Central University of Himachal Pradesh

(Established under Central Universities Act 2009)

PO BOX: 21, DHARAMSHALA, DISTRICT KANGRA – 176215, HIMACHAL PRADESH

www.cuhimachal.ac.in

Course Code: CSI 409 A

Course Name: Database Management System and Distributed Databases.

Credits Equivalent: 4 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Course Objectives: The course

- Provide an introduction to the management of database systems.
- Emphasizes the understanding of fundamentals of relational systems including data models, database architecture and database manipulations.
- Also help us to learn how to create and maintain a database.

Attendance Requirements:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
   - Assignments: 20%
   - Class Participation: 5%

Course contents

Unit I: **(8 hours)**

Introduction: Data processing versus data management , File oriented approach versus verses database oriented approach to data management, Advantages and Disadvantages of using DBMS, Entity types, Entity sets, Attributes, Keys, Relationships and their types, Weak entity types, Components of DBMS, Three-level architecture proposed for DBMS, Data Models classification.

Unit II: **(8 hours)**

Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, Generalization, aggregation, reduction of an ER diagrams to tables.

Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Unit III: **(8 hours)**

SQL : Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, Expressions, Conditions and Operators, Tables, views and Indexes, Queries and sub queries, Clauses, Functions, Joins, Transactions and database security, triggers.

Unit IV: **(11 hours)**

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version.

Database recovery techniques.

Database Security and Integrity: Threats and Defense mechanisms.

Unit V: **(5 hours)**

Distributed databases: Introduction, concept, Advantages and Disadvantages, Distributed database design, Types of distributed database systems, Query processing in distributed databases. Concurrency control and Recovery in distributed databases.

Prescribed Text Books:

1. Bipin C. Desai, “An introduction to Database Systems”, Galgotia Publication
2. Elmasri, Navathe, “Fundamentals Of Database Systems”, Addision Wesley

References

1. Date C J, “An Introduction To Database System”, Addision Wesley
2. Korth, Silbertz, Sudarshan, “Database Concepts”, McGraw Hill
3. Paul Beynon Davies, “Database Systems”, Palgrave Macmillan
4. Ramakrishnan, Gehrke, “Database Management System”, McGraw Hill

Central University of Himachal Pradesh
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PO Box: 21, Dharmshala, District Kangra, Himachal Pradesh- 176215

Course Code: CSI 503

Course Name: Java Programming

Credits Equivalent: 4

Course Objectives: After completing this course the students will be able to:

Course Contents

Unit-1

Overview of Java, Data types, variables and arrays, Operators, Control Statements, Introducing classes, declaring objects, Introducing methods, constructors, Parameterized constructors, This keyword, Garbage collection

Unit-2

Overloading methods, Using objects as parameters, Returning objects, Introducing access control, Understanding static, Introducing final, Exploring the string class, Using command line arguments

Unit-3

Inheritance basics, Using super, Creating a multilevel hierarchy, Method overriding, dynamic method dispatch, Using abstract classes, Using final with inheritance

Unit-4

Packages, Access protection, Importing packages, Interfaces

Exception handling, Uncaught exceptions, Using try and catch, Multiple catch clauses, throw, finally.

Unit-5

Java thread Model, The main thread, Creating multiple threads, Thread priorities, Using multithreading.

Prescribed Texts:

1. Herbert Schildt, "The Complete Reference JAVA2", TMH
2. Balagurusamy E, "Programming in JAVA", TMH
3. Mark Wutica, "Java Enterprise Edition", QUE
4. Steven Holzner, "Java2 Black book", dreamtech

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PO BOX: 21, DHARAMSHALA, DISTRICT KANGRA – 176215, HIMACHAL PRADESH
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Course Code: CSI 506
Course Name: E Governance, E learning & E Business
Credits Equivalent: 4 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Course Objectives:

- The course objective is to understand fundamentals and applicability of Information and Communication Technology (ICT) in various fields such as Governance, Learning and Business.
- The course also provides introduction and detailed study of E Governance, E learning and E Business.
- The recent trends and developments in the fields of E Governance, E learning and E Business will be demonstrated to the students.

