Uttarakhand Technical University, Dehradun

Scheme of Examination as per AICTE Flexible Curricula

Evaluation Scheme & Syllabus for B. Tech Third Year

W.E.F. Academic Session 2020-21
V & VI SEMESTER

Bachelor of Technology (B. Tech.)

[Computer Science and Engineering]

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Bachelor of Technology (B.Tech.) III Year
[Computer Science & Engineering]
W.E.F. Academic Session 2020-21

V Semester

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per Week			Total Credit
				Theory			Practical						
				End Sem	Mid Sem	Quiz / Assignment	End Sem	Term Work /Lab Work & Sessional		L	T	P	
1.	CS 501	DC	Theory of Computation	100	30	20	30	20	200	3	0	2	4
2.	CS-502	DC	Computer Networks	100	30	20	30	20	200	2	1	2	4
3.	CS-503	DE	Departmental Elective-I	100	30	20	-	-	150	3	1	0	4
4.	CS-504	OE	Open Elective-I	100	30	20	-	-	150	3	1	0	4
5.	CS-505	D Lab	Departmental Lab (Unix/ Linux)	-	-	-	30	20	50	0	1	3	2
6.	CS-506	O/E Lab	Open Elective Lab/ (Python)				30	20	50	0	1	2	2
7	CS-507	IN	Evaluation of Internship-II completed at II year level	-	-	-	-	100	100			4	2
8	CS-508	P	Minor Project – I	-	-	-		100	100	0	0	6	3
9		IN	Internship -III	To be completed any time during Fifth/ Sixth semester. Its evaluation/credit to be added in Seventh semester.									
Total				400	120	80	120	280	1000	11	5	19	25
NSS/NCC													

Departmental Electives			**Open Electives**	
CS 503(A)	Data Analytics		CS-504(A)	Internet and Web Technology
CS 503(B)	Pattern Recognition		CS-504(B)	Principles of Programming Language
CS 503(C)	Cyber Security		CS-504(C)	Modeling and Simulation
CS 503 (D)	Java Programming		CS 503 (D)	Innovation and Entrepreneurship

VI Semester

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per Week			Total Credit
				Theory			Practical						
				End Sem	Mid Sem	Quiz / Assignment	End Sem	Team Work / Lab Work & Sessional		L	T	P	
1.	CS 601	DC	Microprocessors and Applications	100	30	20	30	20	200	3	1	2	5
2.	CS-602	DC	Compiler Design	100	30	20	30	20	200	3	1	2	5
	CS-603	DC	Operating System	100	30	20	30	20	200	2	1	2	4
3.	CS-604	DE	Departmental Elective	100	30	20		-	150	3	1	0	4
4.	CS-605	OE	Open Elective	100	30	20	-	-	150	3	1	0	4
5.	CS-606	O/E Lab	Open Elective Lab/ Matlab Programming	-	-	-	30	20	50	0	0	4	2
6.	CS-607	P	Minor Project -II					50	50	0	0	4	2
8		IN	Internship – III	To be completed anytime during Fifth/Sixth semester. Its evaluation/credit to be added in Seventh Semester.									
Total				500	150	100	120	130	1000	14	4	14	26

Note: Meaning of Last Character of Subject Code (T – Theory; P – Practical)

Departmental Electives			**Open Electives**	
CS 604(A)	Graph Theory		CS-605(A)	Digital Signal Processing
CS 604(B)	Computer Graphics and Visualisation		CS-605(B)	Machine Learning
CS 604(C)	Design and Analysis of Algorithm		CS-605(C)	Project Management

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, V-Semester

CS501 Theory of Computation

COURSE OBJECTIVE

-To understand computability, decidability, and complexity through problem solving.
-To analyse and design abstract model of computation & formal languages
-To understand and conduct mathematical proofs for computation and algorithms.

Unit-I

Introduction of Automata Theory: Examples of automata machines, Finite Automata as a language acceptor and translator, Moore machines and mealy machines, composite machine, Conversion from Mealy to Moore and vice versa.

Unit-II

Types of Finite Automata: Non Deterministic Finite Automata (NDFA), Deterministic finite automata machines, conversion of NDFA to DFA, minimization of automata machines, regular expression, Arden's theorem. Meaning of union, intersection, concatenation and closure, 2 way DFA.

Unit-III

Grammars: Types of grammar, context sensitive grammar, and context free grammar, regular grammar. Derivation trees, ambiguity in grammar, simplification of context free grammar, conversion of grammar to automata machine and vice versa, Chomsky hierarchy of grammar, killing null and unit productions. Chomsky normal form and Greibach normal form.

