7)

Unit – IV: **15 Hrs.**

Security- Introduction, secure channels, access control, security management. **Distributed Object-based systems -** CORBA, COM. **Distributed File Systems –**Sun network file system, the coda file system. **Distributed document-based systems** – The WWW, Lotus Notes. (Ch. 8, 9, 10, 11)

Suggested Books:

Andrew S. Tanenbaum & Maarten van Steen, Distributed Systems- Principles and Paradigms, Pearson education.

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Reference Books:

1. A Text Book of DISTRIBUTED SYSTEMS, Profession Publications, First Edition
2.GeorgeCoulouris, Jean Dollimore, Tim Kindberg, Gordon Blair – "Distributed Systems Concepts and Design", Fifth Edition- Pearson Edition.

COURSE OUTCOMES:

At the end of the course students will be able to:

CS403(B) CO1: Be familiar with traditional client/server and distribution functions.
CS403(B) CO2: Understand processes, naming and different clock implementations.
CS403(B) CO3: Be familiar with data consistency, replication and fault tolerance use.
CS403(B) CO4: Acquire knowledge on Security, distributed object based environment and distributed document based systems.

Employability Aspect : System Administrator, Backup/Recovery Manager.

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CS301 - C# Programming

PAPER CODE: CS301 **PPW: 4**

YEAR/SEMESTER:II/I **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of programming to develop .Net based applications using C# platform.

UNIT-WISE COURSE OBJECTIVES:

COb1: To inculcate knowledge on .Net framework objects.
COb2: To demonstrate the concepts of C# fundamentals, C# programming with console applications.
COb3: To inculcate knowledge on Windows and Web application environments.
COb4: To illustrate the concepts of ASP.NET, ADO.NET with web controls and services.

Unit – I: **15 Hrs.**

Introduction to Programming - The C# Language and the .NET Platform, Visual Studio IDE, Alternatives to Visual Studio, Decompiling Code, C# in Linux, iOS and Android, Other .NET Languages. Primitive types and variables – Data types, variables, value and reference type, literals. Operators, type casting and conversion, expressions. **Console Input and Output** statements. **Conditional and looping statements** – if, if-else, switch statements. For, do-while, for each loop and nested loops. (I-Chap – 1,2,3,4,5, 6)

Unit – II: **15 Hrs.**

Arrays – reading array elements from console, memory allocation to array elements, multidimensional arrays, array of arrays. **Methods** – How to declare, implement and invoke methods. Implementation of user defined methods. Parameters and return value from methods. Best practices when using methods. **Recursion** – direct or indirect recursion, creating recursive methods, why to use recursions. Exception handling, string and text processing.(I-Chap –7, 9, 10, 12, 13)

Unit – III: **15 Hrs.**

Defining Classes – custom classes, classes and objects, organizing classes in files and namespaces, class declaration, members visibility, usage of reserved word 'this', constructors, static class and members, structures, nested classes, generics. **Text files** – Streams, read and write operations with text files, input/output exception handling. Windows forms – creating windows forms, for object property settings, creating Multiform Windows Applications forms, displaying messages. Windows form controls-labels, text box, list box, rich text box, list box, check box, combo box controls, buttons.(I-Chap – 14, 15, II-Chap -4,5)

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Unit – IV: **15 Hrs.**

ADO.NET – connection, data access, data set, data reader. **ASP.NET**- Introducing new features, describing the ASP.NET life cycle. **Web forms** – standard controls. Working with database controls.(II-Chap - 19, 25, 28, 32)

Suggested Readings:

1. FUNDAMENTALS OF COMPUTER PROGRAMMING WITH C# (The Bulgarian C# Programming Book) © SvetlinNakov& Co., 2013
2. NET 4.0 Black Book, Dreamtech Press.

Reference Readings:

1. .NET Framework with C#, Sweeta Bansal, Apex Publishing
2. Microsoft Visual C# Step By Step-2016 – Sharp John- Microsoft, EEE

COURSE OUTCOMES:

At the end of the course students will be able to:

CS301 CO1: Develop applications using classes and objects, console applications.
CS301 CO2: Develop programs usingconsole applications and exception handlings.
CS301 CO3: Develop programs usingtext file handling and Windows applications.
CS301 CO4: Develop programs using ASP.NET and ADO.NET with web controls.

Employability Aspect : Software Developer, Programmer.