Attendance Requirements: Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
   - Assignments: 15%
   - Class Participation: 5%
   - Class Attendance : 5%

Contents

UNIT 1

E-Governance: Introduction, E-Governance & E-Government, Need for e-Governance, Measures, work plan and infrastructure for E-Governance, Scope,(types) of e-Governance, Objectives of e-Governance, Evolution of e-Governance, UN e-Government Survey, Phases of e-Governance, e-Governance Project Development Lifecycle, Software Development Lifecycle vs e-Governance Lifecycle. E Governance: international scenario, Challenges in e-Governance.

UNIT II

E-Governance: Strategies for e-Governance in India, National e-Governance Plan, Mission Mode Projects conceptualized under NeGP: Central Government Category, State Government Category, Integrated Services Category, Components of NeGP: The Institutional Structure, The common Support Infrastructure, The Mission Mode Projects, Recent Initiatives in e-Governance in India: Government to citizen (G2c) initiatives, Government to business (G2B) initiatives, Government to Government (G2G) initiatives

UNIT III

E-Learning: what is learning, why e-learning, concept and definition, e-leaning basics, types of e-learning, computer based learning, internet based learning, completely online mode, the use of e-learning in education, advantages and disadvantages of e-learning, e-learning model-ADDIE model, MERRILL's principles of Instruction (MPI),GAGNE's nine events of instruction, e-learning components, e-learning content, E-Tutoring, E-Coaching, E-Mentoring, collaborative learning, virtual classroom, e-learning in India.

UNIT IV

E-Business: Introduction, Global Online Retail Spending: Statistics and Trends, E-business & E-commerce, E-business environment, E-marketplaces, E-business markets, Technical ingredients of e-business, Electronic business infrastructure, Potential benefits of E-business, Basic E-Commerce Strategies, E-business Types & Categories, Phases of e-Business Development, E-business technology, Technology Issues in Internet Commerce, E-commerce Security,M-Commerce,E-marketing.

UNIT IV

E-Business: E-Business models: Storefront Model-Shopping-cart Technology, Online Shopping Malls, Auction Model, Portal Model, Dynamic Pricing Models: Name-Your-Price Model, Comparison Pricing Model, Demand-Sensitive Pricing model, Offering Free Products and Services, Online Trading and Learning Models, Bartering model, framework for analyzing e-business models, Organizational culture and e-business, Organizational structure and e-business, Managing applications systems for e-business, Management skills for e-business, The performance of e-business, The future of e-business.

Prescribed text book:

1. C. S. R. PRABHU ,"E-GOVERNANCE : CONCEPTS & CASE STUDIES", 2/E, PHI Learning
2. Hossen Najan**,"** Distance Education and E Learning", lambert academic publishing.
3. Ravi Kalakota and Marcia Robinson," E-Business 2.0: Roadmap For Success", Pearson Education;

Reference Books:

- Srinivasa H. Rajeshwari ,"E-Governance in India Concepts and Cases", AP Lambert Academic Publishing
- Hardy Bower," From Distance Education to E-Learning: Lessons Along the Way", John Wiley & Sons
- Parag Kulkarni, Sunita Jahirabadkar, Pradip Chande, "E Business ",Oxford University Press

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Course Code: CSI 426 A

Course Name: Operating Systems Concepts

Credits Equivalent: 4 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Course Objectives:

To learn the various aspects of operating systems such as process management, memory management, I/O management, protection , security etc.

Attendance Requirements:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
   - Assignments: 20%
   - Class Participation: 5%

Course Contents

Unit-I **(10Hours)**

Introduction: Definition, Structure and Functions of Operating System, Types of operating systems.

Process Management: Process states, State Transitions, Process Control block, Context Switching, Process Scheduling, Scheduling algorithm, Threads.

Unit-II **(8 Hours)**

Inter process synchronization and communication: need, Mutual exclusion, semaphore and hardware support for mutual exclusion, queuing implementation, and classical Problem in concurrent programming, critical region and conditional critical region, Monitors, Messages, Deadlock.

Unit-III **(10 Hours)**

Memory Management: Address Binding, Dynamic Loading and Linking Concepts, Logical and Physical Addresses, Contiguous Allocation, fragmentation, Paging, Segmentation, Virtual Memory, Demand Paging, Page fault, Page replacement algorithms, Thrashing, Working Set Model.