Unit-IV

Push down Automata: example of PDA, deterministic and non-deterministic PDA, conversion of PDA into context free grammar and vice versa, CFG equivalent to PDA, Petrinet model.

Unit-V

Turing Machine: Techniques for construction. Universal Turing machine Multitape, multihead and multidimensional Turing machine, N-P complete problems. Decidability and Recursively Enumerable Languages, decidability, decidable languages, undecidable languages, Halting problem of Turing machine & the post correspondence problem.

RECOMMENDED BOOKS

1. Introduction to Automata Theory Language & Computation, Hopcroft& Ullman, Narosa Publication.
2. Element of the Theory Computation, Lewis &Christors, Pearson.
3. Theory of Computation, Chandrasekhar & Mishra, PHI.
4. Theory of Computation, Wood, Harper & Row.
5. Introduction to Computing Theory, Daniel I-A Cohen, Wiley.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1.explain the basic concepts of switching and finite automata theory & languages.
CO2.relate practical problems to languages, automata, computability and complexity.
CO3.construct abstract models of computing and check their power to recognize the languages.
CO4.analyse the grammar, its types, simplification and normal form.
CO5.interpret rigorously formal mathematical methods to prove properties of languages, grammars and automata.
CO6.develop an overview of how automata theory, languages and computation are applicable in engineering application.

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New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, V-Semester

CS 502 Computer Networks

Unit –I

Computer Network: Definitions, goals, components, Architecture, Classifications & Types. Layered Architecture: Protocol hierarchy, Design Issues, Interfaces and Services, Connection Oriented & Connectionless Services, Service primitives, Design issues & its functionality. ISOOSI Reference Model: Principle, Model, Descriptions of various layers and its comparison with TCP/IP. Principals of physical layer: Media, Bandwidth, Data rate and Modulations

Unit-II

Data Link Layer: Need, Services Provided, Framing, Flow Control, Error control. Data Link Layer Protocol: Elementary &Sliding Window protocol: 1-bit, Go-Back-N, Selective Repeat, Hybrid ARQ. Protocol verification: Finite State Machine Models & Petri net models. ARP/RARP/GARP

Unit-III

MAC Sub layer: MAC Addressing, Binary Exponential Back-off (BEB) Algorithm, Distributed Random Access Schemes/Contention Schemes: for Data Services (ALOHA and Slotted- ALOHA), for Local-Area Networks (CSMA, CSMA/CD, CSMA/CA), Collision Free Protocols: Basic Bit Map, BRAP, Binary Count Down, MLMA Limited Contention Protocols: Adaptive Tree Walk, Performance Measuring Metrics. IEEE Standards 802 series & their variant.

Unit-IV

Network Layer: Need, Services Provided, Design issues, Routing algorithms: Least Cost Routing algorithm, Dijkstra's algorithm, Bellman-ford algorithm, Hierarchical Routing, Broadcast Routing, Multicast Routing. IP Addresses, Header format, Packet forwarding, Fragmentation and reassembly, ICMP, Comparative study of IPv4 & IPv6

Unit-V

Transport Layer: Design Issues, UDP: Header Format, Per-Segment Checksum, Carrying Unicast/Multicast Real-Time Traffic, TCP: Connection Management, Reliability of Data Transfers, TCP Flow Control, TCP Congestion Control, TCP Header Format, TCP Timer Management. Application Layer: WWW and HTTP, FTP, SSH, Email (SMTP, MIME, IMAP), DNS, Network Management (SNMP).

References:

1. Andrew S. Tanenbaum, David J. Wetherall, “Computer Networks” Pearson Education.
2. Douglas E Comer, Internetworking WithTcp/Ip Principles, Protocols, And Architecture – Vol.1
3. Dimitri Bertsekas, Robert Gallager, “Data Networks”, PHI Publication, Second Edition.
4. Uyless Black, “Computer Networks”, PHI Publication, Second Edition.
5. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill.