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CS302 - Computer Organization

PAPER CODE: CS302 **PPW: 4**

YEAR/SEMESTER:II/I **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of digital computer operations, arithmetic unit operations, I/o device communications and memory management.

UNIT-WISE COURSE OBJECTIVES:

COb1:To have a thorough understanding of the basic structure and operation of a digital computer.
COb2: To discuss in detail the operation of the arithmetic unit.
COb3: To study the different ways of communicating with I/O devices and standard I/O interfaces.
COb4: To study the hierarchical memory system including cache memories and virtual memory.

Unit – I: **15 Hrs.**

Number systems: binary, octal, decimal and hexadecimal. Number conversion from one number system to another for integers and fractions, Two's compliment, addition/subtraction of numbers in twos complement, Binary codes. **Digital logic circuits:** logic gates (OR, AND, NOT, XOR Gates), DeMorgan's theorem, Universal building blocks, laws of Boolean algebra, flip-flops. (Ch-3,1)

Unit – II: **15 Hrs.**

Digital Components: binary counters, shift registers, encoders, decoders, multiplexers, demultiplexers circuits, memory unit. **Register transfer and Micro-operations**: Register Transfer Language, Bus and memory transfers, Arithmetic Micro operations, Logic Micro operations, Shift Micro operations, Arithmetic Logic Shift unit.(Ch-2,4)

Unit – III: **15 Hrs.**

Micro programmed Control: Control Memory, Address Sequencing, Micro program Example, Design of Control Unit. **Central Processing Unit**: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data and Transfer Manipulation, Program Control.(Ch-7,8)

Unit – IV: **15 Hrs.**

Input-Output Organization: Peripheral Devices, Input-Output interface, Asynchronous Data Transfer, Modes of transfer, Priority interrupt, Direct Memory Access (DMA), input-output processors (IOP), Serial communication. **Memory Organization**: Memory Hierarchy, Main memory, Definitions - Auxiliary memory, Associate Memory, Cache Memory, Virtual memory. (Ch-11,12)

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Suggested Reading:
Computer System Architecture, M. Morris Mano, Prentice Hall of India Pvt. Ltd., Third Edition, Sept. 2008

Reference Readings:
1. Mano, M.M. : Digital Logic and Computer Design, Prentice- Hall of India.
2. Stallings, William : Computer Organization& Architecture.
3. Mano, M.M. : Digital Design, Prentice-Hall of India.

COURSE OUTCOMES:
At the end of the course students will be able to:
CS302 CO1: Basic structure of digital computer and its functions.
CS302 CO2: Understand digital components and micro operations
CS302 CO3: Micro programming operations and CPU organization.
CS302 CO4: Understand Memory organization and I/O device processing.

Employability Aspect : New system developer/Device Driver Developer.

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CS303(A) - Network Security

PAPER CODE: CS303(A) **PPW: 4**

YEAR/SEMESTER:II/I **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of Network Security, different key encryption and decryption techniques.

UNIT-WISE COURSE OBJECTIVES:

COb1: To inculcate computer network security.
COb2: To demonstrate the concepts of the conventional and public key cryptosystem algorithms.
COb3: To inculcate knowledge on authentication techniques and algorithms.
COb4: To illustrate the concepts of cryptographic algorithms and key encryptions and Internet Security.

Unit – I: **15 Hrs.**

Overview of Network Security: The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, a Model for Network Security.
Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography.
Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure, the Data Encryption Standard (DES), A DES Example, Strength of DES.
Block Cipher Operation: Double DES, Triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode.
(Ch. 1.2, 1.3, 1.4, 1.5, 1.6, 2.1, 2.2, 2.3, 2.4, 2.5, 3.1, 3.2, 3.3, 3.4, 6.1, 6.2, 6.3, 6.4, 6.5)

Unit – II: **15 Hrs.**

Pseudorandom Number Generation and Stream Ciphers: Principles of Pseudorandom Number Generation, Pseudorandom Number Generators,Pseudorandom Number Generation using BlockCipher. **Public-Key Cryptography and RSA:** Principles of Public-Key Cryptosystems, the RSA Algorithm.
Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509 Certificates, Diffie-Hellman Key Exchange.
(Ch. 7.1, 7.2, 7.3, 9.1, 9.2, 14.1, 14.2, 14.3, 14.4, 10.1)

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Unit – III: **15 Hrs.**

Message Authentication Codes: Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes,Security of MACs,MACs Based on Hash Functions:HMAC.

Digital Signatures: Digital Signatures, NIST Digital Signatures Algorithm.