Unit-IV **(12 Hours)**

Storage Management: File Attributes, File Types, File Access Methods, Directory Structure, File System Organization and Mounting, file system implementation, directory system implementation, Allocation Methods, Free Space management, Secondary storage management, I/O system,

Protection & Security.

Prescribed Text Books

1. Operating system concepts, by Gagne Greg, Abraham Silberschatz and Peter B. Galvin , Addison Wesley 8^{th} Edition.
2. Dhamdhere, Operating system, TMH

References:

1. Modern operating Systems, A S Tanenbaum, PHI.
2. William Staling, Operating System.

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Course Code: CSI502
Course Name: Software Engineering
Credit Equivalent: 4 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars, etc.)

Course Objectives: The course is designed

- To introduce the methodologies involved in the development.
- To be aware of different life cycle models.
- To be aware of Architectural and detailed design methods.
- To study the implementation, testing strategies, Verification and Validation techniques.
- To study the project planning and management.

Attendance Requirement:
Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
   - i) Assignment 20%
   - ii) Class participation 5%

Course Contents:

Unit-I:
Software: Software Hardware relationship, History and evolution of software, Programming Languages, Software platform, Software components, Features of Software, Software categories; Software Engineering Fundamentals: Software Engineering, Software Characteristics and Application; Software processes: Process and project; Software development process models: Water fall model, Prototyping, Incremental & Spiral model, 4th Generation Techniques; Software Project Management: Responsibilities of a software project manager, Project Planning, Metrics for project size estimation; Empirical Estimation Models: COCOMO Model, Project Scheduling.

Unit-II:

Software Requirements Analysis and Specification: Requirement gathering and analysis, Requirement Specification, Characteristics of an SRS, Organisation of the SRS document; System analysis tools and techniques: Data Flow Diagrams, Entity Relationship Diagrams; System Design: Design concepts, Coupling, Cohesion, User interface design, Characteristics of a good user interface.

Unit-III:

Software Quality Assurance: Quality concepts, Quality control, Quality assurance, SQA activities; Software reliability; Introduction to software coding; Software testing fundamentals: Testing objectives, Testing Principles, Test case design.

Unit-IV:

White Box testing: Basis Path Testing; Black Box testing: Methods, Equivalent class partitioning, Boundary value analysis, Cause effect graphing; Software Testing Strategies; Unit Testing, Integration Testing, Regression Testing, Smoke Testing, Validation Testing, Alpha and Beta Testing; System Testing: Recovering Testing, Security Testing, Performance Testing, Stress Testing; Debugging: Techniques, Strategies.

Unit-V:

Computer Aided Software Engineering: CASE and its scope, Benefits of CASE, CASE support in software life cycle; Software Maintenance: Objective, Types- Corrective maintenance, Adaptive maintenance, Perfective maintenance; Software Reuse: Basic issues in any reuse program, Reuse approach.

Prescribed Text Book:

1. Roger S. Pressman, " Software Engineering- A Practitioner's Approach", Tata McGraw Hill
2. Pankaj Jalote, " Software Engineering", Wiley India

Suggested Additional Reading:

1. Rajib Mall, "Fundamentals of Software Engineering", PHI Learning Pvt. Ltd.

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Course Code: CSI 429

Course Name: IT Tools for Smart Work

Credit Equivalent: 2 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars, etc.)

Course Objectives: The course is designed to

- The main purpose of this course is to introduce students with the real world problems and their solving approaches and techniques using IT tools, which not only minimize their time requirement, but also upgrade their existing skills.
- The students will be made aware about the different apps, websites that help them to enhance the quality of life by doing smart work.
- IT tools is having the ability to extend itself. Thus students can continuously develop and add their own tools.
- Further as the course will continue the students will be introduced and taught many more concepts, features and tool development skills.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
   - i) Assignment 15%
   - ii) Class participation 5%
   - iii) Attendance 5%