Course Out comes:

After completion of the course students will be able to

1. Characterize and appreciate computer networks from the view point of components and from the view point of services
2. Display good understanding of the flow of a protocol in general and a network protocol
3. Model a problem or situation in terms of layering concept and map it to the TCI/IP stack
4. Select the most suitable Application Layer protocol
5. Design a Reliable Data Transfer Protocol and develop solutions of Transport Layer
6. Describe principles of Network Layers and use IP addressing to create subnets

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New Scheme of Examination as per AICTE Flexible Curricula
Computer Science and Engineering, V-Semester, Departmental Elective
CS- 503 (A) Data Analytics

UNIT-I:

DESCRIPTIVE STATISTICS: Probability Distributions, Inferential Statistics, Inferential Statistics through hypothesis tests Regression & ANOVA, Regression ANOVA (Analysis of Variance)

UNIT-II:

INTRODUCTION TO BIG DATA: Big Data and its Importance, Four V's of Big Data, Drivers for Big Data, Introduction to Big Data Analytics, Big Data Analytics applications. BIG DATA TECHNOLOGIES: Hadoop's Parallel World, Data discovery, Open source technology for Big Data Analytics, cloud and Big Data, Predictive Analytics, Mobile Business Intelligence and Big Data, Crowd Sourcing Analytics, Inter- and Trans-Firewall Analytics, Information Management.

UNIT-III:

PROCESSING BIG DATA: Integrating disparate data stores, Mapping data to the programming framework, Connecting and extracting data from storage, Transforming data for processing, subdividing data in preparation for Hadoop Map Reduce.

UNIT-IV:

HADOOP MAPREDUCE: Employing Hadoop Map Reduce, Creating the components of Hadoop Map Reduce jobs, Distributing data processing across server farms, Executing Hadoop Map Reduce jobs, monitoring the progress of job flows, The Building Blocks of Hadoop Map Reduce Distinguishing Hadoop daemons, Investigating the Hadoop Distributed File System Selecting appropriate execution modes: local, pseudo-distributed, fully distributed.

UNIT-V:

BIG DATA TOOLS AND TECHNIQUES: Installing and Running Pig, Comparison with Databases, Pig Latin, User- Define Functions, Data Processing Operators, Installing and Running Hive, Hive QL, Querying Data, User-Defined Functions, Oracle Big Data.

REFERENCES:

1. Michael Minelli, Michehe Chambers, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Business", 1st Edition, Ambiga Dhiraj, Wiely CIO Series, 2013.
2. Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game", 1st Edition, IBM Corporation, 2012.1. Rajaraman, A., Ullman, J. D., Mining of Massive Datasets, Cambridge University Press, United Kingdom, 2012
3. Berman, J.J., Principles of Big Data: Preparing, Sharing and Analyzing Complex Information, Morgan Kaufmann, 2014
4. Barlow, M., Real-Time Big Data Analytics: Emerging Architecture, O Reilly, 2013
5. Schonberger, V.M., Kenneth Cukier, K., Big Data, John Murray Publishers, 2013
6. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, Wiley and SAS Business Series, 2012.

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Computer Science and Engineering, V-Semester

Departmental Elective CS- 503 (B) Pattern Recognition

Unit-I

Introduction – Definitions, data sets for Pattern, Application Areas and Examples of pattern recognition, Design principles of pattern recognition system, Classification and clustering, supervised Learning, unsupervised learning and adaptation, Pattern recognition approaches, Decision Boundaries, Decision region , Metric spaces, distances.

Unit -II

Classification: introduction, application of classification, types of classification, decision tree, naïve bayes, logistic regression , support vector machine, random forest, K Nearest Neighbour Classifier and variants, Efficient algorithms for nearest neighbour classification, Different Approaches to Prototype Selection, Combination of Classifiers, Training set, test set, standardization and normalization.

Unit – III

Different Paradigms of Pattern Recognition, Representations of Patterns and Classes, Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square -error partitional clustering – K means, hierarchical clustering, Cluster validation.

Unit -IV

Introduction of feature extraction and feature selection, types of feature extraction, Problem statement and Uses, Algorithms - Branch and bound algorithm, sequential forward / backward selection algorithms, (l,r) algorithm.

Unit -V

Recent advances in Pattern Recognition, Structural PR, SVMs, FCM, Soft computing and Neuro-fuzzy techniques, and real-life examples, Histograms rules, Density Estimation, Nearest Neighbor Rule, Fuzzy classification.

REFERENCE BOOKS:

1. Richard O. Duda, Peter E. Hart and David G. Stork, “Pattern Classification”, 2nd Edition, John Wiley, 2006.
2. C. M. Bishop, “Pattern Recognition and Machine Learning”, Springer, 2009.
3. S. Theodoridis and K. Koutroumbas, “Pattern Recognition”, 4th Edition, academic Press, 2009.
4. Robert Schalkoff, “pattern Recognition: statistical, structural and neural approaches”, JohnWiley & sons , Inc, 2007.