(Ch. 12.1, 12.2, 12.3, 12.4, 12.5, 13.1, 13.4)

Unit – IV: **15 Hrs.**

Cryptographic Hash Functions: Applications of Cryptographic Hash Functions, Two Simple Hash Functions, Secure Hash Algorithm (SHA) & MD5 Algorithm.
Electronic Mail Security: Pretty Good Privacy.
IP Security: IP Security Overview.
(Ch. 11.1, 11.2, 11.5, 19.1, 20.1)

Suggested Reading:
William Stallings, Cryptography and Network Security – Principles and Practice, Sixth Edition, Kindle Edition.

Reference Readings:

1. Cryptography and Network Security by Behrouz AForouzan, DebdeepMukhopadhyay, McGraw-Hill Education, SIE, 3e.
2. Cryptography and Network Security :AtulKahate, Mc Graw Hill, 2nd Edition.
3. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.

COURSE OUTCOMES:

At the end of the course students will be able to:
CS303(A) CO1: Understand the basic security issues and classical encryption techniques.
CS303(A) CO2: Understand the Public Key Cryptosystems and how the keys are exchanged among different participating entities.
CS303(A) CO3: Understand the Message Authentication algorithms and importance of Digital Signatures.
CS303(A) CO4: Understand various Hash Functions used in security and also about Email and IP Security.

Employability Aspect : System Security Developer, Application Security Implementation.

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Unit – IV: **15 Hrs.**

Understanding Analytics and Big Data: Comparing Reporting and Analysis, Types of Analytics, Points to consider during Analysis, Developing an Analytic Team, Understanding Text Analytics.Analytical Approach and Tools to Analyze Data: Analytical Approaches, History of Analytical Tools, Introducing Popular Analytical Tools, Comparing Various Analytical Tools.

Social Media Analytics and Text Mining: Introducing Social Media, Key elements of Social Media,TextMining, Understanding Text Mining Process, Sentiment Analysis, Performing Social Media Analytics and Opinion Mining on Tweets.

(II – Chap.17, 27)

Suggested Readings:

1. BIG DATA and ANALYTICS, Seema Acharya, SubhasininChellappan, Wiley publications.
2.BIG DATA, Black BookTM, DreamTech Press, 2015 Edition.

Reference Readings:

1.Rajiv Sabherwal, Irma Becerra-Fernandez," Business Intelligence –Practice, Technologies and Management", John Wiley 2011.
2.Lariss T. Moss,ShakuAtre, " Business Intelligence Roadmap", Addison-Wesley It Service.

COURSE OUTCOMES:

At the end of the course students will be able to:

CS303(B)CO1: Be familiar with big data concepts.
CS303(B) CO2: Understand big data analytics.
CS303(B) CO3: Be familiar with MapReduce fundamentals.
CS303(B) CO4: Acquire knowledge on the usage of big data analytics in social media.

Employability Aspect : Data Analyst, Programmer.

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CS304(A) - Object Oriented System Development

PAPER CODE: CS304(A) **PPW: 4**

YEAR/SEMESTER:II/I **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of UML and its related diagrams to analyze and design new application system.

UNIT-WISE COURSE OBJECTIVES:

COb1: To inculcate knowledge on Object oriented system life cycle and UML structures.
COb2: To demonstrate the concepts of Structure modeling and advanced modeling.
COb3: To inculcate knowledge on Behavioral modeling and advanced modeling.
COb4: To illustrate the concepts of Advanced modeling concepts related to patterns and frame works.

Unit – I: **15 Hrs.**

Introduction. An Overview of Object OrientedSystem Development,Object Basics, Object Oriented Systems Development Life Cycle, Object Oriented Methodologies, Importance of Modeling, Object Oriented Modeling,AnOverview of the UML. Software Development Life Cycleof UML, Building Blocks of the UML, Rules of the UML, UML Architecture.
(I: ch-1 to 4) (II: ch-1 &2).