Course Contents

Unit 1: E learning –what is learning, why e-learning, concept and definition, e-leaning basics, types of e-learning, computer based learning, internet based learning, completely online mode, the use of e-learning in education, advantages and disadvantages of e-learning, e-learning model-ADDIE model, MERRILL's principles of Instruction (MPI),GAGNE's nine events of instruction, e-learning components, e-learning content, E-Tutoring, E-Coaching, E-Mentoring, collaborative learning, virtual classroom, e-learning in India

Unit-2: IT tools for smart work in professional life: Seach engine, best search engines of world, search engine optimization, search engine optimization tools, email, best email servers of world, Video conferencing, examples of best video conference apps, Collaboration tools for remote teams, cloud storage services, tools for hard drive space analysis, time management apps, e marketing, online marketing tools.

Unit-3: IT tools for smart work in personal life: Money saving tools, tools for productivity enhancement, tools for creative time saving, quick tools for everyday task, just for fun tools, video calling apps, social media sites, Note taking tools, Lecturer capture and recording tools, drawing tools, presentation tools.

Unit-4: IT tools for smart work in education: ePathsala, National Mission on Education through ICT (NME-ICT), epgpathsala, youtube, National Programme on Technology Enhanced Learning (NPTEL), education apps for India, IT tools for library management, Information and Library Network (INFLIBNET), IT tools for academic research.

Note taking tools,

Suggested Additional Reading:

1-https://www.dreamgrow.com/top-15-most-popular-social-networking-sites/

2-https://zapier.com/blog/best-note-taking-apps/

3-https://neilpatel.com/blog/10-online-marketing-tools-you-need-when-starting-a-business/

4-http://epathshala.nic.in/

5-http://epgp.inflibnet.ac.in/

6-http://indiatoday.intoday.in/education/story/free-education/1/850896.html

7-https://indianceo.in/apps/top-10-education-apps-india/

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Course Code: CSI419

Course Name: Compiler Design

Credit Equivalent: 04 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars, etc.)

Course Objectives: The course is designed

- To learn how a compiler works.
- To use of formal attributed grammars for specifying the syntax and semantics of programming languages.
- To Working knowledge of the major phases of compilation, particularly lexical analysis, parsing, semantic analysis, and code generation.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
   - i) Assignments 5%
   - ii) Class participation 5%
   - iii) Class tests 10%
   - iv) Quiz 5%

Course Contents:

Unit-I Introduction to Compiler & Lexical Analysis (08 hours)

Introduction of Compiler, Major data Structure in compiler, BOOT Strapping, Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, Lexical analysis: Input buffering , Specification & Recognition of Tokens, LEX.

Unit-II Syntax Analysis (9 hours)

Syntax analysis: CFGs, Top down parsing, Brute force approach, recursive descent parsing, transformation on the grammars, predictive parsing, bottom up parsing, operator precedence parsing, LR parsers (SLR,LALR, LR).

Unit-III Syntax Directed Translation & Intermediate Code Generation (09 hours)

Syntax directed definitions: Construction of Syntax trees, Bottom up evaluation of S-attributed definition, L-attribute definition, Top down translation, Bottom Up evaluation of inherited attributes Recursive Evaluation, Analysis of Syntax directed definition.

Intermediate code generation: Declarations, Assignment statements, Boolean expressions, Case statements.

Unit-IV Type Checking & Run Time Environment (07 hours)

Type checking: type system, specification of simple type checker.

Run time Environment: storage organization, Storage allocation strategies, parameter passing, dynamic storage allocation, and Symbol table.

Unit –V Code Optimization & Code Generation (07 hours)

Introduction to Code optimization: sources of optimization of basic blocks, loops in flow graphs, dead code elimination, loop optimization, Introduction to global data flow analysis, Code Improving transformations, peephole optimization.

Code Generation: Issues in the design of code generator, Basic block and flow graphs, Register allocation and assignment, DAG representation of basic blocks.

Prescribed Text Book:

1. A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools, Pearson Education

Suggested Additional Reading:

1. Raghavan, Compiler Design, TMH Pub.
2. Louden. Compiler Construction: Principles and Practice, Cengage Learning
3. A. C. Holub. Compiler Design in C, Prentice-Hall Inc., 1993.
4. Mak, writing compiler & Interpreters, Willey Pub.