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New Scheme of Examination as per AICTE Flexible Curricula

Computer Science & Engineering, V-Semester

Departmental Elective CS- 503 (C) Cyber Security

UNIT 1

Introduction of Cyber Crime, Challenges of cyber crime, Classifications of Cybercrimes: EMail Spoofing, Spamming, Internet Time Theft, Salami attack/Salami Technique,

UNIT 2

Web jacking, Online Frauds, Software Piracy, Computer Network Intrusions, Password Sniffing, Identity Theft, cyber terrorism, Virtual Crime, Perception of cyber criminals: hackers, insurgents and extremist group etc. Web servers were hacking, session hijacking.

UNIT 3

Cyber Crime and Criminal justice: Concept of Cyber Crime and the IT Act, 2000, Hacking, Teenage Web Vandals, Cyber Fraud and Cheating, Defamation, Harassment and E-mail Abuse, Other IT Act Offences, Monetary Penalties, jurisdiction and Cyber Crimes, Nature of Criminality, Strategies to tackle Cyber Crime and Trends.

UNIT 4

The Indian Evidence Act of 1872 v. Information Technology Act, 2000: Status of Electronic Records as Evidence, Proof and Management of Electronic Records; Relevancy, Admissibility and Probative Value of E-Evidence, Proving Digital Signatures, Proof of Electronic Agreements, Proving Electronic Messages.

UNIT 5

Tools and Methods in Cybercrime: Proxy Servers and Anonymizers, Password Cracking, Key loggers and Spyware, virus and worms, Trojan Horses, Backdoors, DoS and DDoS Attacks , Buffer and Overflow, Attack on Wireless Networks, Phishing : Method of Phishing, Phishing Techniques.

Suggested Books:

1. Principles of Cyber crime, Jonathan Clough Cambridge University Press
2. John R. Vacca, Computer Forensics:Computer Crime Scene Investigation, 2nd Edition, Charles River Media, 2005
3. Cyber Law Simplified, VivekSood, Pub: TMH.
4. Cyber Security by Nina Godbole, SunitBelapure Pub: Wiley-India
5. Information Warfare: Corporate attack and defense in digital world, William Hutchinson, Mathew Warren, Elsevier.
6. Cyber Laws and IT Protection, Harish Chander, Pub:PHI.

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New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, V-Semester

Departmental Elective CS- 503 (D) Java Programming

Course Objective:

- To learn the basic concepts and techniques which form the object oriented programming paradigm
- To identify Java language components and how they work together in applications.
- To design and program stand-alone Java applications.
- To learn how to use exception handling in Java applications.
- To learn Java Event Handling

UNIT-I

The Java Environment: Java Development Kit (JDK) , Java virtual machine, Java programming environment(compiler, interpreter, applet viewer, debugger), Java Applications Programming Interface(API),Basic idea of application and applet. Java as an object oriented language: objects, classes, encapsulation, inheritance and software reuse, polymorphism, abstract classes and abstract methods,: defining an interface, implementing & applying interfaces, variables in interfaces, extending interfaces, Packages, scope and lifetime; Access specifies; Constructors; Copy constructor; this pointer; finalize() method; arrays; Memory allocation and garbage collection

UNIT- II

AWT: Containers and components, AWT classes, window fundamentals: Component, Container, Panel, Window, Frame, Canvas, AWT Controls, Layout Managers and Menus: adding and removing control, Labels, Button, Check Box, Radio Button, Choice, menu, Text area, Scroll list, Scrollbar; Frame; Layout managers flow layout, Grid layout, Border layout, Card layout. Java Event Handling Model: Java's event delegation model –Ignoring the event, Self-contained events, Delegating events; The event class hierarchy; There relationship between interface, methods called, parameters and event source; Adapter classes; Event classes action Event, Adjustment Event, Container Event, Focus Event, Item Event, Eye Event, Mouse Event, Text Event, Window Event. Applets: Applet security restrictions; the class hierarchy for applets; Life cycle of applet; HTMLTags for applet Introduction to Swing: swing library, Building application susing Swings

UNIT-III

Multithreading and Exception Handling: Overview of simple threads, Basic idea of multithreaded programming, Thread synchronization: Locks, synchronized methods, synchronized block, Thread scheduling, Producer-consumer relationship, Daemon thread, Basic idea of exception handling, stack based execution and exception propagation, Exception types: Exception Handling: Try, Catch, Finally, Throw statement, Assertions

UNIT-IV

Input/Output:ExploringJavaI/O.,Directories,streamclassesTheBytestream:Inputstream,outputstream, file input stream, file output stream, print stream, Randomaccess file, the character streams, Buffered reader, buffered writer, print writer, serialization. JDBC: JDBC-ODBC bridge; The connectivity model; The driver manager; Navigating there sult set object contents; java.sql Package; The JDBCexception classes; Connecting to Remote database.