Unit – II: **15 Hrs.**

Structural modeling: Classes, Relationships,Common Mechanisms, Diagrams, Class Diagrams.**Advanced Structural Modeling**: Advanced classes, Advanced Relationships, Interfaces, Types, Roles, Packages, Instances, Object Diagrams.
(II: ch-4 to 14)

Unit – III: **15 Hrs.**

Behavioral modeling: Interactions, Use cases, Use case Diagrams, Interaction Diagrams,Activity Diagrams.**Advanced Behavioral Modeling:** Events and Signals, State Machines, Processes and Threads, Time and Space, State Chart Diagrams.
(II: ch-15 to 24)

Unit – IV: **15 Hrs.**

Advanced-Modeling: Components, Deployment,Collaborations,Patterns and Frame works, Component diagrams, Deployment Diagrams, Systems and Models.
(II: ch-25 to 31)

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Suggested Books:

1. Ali Bahrami, "Object Oriented Systems Development",McGraw-Hill International Editions.1999.
2. Grady Booch, James Rumbaugh, lvar Jacobson,"The Unified Modeling Language-User Guide", Pearson Education, Addison-Wesley, 1999

Reference Books:

1. Rational Rose Manuals
2. Meilir Page-Jones, "Fundamentals of Object Oriented Design in UML", 1stEdition, Pearson Education, 2006.
3. Pascal Roques, "Modeling Software Systems Using UML2", 1stEdition, WILEY Dreamtech, 2007.
4. AtulKahate, "Object Oriented Analysis & Design", 1stEdition, TMH, 2007.
5. Mark Priestley, "Practical Object-Oriented Design with UML", 2nd Edition, TMH, 2005.
6. Craig Larman, "Appling UML and Patterns: An introduction to Object", Oriented Analysis and Design and Unified Process, 3rd Edition, Pearson Education, 2007.

COURSE OUTCOMES:

At the end of the course students will be able to:

CS304(A) CO1: Be familiar with Object Oriented System Development concepts.
CS304(A) CO2: Understand different structured and advanced modeling.
CS304(A) CO3: Be familiar with Behavioral Modeling and advanced modeling concepts.
CS304(A) CO4: Acquire knowledge on the advanced modeling concepts related to OOSD.

Employability Aspect : Application Developer, Analyst.

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CS304(B) - Data Mining

PAPER CODE: CS304(B) **PPW: 4**

YEAR/SEMESTER:II/I **NO. OF CREDITS: 4**

COURSE OBJECTIVE: To enable students with the concepts of Data warehouse and data mining algorithms for the effective data analysis.

UNIT-WISE COURSE OBJECTIVES:

COb1: To inculcate knowledge on study data warehouse principles and its functioning.
COb2: To demonstrate the concepts of learn data mining concepts.
COb3: To inculcate knowledge on different types of classification algorithms.
COb4: To illustrate the concepts of data grouping using clustering techniques..

Unit – I: **15 Hrs.**

Data Warehousing and Online Analytical Processing: Data Warehouse- Basic Concepts, Data Warehouse Modelling: Data Cube and OLAP.**Data Warehouse Design and Usage:** A Business Analysis Framework for Data Warehouse Design, Data Warehouse Design Process, Data Warehouse Usage for Information Processing, From Online Analytical Processing to Multidimensional Data Mining.

(Chap 4-4.1,4.2,4.3)

Unit – II: **15 Hrs.**

Introduction to Data Mining: What Is Data Mining? What Kinds of Data Can Be Mined?What Kinds of Patterns Can Be Mined? Which Technologies Are Used? Major issues in Data Mining. **Mining Frequent Patterns, Associations, and Correlations: Basic Concepts and Methods**:Basic Concepts, Frequent Itemset Mining Methods-Apriori Algorithm: Finding Frequent Items sets by ConfinedCandidate Generation, Generating Association Rules from Frequent Itemsets,A Pattern-Growth Approach for Mining Frequent Itemsets.

(Chap 1-1.1, 1.2 , 1.3, 1.4, 1.5, 1.7, Chap 6-6.1, 6.2)

Unit – III: **15 Hrs.**

Classification: Basic Concepts, Decision Tree Induction (Decision tree induction, Attribute selection measures), Bayes Classification Methods, Rule-Based Classification-Using IF-THEN Rules for Classification, Rule Extraction from a Decision Tree, **Cluster Analysis -Basic Concepts and Methods:** Cluster Analysis, Partitioning Methods, Hierarchical Methods- Agglomerative versus Divisive Hierarchical Clustering, Distance Measures in Algorithmic Methods, BIRCH: Multiphase Hierarchical Clustering Using Clustering Feature Trees, Density-Based Methods - DBSCAN: Density-Based Clustering Based on Connected Regions with High Density.