LECTURE PLAN

Lectures	Topics	Prescribed Text Book
Lecture-1	**Introduction to Compiler & Lexical Analysis:** Introduction of Compiler	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-2	Major data Structure in compiler	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-3	BOOT Strapping.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-4	Compiler structure: analysis-synthesis model of compilation.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-5	Various phases of a compiler.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-6	Lexical analysis: Input buffering , Specification	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-7	Recognition of Tokens	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-8	LEX & related numerical	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-9	**Syntax Analysis:** Introduction of Syntax analysis, CFGs	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-10	Classification of Parsing, Top down parsing	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-11	Brute force approach, recursive descent parsing	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-12	Predictive parsing, prerequisites of predictive parsing, Non ambiguity of CFG	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-13	Non Left Recursion, Left Factoring.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-14	Bottom up parsing,	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-15	Operator precedence parsing,	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-16	LR parsers- SLR Parsing	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-17	LR & LALR Parsing	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-18	**Syntax Directed Translation & Intermediate Code Generation:** Syntax directed definitions	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-19	Construction of Syntax trees	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-20	Bottom up evaluation of S-attributed definition	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-21	L-attribute definition,	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-22	Top down translation, Bottom Up evaluation of inherited attributes Recursive Evaluation,	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-23	Analysis of Syntax directed definition.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-24	Intermediate code generation: Declarations, Assignment statements,	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools

Lecture-25	Intermediate code generation: Boolean expressions, Case statements.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-26	Intermediate code generation: looping statements, Array statements.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-27	**Type Checking & Run Time Environment** Introduction of Type checking	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-28	type systems	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-29	Specification of simple type checker.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-30	Run time Environment: storage organization	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-31	Storage allocation strategies	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-32	Parameter passing	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-33	Dynamic storage allocation and Symbol table.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-34	**Code Optimization & Code Generation:** Introduction to Code optimization, Sources of optimization of basic blocks.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-35	Loops in flow graphs, dead code elimination	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-36	Loop optimization, Introduction to global data flow analysis, Code Improving transformations,	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-37	Peephole optimization.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-38	Code Generation: Issues in the design of code generator	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-39	Basic block and flow graphs,	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools
Lecture-40	Register allocation and assignment, DAG representation of basic blocks.	A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools

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Course Code: CSI420

Course Name: Data Structure & Algorithms

Credit Equivalent: 04 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars, etc.)

Course Objectives: The course is designed

- To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.
- To be able to carry out the Analysis of various Algorithms for mainly Time and Space Complexity.
- To get a good understanding of applications of Data Structures.
- To develop a base for advanced computer science study.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
   - i) Assignments 5%
   - ii) Class participation 5%
   - iii) Class tests 10%
   - iv) Seminars 5%

Course Contents:

Unit-I: **(08 Hours)**

Introduction: Basic Terminology, Data types and its classification, Algorithm, complexity- space & time complexity ,complexity notations- big Oh, Omega, Theta.

Array Definition, Representation and Analysis of Arrays, Single and Multidimensional Arrays, Address calculation, Linear Search, Binary Search of Array, Traversing , Insertion & deletion in array, Sparse Matrices, Strings.

Unit-II: **(08 Hours)**

Linked List Introduction, Representation of linked list in to memory, Memory allocation -Garbage Collection, Traversing & Searching in Linked List, Insertion into linked list- at beginning of list & at given location, Deletion in linked list- from starting of list & given location of node, Header Linked List, two way List, Input & output restricted liked list, Circular Header Linked List, Representation of Polynomials using linked List .

Unit-III: **(08 Hours)**

Stack, Array Implementation of stack, Linked Representation of Stack, Application of stack: Conversion of Infix to Prefix and Postfix Expressions and Expression evaluation.

Queue, Array and linked implementation of queues, Circular queues, D-queues and Priority Queues.

Unit-IV: **(09 Hours)**

Trees: Basic terminology, Binary Trees, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Binary Search Tree (BST), AVL Trees, B-trees.

Graphs: Introduction, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

Unit-V: **(07 Hours)**

Internal and External sorting, Insertion Sort, Bubble Sort, selection sort, Quick Sort, Merge Sort, Radix sort.