UNIT-V

Java Networking: exploring java. Net package Networking Basics: Socket, Client server, reserved sockets, servers, Internet addressing, TCP sockets, UDP sockets. RMI: Client/Server architecture, RMI registry services; Step sofcreating RMI Application and an example

References:

1. Naughton & Schildt“ The Complete Reference Java
2. Tata McGraw Hill.2.Deitel “Java-How to Program:”Pearson Education, Asia.
3. Horstmann & Cornell “CoreJava2” (Vol I&II) , Sun Microsystems.
4. LvanBayross“Java2.0”:BPBpublications.
5. Ivor Horton’s“BeginningJava2,JDK5Ed.,WileyIndia.
6. Java Programming for the absolute beginners By Russell, PHIL earning

Course Outcomes

Upon successful completion of this course the student will:

-Have the knowledge of the structure and model of the Java programming language

-use the Java programming language for various programming tasks

-develop software in the Java programming language

-evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements

-propose the use of certain technologies by implementing them in the Java programming language to solve the given problem

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula
Computer Science and Engineering, V-Semester Open Elective
CS- 504 (A) Internet and Web Technology

UNIT 01

Introduction: Concept of WWW, Internet and WWW, HTTP Protocol: Request and Response, Web browser and Web servers, Features of Web 2.0 Web Design: Concepts of effective web design, Webdesign issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Web site, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation.

UNIT 02

HTML: Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of HTML5

UNIT 03

Style sheets: Need for CSS, introduction to CSS, basic syntax andstructure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists,positioning using CSS, CSS2, Overview and features of CSS3 JavaScript : Client side scriptingwith JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations,DHTML : Combining HTML, CSS and Javascript, Events and buttons

UNIT 04

XML: Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT PHP: Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

UNIT 05

PHP and MySQL:Basic commandswith PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names,creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and databasebugs

Reference Books:

1. Developing Web Applications, Ralph Moseley and M. T. Savaliya, Wiley-India
2. Web Technologies, Black Book, dreamtech Press
3. HTML 5, Black Book, dreamtech Press
4. Web Design, Joel Sklar, Cengage Learning
5. Developing Web Applications in PHP and AJAX, Harwani, McGrawHill
6. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel , Pearson

Course Outcome

After completion of the course students will be able to

1. Describe the concepts of WWW including browser and HTTP protocol.
2. List the various HTML tags and use them to develop the user friendly web pages.
3. Define the CSS with its types and use them to provide the styles to the webpages at various levels.
4. Develop the modern web pages using the HTML and CSS features with different layouts as per need of applications.
5. Use the JavaScript to develop the dynamic web pages.
6. Use server side scripting with PHP to generate the web pages dynamically using the database connectivity.
7. Develop the modern Web applications using the client and server side technologies and the web design fundamentals.

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science & Engineering, V-Semester Open Elective

EE- 504 (B) Principles of Programming Language

Unit- I

Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, developments in programming methodologies, desirable features and design issues. Programming language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

Unit -II

Elementary and Structured Data Types, Structured data type and objects, Sub Program and programmer defined data types: Evolution of data types, abstractions, encapsulations, information hiding, sub programmes, abstract data types. Sequence Control; Implicit and Explicit sequence control, sequence control with within expression and statements, recursive sub programmes, exception handling, co-routines, Scheduled sub programmes, concurrent execution.

Unit -III

Data control referencing environments, static and dynamic scope, local data local data referencing environment, shared data: Explicit common environment dynamic scope parameter passing mechanism. Storage Management: Major run time requirements, storage management phases, static storage management, stack based, heap based storage management.

Unit -IV

Syntax and translation: General syntactic criteria, syntactic element of a language, stages in translation, formal syntax and semantics. Introduction to Functional Programming, Lambda calculus, Data flow language and Object Oriented language,

Unit –V

Comparison in various general and special purpose programming languages e.g. Fortran, C, Pascal, Lisp, etc. issues related to programming languages and limitations.