(Chap 8- 8.1, 8.2(8.2.1,8.2.2), 8.3, 8.4, Chap 10- 10.1,10.2, 10.3, 10.4)

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Unit – IV: **15 Hrs.**

Outlier Detection: Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches-parametric based: Detection of univariate outliers based on Normal distribution, Proximity-Based Approaches-Distance-based Outlier detection and a nested loop method only,Clustering-Based Approaches

Data Mining Trends and Research Frontiers: Mining Complex Data Types, Other Methodologies of Data Mining,Data Mining Applications-Data Mining for Financial Data Analysis, Data Mining for Retail and Telecommunication Industries, Data Mining in Science and Engineering.

Chap 12- 12.1, 12.2, 12.3, 12.4, 12.5, 12.6, Chap 13- 13.1,13.2, 13.3

Suggested Books:

DATA MINING -concepts and Techniques – Jiawei Han,Micheline Kamber-Jian PeiMorgan Kaufmann Publisher 3rd Edition.

Reference Books:

1.Data Mining Techniques –Arun K pujari,3rd Edition,Universities Press.
2.Data Warehousing Fundamentals –Pualraj Ponnaiah,Wiley Studebt Edition.

COURSE OUTCOMES:

At the end of the course students will be able to:

CS304(B) CO1: Be familiar with data warehouse and differences with traditional databases.
CS304(B) CO2: Understand the process involved in different mining techniques.
CS304(B) CO3: Be familiar with the association rules, classification and clusters in large data sets.
CS304(B) CO4: Acquire knowledge on real world problems in business an scientific information using data mining.

Employability Aspect : Data Analyst, Data Provider.

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M.Sc. (Computer Science) III Semester (CBCS), w.e.f. 2020-2021

CS305(AECC):MOOCs Online NPTEL Courses

PAPER CODE: CS305(AECC) **PPW: 2**

1) **Big Data Computing**
   Duration : 8 weeks

   Start Date : 17 Aug 2020

   End Date : 09 Oct 2020

   Exam Date : 18 Oct 2020

   Enrollment Ends :17 Aug 2020

Category :Computer Science and Engineering

Level : Postgraduate

2) **Object Oriented Analysis and Design**

Duration : 8 weeks

   Start Date : 20 Jul 2020

   End Date : 11 Sep 2020

   Exam Date : 27 Sep 2020

   Enrollment Ends :27 Jul 2020

Category :Computer Science and Engineering

Level : Undergraduate /Postgraduate

3) **Programming in C++**

Duration : 8 weeks

   Start Date : 20 Jul 2020

   End Date : 11 Sep 2020

   Exam Date : 27 Sep 2020

   Enrollment Ends :27 Jul 2020

Category :Computer Science and Engineering Programming

Level : Undergraduate/Postgraduate

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4) Introduction To Haskell Programming

Duration : 8 weeks

Start Date : 20 Jul 2020

End Date : 11 Sep 2020

Exam Date : 27 Sep 2020

Enrollment Ends :27 Jul 2020

Category :Computer Science and Engineering

Level : Undergraduate/Postgraduate

Employability Aspect : Skill Enhancement Course.

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CS301P – C# Programming Lab

Objective: Student will get knowledge in implementation of C# code on .NET utilities.

Week – 1:

1. Write a program to implement control statement.
2. Writea program to implement looping statement.

Week – 2:

3. Write a program for bubble sort using arrays.
4. Write a program to implement arithmetic operations on the given 2 numbers.

Week – 3:

5. Program to create classes and objects.
6. Program to implement inheritance.

Week – 4:

5. Print multiplication table for the given number (using for loop).
6. Create an MDI (Multi Document Interface) form with menu controls.

Week – 5:

7. Write a program to navigate the records using first, last, next, previous buttons in windows applications.
8. Write a program with list boxes for interchanging data from one list to another list.

Week – 6:

9. Create a web services with a method GetEmployeeData and call the web services from browser.

Week – 7:

10. Create a web services and consume that services using Proxy in web application..

Week – 8:

11. Create a XML schema with emp no, name, salary, designation.

Week – 9:

12. Create a webpage with validation controls to validate the data given in textboxes.

Week – 10:

13. Create a form with Data grid and display the employee data into that using stored procedure.

Week – 11:

14. Create a webpage with a data grid view display with employee data.

Week – 12:

15. Passing a value from one page to another page in web applications.

Week – 13:

16. Create a virtual directory in IIS and map to local web application folder.

Week – 14:

17. Create student data form with web controls Textboxes CheckBox,Radio button, Dropdown, Button, Textbox for search.

Outcome: Student gets perfection in Windows and Web application development with Database connectivity.