Searching & Hashing: Sequential search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies.

Prescribed Text Book:

- Lipschutz, “Data structure (Schaum)”, TMH
- Horowitz and Sahani, “Fundamentals of data Structures”, Galgotia Publication Pvt. Ltd., N Delhi.

Suggested Additional Reading:

1. A.M. Tenenbaum, “Data Structures using C & C++”, Prentice-Hall of India Pvt. Ltd., New Delhi.
2. Data Structures Trembley and Sorenson, TMH Publications
3. R. Kruse et al, “Data Structures and Program Design in C”, Pearson Education Asia, Delhi-2002
4. http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/data_str_algo/frameset.htm
5. “Data Structures: The Problem of Time Series Computing”, John Henstridge , *Journal of Applied Probability*, Vol. 23, Essays in Time Series and Allied Processes (1986), pp. 407-411 [http://www.jstor.org/]
6. “Internal Data Structures” Author(s): J. C. Gower and I. D. HillSource: Journal of the Royal Statistical Society. Series C (Applied Statistics), Vol. 20, No. 1(1971), pp. 32-45Published by: Wiley for the Royal Statistical SocietyStable URL: http://www.jstor.org/stable/2346629

LECTURE PLAN

Lectures	Topics	Prescribed Text Book	Chapter No.
Lecture-1	Introduction: Basic Terminology, Data types and its classification. Introduction of Algorithm.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-1 &2
Lecture-2	Complexity of an algorithm, Time & Space Complexity. Asymptotic Notation, Big Oh, Omega, Theta, Little Oh & Little Omega.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-1 &2
Lecture-3	Introduction to Data Structures, Basic operations, Arrays, Address Calculation of 1- dimension array.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-1 &4
Lecture-4	Traversing, Insertion, Deletion operation in array.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-4
Lecture-5	Linear Search, Binary Search of Array.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-4
Lecture-6	Two dimensional array, Memory representation of Two dimensional array.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-4
Lecture-7	Addition, Multiplication & Transpose of Matrix. Sparse matrices.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-4
Lecture-8	Strings - representation, String operations – strcpy, strcmp, strlen etc.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-3
Lecture-9	Linked List Introduction, Representation of linked list in to memory.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-5
Lecture-10	Memory allocation -Garbage Collection.Traversing & Searching in Linked List.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-5
Lecture-11	Insertion into linked list- at beginning of list & at given location.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-5
Lecture-12	Deletion in linked list- from starting of list & given location of node.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-5
Lecture-13	Header Linked List, two way List, Input & output restricted liked list.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-5
Lecture-14	Circular Header Linked List, Representation of Polynomials using linked List .	Lipschutz, "Data structure (Schaum)", TMH	Chapter-5
Lecture-15	Stack Introduction, array representation of Stack, Linked list representation of Stack.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6
Lecture-16	Insertion (Push) into Stack, Deletion operation (POP) into stack.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6
Lecture-17	Recursion, Implementation of recursive procedure by stack.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6
Lecture-18	Polish, Infix & Reverse polish expression, Evaluation of postfix expression using stack.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6