References:

1. Terrance W Pratt, "Programming Languages: Design and Implementation" PHI
2. Sebesta, "Concept of Programming Language", Addison Wesley
3. E Horowitz , "Programming Languages", 2nd Edition, Addison Wesley
4. "Fundamentals of Programming Languages", Galgotia.

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Computer Science and Engineering, V-Semester Open Elective
EE- 504 (C) Modeling and Simulation

UNIT-I

Introduction: Systems, models, discrete event simulation and continuous simulation.

Discrete Event Simulation: Time-advance mechanisms, event modeling of discrete dynamic systems, single-server single queue model, event graphs, Monte Carlo simulation.

UNIT-II

GPSS: Model structure, entities and transactions, blocks in GPSS, process oriented programming, user defined functions, SNA, logic switches, save locations, user chains, tabulation of result, programming examples.

UNIT-III

Random Number Generation: Congruence generators, long period generators, uniformity and independence testing

UNIT - IV

Random Variate Generation: Location, scale and shape parameters, discrete and continuous probability distributions; Inverse transform method, composition and acceptance rejection methods

UNIT-IV

Queuing Models: Little's theorem, analytical results for M/M/1, M/M/1/N, M/M/c, M/G/1 and other queuing models.

Books:

1. Karian, Z.A. and Dudewicz, E.J., "Modern Statistical Systems and GPSS Simulation", 2nd Ed., CRC Press. 1999
2. Banks, J., Carson, L.S., Nelson, B.L. and Nicol, D.M., "Discrete Event System Simulation", 3rd Ed., Pearson Education. 2002
3. Law, A.M. and Kelton, W.D., "Simulation, Modeling and Analysis", 3rd Ed., Tata McGraw-Hill. 2003

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Computer Science and Engineering, V-Semester Open Elective
EE- 504 (D) Innovation and Entrepreneurship

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VI-Semester

CS- 601 Microprocessors and Applications

UNIT I

Salient features of advanced microprocessors. Review and evolution of advanced microprocessors: 8086, 8088, 80186/286/386/486/Pentium and core i processors.

8086 processor: Register organization, Architecture, memory mapping, modes, and timings.

UNIT II

Intel 8086 microprocessor programming: 8086 Instruction Set, Addressing modes, Assembly Language Programming with Intel 8086 microprocessor

UNIT III

Introduction to the various interfacings chips, 8255, Interfacings key boards, LEDs, ADC, DAC and memory Interfacing. Programmes for various interfacing modules

UNIT IV

General purposes programmable peripheral devices: Timer (8253/8254), 8259A programmable interrupt controller, USART, serial I/O & data Communication. Interfacing Programs for chips

UNIT V

Introduction to 8bit and 16 bit microcontrollers and embedded systems, 8051 architecture, pin description , I/O configuration , interrupts, addressing modes instruction set, embedded system, use of microcontrollers in embedded systems, Display systems using microcontrollers

Reference Books:

1. Advance microprocessor and peripheral –A.K. Ray and K. M. Bhurchandi, Tata Mcgraw Hill
2. Microprocessor and Interfacing – D.V.Hall, McGraw Hill.
3. The Intel microprocessor - Barry B. Brey, Pearson
4. The 8086 & 8088 Microprocessor- LIU and Gibson, Tata McGraw Hill
5. GS Tomar, Advanced Microprocessors and Interfacing, Sun India Pub
6. The 8051 microcontroller and embedded systems-M.A. Mazidi, Janice GillispieMazidi, Pearson Prentice Hall

Course Outcome:

- Will be able to know the memory mapping stnadrads to be used for hard ware programming
- Will be able to devise assembly language programmes for various applications
- Will be able to programme devices for interfacing
- Will be able to design circuits for home automation
- Will be able to design products for societal use

Uttarakhand Technical University, Dehradun

New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VI-Semester

Departmental Elective – CS 602 Compiler Design

Unit-I Introduction to compiling & Lexical Analysis

Introduction of Compiler, Major data Structure in compiler, types of Compiler, Front-end and Back-end of compiler, Compiler structure: analysis-synthesis model of compilation, various phases of a compiler, Lexical analysis: Input buffering , Specification & Recognition of Tokens,Design of a Lexical Analyzer Generator, LEX.

Unit-II Syntax Analysis &Syntax Directed Translation

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),Parser generation. 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.