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CS302P - Computer Organization Lab

Objective: Student will be able to write Micro programming for 8086 and 8051 processors.

Week – 1:

I. Digital systems:

-Verification of the logic gates, Encoder, Decoder, Mux.,Demux.

Week – 2:

II. 8086 Microprocessor Programs

1.write an assembly language program to add two 8 bit numbers

2.write an assembly language program to subtract two 8 bit numbers

Week - 3:

3.write an assembly language program to multiply two 8 bit numbers and the result is an 8 bit number

Week - 4:

4.write an assembly language program to divide a big number with a small number (8 bit numbers)

Week -5:

5.Write an assembly language program to move block of elements to another block

Week - 6:

6 Write an assembly language program to find biggest element in the given list

Week - 7:

7.Write an assembly language program to find SMALLEST element in the given list

Week - 8:

8.Write an assembly language program to arrange nos. in ascending order

Week - 9:

9.Write an assembly language program to arrange nos. in descending order

III.8051 Microcontroller Programs

Week - 10:

10. Write an assembly language program to add two 8-bit numbers.

Week - 11:

11. Write an assembly language program to subtract two 8-bit numbers.

Week - 12:

12. Write an assembly language program to multiplication two 8-bit numbers.

Week - 13:

13. Write an assembly language program to division two 8-bit numbers.

Week - 14:

14. Write an assembly language program to sum of n-elements in a given array.

15. Writean assembly language program to finding the largest element in an array.

Outcome: Student can be confident in writing Micro processor and Micro controller programming.

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CS303(A)P – Network Security Lab

Objective: Student will be able to implement different security algorithms in data transmission.
Note: Implement of these algorithms using Java.

Week 1:
1. Program to perform the Caesar Cipher technique

Week 2:
2. Program to perform the Mono alphabetic

Week 3:
3. Program to Rail Fence Technique

Week 4:
4. Program to perform poly alphabetic cipher

Week 5:
5. Program to perform single DES-ENCRYPT Method

Week 6:
6. Program to perform single DES-DECRYPT Method

Week 7:
7. Program to perform Triple DES-ENCRYPT Method.

Week 8:
8. Program to perform Triple DES-DECRYPT Method.

Week 9:
9. Program to generate Secret/Symmetric key

Week 10:
10. Program to generate Private & Public keys

Week 11:
11. Program to encrypt and decrypt the data using RSA Algorithm.

Week 12:
12. Program to generate Message digest using MD5 Algorithm

Week 13:
13. Program to generate Message digest using SHA Algorithm

Week 14:
14. Program to implement Diffie Hellman Key Exchange Algorithm

Outcome: Student gets the knowledge in implementation of different keys and encryption and decryption mechanisms.

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CS304(B)P - Big Data Analytics Lab

(Using Python / R Tool)

Objective: Student will be able to analyze big data and will be capable to implement different map reduce algorithms.

Week – 1:

1. Study of tool for Data Analytics.

Week – 2:

2. Programming exercises on tool.

Week -3:

3. Programming exercises in No SQL.

Week – 4:

4. Implementing simple algorithms in Map-Reduce (3) -Matrix multiplication, Aggregates, joins, sorting, searching etc.

Week – 5:

5. Implementing any one Frequent Itemset algorithm using Map-Reduce.

Week – 6:

6. Implementing any one Clustering algorithm using Map-Reduce.

Week – 7:

7. Implementing any one data streaming algorithm using Map-Reduce.

Week – 8:

Mini Project: One real life large data application to be implemented (Use standard Datasets available on the web).

8. Twitter data analysis.

Week – 9:

9. Fraud Detection.

Week – 10:

10. Tweeter.

Week – 11:

11. Data Management.

Week – 12:

12. Anomaly Detection.

Week – 13:

13. Stream Mining for Tweets.

Week – 14:

14. Text Mining with LDA.
15. Sentiment Analysis.

Outcome: Student get perfection in analyzing big data and apply on different data reduction techniques.

Note: Make the students into teams of 2 or 3.Each group to perform the followingexperiments on their case-study.

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Each group should perform the exercises on a large dataset created by them with respect to the case study allotted. At the end of the semester, the teams should submit a report on the solutions found.

List of Open Source Software/learning website:

- **http://in.reuters.com/tools/rss**
- http://www.altova.com/xmlspy.html
- https://www.w3.org/RDF/
- http://www.data.gov.in
- http://www.hackerrank.com

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