Lecture-19	Typical Problems- Recursion, Factorial, Fibonacci, Tower of Hanoi.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6
Lecture-20	Conversion from Infix to Postfix Expression.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6
Lecture-21	Queues, array representation of queue,	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6
Lecture-22	Insertion operation, Deletion operation	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6
Lecture-23	Dequeue implementation , Priority Queues.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6
Lecture-24	Trees: Basic terminology, Binary Trees, Algebraic Expressions, Complete Binary Tree, Extended Binary Trees.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-7
Lecture-25	Array and Linked Representation of Binary trees.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-7
Lecture-26	Traversing Binary trees, Inoder, Preorder & Post order.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-7
Lecture-27	Threaded Binary trees, Binary Search Tree (BST). Insertion and deletion into BST.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-
Lecture-28	Height balanced tree, AVL Trees, Insertion & Deletion into AVL Tree.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-7
Lecture-29	M-way search tree, B-tree, insertion & deletion into B tree.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-7
Lecture-30	Graphs: Introduction, Sequential Representations of Graphs, Adjacency Matrices, Linked List representation of Graph.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-8
Lecture-31	Traversing a Graph- BFS & DFS.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-8
Lecture-32	Spanning Trees, Minimum Cost Spanning Trees. Prims & Kruskal method.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-8
Lecture-33	Internal and External sorting, Insertion Sort.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-9
Lecture-34	Bubble Sort, selection sort	Lipschutz, "Data structure (Schaum)", TMH	Chapter-9
Lecture-35	Quick Sort	Lipschutz, "Data structure (Schaum)", TMH	Chapter-9
Lecture-36	Merge Sort, Radix sort.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-9
Lecture-37	Searching & Data Modification	Lipschutz, "Data structure (Schaum)", TMH	Chapter-9
Lecture-38	Hashing- Hash Table, Hash Functions- Division Method, Mid Square Mehod, Folding method.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-9
Lecture-39	Collision Resolution Strategies- open addressing: Linear probing & Modifications,	Lipschutz, "Data structure (Schaum)", TMH	Chapter-9
Lecture-40	Quadratic probing, Chaining & Hash Table Implementation.	Lipschutz, "Data Structure (Schaum)", TMH	Chapter-9

Central University of Himachal Pradesh
(Established under Central Universities Act 2009)
PO BOX: 21, DHARAMSHALA, DISTRICT KANGRA – 176215, HIMACHAL PRADESH
Website: www.cuhimachal.ac.in

Course Code: CSI422

Course Name: LAB- Data Structure & Algorithms

Credit Equivalent: 02 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars, etc.)

Course Objectives: The course is designed

- To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.
- To be able to carry out the Analysis of various Algorithms for mainly Time and Space Complexity.
- To get a good understanding of applications of Data Structures.
- To develop a base for advanced computer science study.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
   - i) Class participation 10%
   - ii) Class tests 10%
   - iii) Assignments 5%

Course Contents:

Unit-I: **(04 Hours)**

Introduction: Basic Terminology, Data types and its classification, Array Definition, Representation and Analysis of Arrays, Single and Multidimensional Arrays, Address calculation, Linear Search, Binary Search of Array, Traversing , Insertion & deletion in array, Sparse Matrices, Strings.

Unit-II: **(04 Hours)**

Linked List : Traversing & Searching in Linked List, Insertion into linked list- at beginning of list & at given location, Deletion in linked list- from starting of list & given location of node, Header Linked List, two way List, Input & output restricted liked list, Circular Header Linked List.

Unit-III: **(04 Hours)**

Stack, Array Implementation of stack, Linked Representation of Stack, Conversion of Infix to Prefix and Postfix Expressions and Expression evaluation.

Queue, Array and linked implementation of queues, Circular queues, D-queues and Priority Queues.

Unit-IV: **(04 Hours)**

Trees: Array and Linked Representation of Binary trees, Traversing Binary trees, Binary Search Tree (BST), AVL Trees, B-trees.

Graphs: Introduction, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees

Unit-V: **(04 Hours)**

Sorting: Insertion Sort, Bubble Sort, selection sort, Quick Sort, Merge Sort.

Prescribed Text Book:

- Lipschutz, "Data structure (Schaum)", TMH

Suggested Additional Reading:

1. A.M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.
2. Data Structures Trembley and Sorenson, TMH Publications
3. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., N Delhi.
4. R. Kruse et al, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002
5. http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/data_str_algo/frameset.htm
6. "Data Structures: The Problem of Time Series Computing", John Henstridge , *Journal of Applied Probability*, Vol. 23, Essays in Time Series and Allied Processes (1986), pp. 407-411 [http://www.jstor.org/]
7. "Internal Data Structures" Author(s): J. C. Gower and I. D. HillSource: Journal of the Royal Statistical Society. Series C (Applied Statistics), Vol. 20, No. 1(1971), pp. 32-45Published by: Wiley for the Royal Statistical SocietyStable URL: http://www.jstor.org/stable/2346629

List of Experiments

Lab	**Experiments**
Lab-1	
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Lab-3	
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Lab-5	
Lab-6	
Lab-7	
Lab-8	
Lab-9	
Lab-10	

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Website: www.cuhimachal.ac.in

Course Code: CSI442

Course Name: **Discrete Structures**

Credit Equivalent: 04 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars, etc.)