Unit-III Type Checking & Run Time Environment

Type checking: type system, specification of simple type checker, equivalence of expression, types, type conversion, overloading of functions and operations, polymorphic functions. Run time Environment: storage organization, Storage allocation strategies, parameter passing, dynamic storage allocation, Symbol table, Error Detection & Recovery, Ad-Hoc and Systematic Methods.

Unit –IV Code Generation

Intermediate code generation: Declarations, Assignment statements, Boolean expressions, Case statements, Back patching, Procedure calls Code Generation: Issues in the design of code generator, Basic block and flow graphs, Register allocation and assignment, DAG representation of basic blocks, peephole optimization, generating code from DAG.

Unit –V Code Optimization

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 ,Data flow analysis of structure flow graph Symbolic debugging of optimized code.

References:

1. A. V. Aho, R. Sethi, and J. D. Ullman. Compilers: Principles, Techniques and Tools , Pearson Education
2 Raghavan, Compiler Design, TMH Pub.
3. Louden. Compiler Construction: Principles and Practice, Cengage Learning
4. A. C. Holub. Compiler Design in C , Prentice-Hall Inc., 1993.
5. Mak, writing compiler & Interpreters, Willey Pub.

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New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VI-Semester

CS 603 Operating Systems

Unit-I

Introduction: Operating System and Function, Evolution of Operating System, Batch, Interactive, Time Sharing and Real Time System, System Protection. Operating System Structure: System Components, System Structure, Operating System Services.

Unit - II

Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Critical Section Problem, Semaphores, Classical Problems in Concurrency, Inter Processes Communication, Process Generation, Process Scheduling, Threads. CPU Scheduling: Scheduling Concept, Performance Criteria, Scheduling Algorithm Evolution, Multiprocessor Scheduling.

Unit - III

Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from Deadlock, Combined Approach. Memory Management: Basic Machine, Resident Monitor, Multiprogramming with Fixed Partition, Multiprogramming with Variable Partition, Multiple Base Register, Paging, Segmentation, Paged Segmentation, Virtual' Memory Concept, Demand Paging, Performance, Paged Replaced Algorithm, Allocation of Frames, Thrashing, Cache Memory Organization, Impact on Performance.

Unit - IV

File Concept: Access Methods, Directory Structure, File System Mounting, File Sharing, Protection, File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free space Management, Kernel I/O Subsystems, Disk Structure, Disk Scheduling, Disk Management, Swap, Space Management.

UNIT V

Linux overview: Kernel Architecture, Process, memory, file and I/O management, Interprocess communication and synchronization, Security.

Windows XP: System architecture, system management mechanisms, process, thread, memory and file management, I/O subsystem, Interprocess communication, Security.

Suggested Books and References:

1. Milenekovie , "Operating System Concept", McGraw Hill.
2. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, John Wiley & Sons (ASIA) Pvt. Ltd, Seventh edition, 2005
3. Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes, “Operating Systems”, Prentice Hall, Third edition, 2003
4. Petersons, "Operating Systems", Addision Wesley.
5. Tannenbaum, "Operating System Design and Implementation", PHI.
6. Stalling, Willium, "Operating System", Maxwell Macmillan
7. Gary Nutt, "Operating System, A Modern Perspective", Addision Wesley.

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New Scheme of Examination as per AICTE Flexible Curricula

Computer Science and Engineering, VI-Semester

Departmental Elective - CS604 (A) Graph Theory

Graph theoretic algorithms must be provided wherever required to solve the problems.

Unit- I

Graphs, Sub graphs, some basic properties, various example of graphs & their sub graphs, walks, trails, path & circuits, connected graphs, disconnected graphs and component, various operation on graphs, Euler graphs, Hamiltonian paths and circuits, the traveling salesman problem, directed graphs, some types of directed graphs, directed paths and connectedness, Hamiltonian and Euler digraphs.

Unit- II

Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, trees with directed edges, fundamental circuits in digraph, algorithms of Prim, Kruskal and Dijkstra.

Unit -III

Cuts sets and cut vertices, some properties, all cut sets in a graph, fundamental circuits and cut sets, connectivity and separability, network flows, planer graphs, Euler's formula and its corollaries, Kuratowski's theorem and its application to planarity detection of graphs, combinatorial and geometric dual, some more criterion of planarity, thickness and crossings.

Unit -IV

Incidence matrix of graph, sub matrices of A(G), circuit matrix, cut set matrix, fundamental circuit matrix and rank of B, path matrix and relationships among , , & , adjacency matrices, adjacency matrix of a digraph, matrices A, B and C of digraphs, rank- nullity theorem, coloring and covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, enumeration, types of enumeration, counting of labeled and unlabeled trees.