Course Objectives: The course is designed

• To be able to carry out the Analysis of various Algorithms for mainly Time and Space Complexity.

• develop efficient algorithms for simple computational tasks and reasoning about the correctness of them. Through the complexity measures, different range of behaviours of algorithms and the notion of tractable and intractable problems will be understood

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
   - i) Assignments 5%
   - ii) Class participation 5%
   - iii) Class tests 10%
   - iv) Quiz 5%

Course Contents:

UNIT-I

Sets, Relations and Functions:

Sets, Subsets, Power sets, Complement, Union and Intersection, Demorgan's law Cartesian products, Relations, relational matrices, properties of relations, equivalence relation, functions ,Injection, Surjection and Bijective mapping, Composition of functions, the characteristic functions and Mathematical induction.

UNIT-II

Proportions & Lattices :

Proposition & prepositional functions, Logical connections Truth-values and Truth Table, the algebra of prepositional functions-the algebra of truth values-Applications (switchingcircuits, Basic Computer Components).

Partial order set, Hasse diagrams, upper bounds, lower bounds, Maximal and minimal element, first and last element, , Lattices, sub lattices, Isotonicity , distributive inequality, Lattice homomorphism, lattice isomorphism ,complete lattice ,complemented lattice distribution lattice .

UNIT-III

Groups and Fields:

Group axioms ,permutation group, sub group, co-sets, normal subgroup, semi group, Lagrange theorem, fields, minimal polynomials, reducible polynomials, primitive polynomial, polynomial roots, applications.

UNIT-IV

Graphs:

Finite graphs, incidence and degree, isomorphism, sub graphs and union of graphs, connectedness, walk, paths, and circuitsEulerian graphs ,tree properties of trees, pendant vertices in tree, center of tree ,spanning trees and cut vertices, binary tree ,matrix representation of graph, incidence and adjacency matrix and their propertices, applications of graphs incomputer science.

UNIT-V

Discrete Numeric function and Recurrence relation:

Introduction to discrete numeric functions and generating functions introduction to recurrence relations and recursive algorithms, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions and total solutions

BOOKS

1. J.P.Trembley & R.P.Manohar "Discrete Mathematical Structure with applications to Computer Science".
2. Kenneth H. Rosen-203 "Discrete Math & its Applications" 5th ed.
3. K.A. Ross and C.R.B. Writht "Discrete Mathematics ".
4. Bernard Kolman & Robert C. Busby "Discrete Mathematical Structures for Computer Science".

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PO BOX: 21, DHARAMSHALA, DISTRICT KANGRA – 176215, HIMACHAL PRADESH
Website: www.cuhimachal.ac.in

Course Code: CSI449

Course Name: LAB- PC package

Credit Equivalent: 02 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars, etc.)

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Course Contents:

Unit-I: **(10 Hours)**

Word Processing Concepts: Definition, Benefits, Facilities & Features in general. Office tool: Word processing using MS-WORD, File handling, Editing, Formatting, spell checking.

Unit-II: **(10 Hours)**

Mail merge, Table handling & Insertion, importing, exporting & object linking embedding, printing operation. Spreadsheet: features, uses & benefits in general.

Unit-III: **(10 Hours)**

Spread sheet: Entering data & selecting cells, editing worksheet data, formatting worksheet, creating Formulae, function & charts /graphs, multi operation, data base management.

Unit-IV: **(10 Hours)**

Presentation Tools: features, uses & benefits in general. MS Power Point: Creating & saving presentation templates & view (slide view, notes view, outline view, slide show) Formatting text, slides & graphs, animations, slides transition, multi operation.

Prescribed Text Book:

- MS OFFICE XP COMPLETE BPB PUBLICATION
- JOE HABRAKEN, MICROSOFT OFFICE 2000, 8 IN 1, BY, PRENTICE HALL OF INDIA
- I.T .TOOLS AND APPLICATIONS, BY A. MANSOOR, PRAGYA PUBLICATIONS, MATURA