References:

1. Deo, N: Graph theory, PHI
2. Bondy and Murthy: Graph theory and application. Addison Wesley.
3. John M. Aldous and Robin J. Wilson: Graphs and Applications-An Introductory Approach, Springer
4. Robin J, Wilson: Introduction to Graph Theory, Addison Wesley

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Computer Science and Engineering, VI-Semester

Departmental Elective - CS604 (B) Computer Graphics & Visualization

Unit-I Introduction to Raster Scan displays, Pixels, Frame buffer, Vector & Character generation, Random Scan systems, Display devices, Scan Conversion techniques, Line Drawing algorithms: simple DDA, Bresenham's Algorithm, Circle Drawing Algorithms: Midpoint Circle drawing and Bresenham's Algorithm, Polygon fill algorithm: Boundary-fill and Flood-fill algorithms.

Unit-II 2-D Transformation: Translation, Rotation, Scaling, Shearing, Reflection. Inverse Transformation, Homogeneous coordinate system, Matrices Transformation, Composite Transformation. Windowing & Clipping: World Coordinate System, Screen Coordinate System, Viewing Transformation, Line Clipping & Polygon Clipping Algorithms

Unit-III 3-D Transformations: Translation, Rotation and Scaling. Parallel & Perspective Projection: Types of Parallel & Perspective Projection, Hidden Surface elimination: Depth comparison, Back face detection algorithm, Painter's Algorithm, Z-Buffer Algorithm. Curve generation, Bezier and B-spline methods. Basic Illumination Model: Diffuse reflection, Specular reflection, Phong Shading, Gouraud shading, Ray Tracing, Color models like RGB, YIQ, CMY, HSV.

Unit-IV Visualization: Visualization of 2D/3D scalar fields: color mapping, ISO surfaces. Direct volume data rendering: ray-casting, transfer functions, segmentation. Visualization of Vector fields and flow data, Time-varying data, High-dimensional data: dimension reduction, parallel coordinates, Non-spatial data: multi-variate, tree/graph structured, text Perceptual and cognitive foundations, Evaluation of visualization methods, Applications of visualization, Basic Animation Techniques like traditional, key framing

Unit –V Multimedia :Basic of multimedia, application of Multimedia, Text-Types, Unicode Standard, text Compression, Text file formats, Audio Components, Digital Audio, Digital Audio processing, Sound cards, Audio file formats ,Audio Processing software ,Video-Video color spaces, Digital Video, Digital Video processing, Video file formats. Animation: Uses of Animation, Principles of Animation, Computer based animation, 3D Animation, Animation file formats, Animation software,Special Effects in animation, Storyboarding for Animation, Compression: Lossless/Lossy Compression techniques, Image, Audio & Video Compression, MPEG Standards ,Multimedia Architecture, Multimedia databases.

Recommended Text:

1. Donald Hearn and M.P. Becker "Computer Graphics" Pearson Pub.
2. Foley, Van Dam, Feiner, Hughes, "Computer Graphics: Principles and Practice" Addison-Wesley
3. Rogers, "Procedural Elements of Computer Graphics", Tata McGraw Hill
4. Parekh "Principles of Multimedia" Tata McGraw Hill
5. Maurya, "Computer Graphics with Virtual Reality System " , Wiley India
6. Pakhira,"Computer Graphics ,Multimedia & Animation",PHI learning
7. Andleigh, Thakral , "Multimedia System Design " PHI Learning
8. Khalid Sayood , "Introduction to Data Compression", Morgan Kaufmann

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Computer Science and Engineering, VI-Semester

Departmental Elective - CS604 (C) Design and Analysis of Algorithms

Unit –I

Introduction: Algorithms, analysis of algorithms, Growth of Functions, Master's Theorem, Designing of Algorithms. Sorting and order Statistics: Heap sort, Quick sort, Sorting in Linear time, Medians and Order Statistics.

Unit -II

Advanced Data Structure: Red-Black Trees, Augmenting Data Structure. B Trees, Binomial Heaps, Fibonacci Heaps, Data Stricture for Disjoint Sets.

Unit -III

Advanced Design and Analysis Techniques : Dynamic Programming, Greedy Algorithms, Amortized Analysis, Back Tracking.Dynamic Programming, Greedy Algorithms, Amortized Analysis, Back Tracking.

Unit -IV

Graph Algorithms: Elementary Graphs Algorithms, Minimum Spanning Trees, Single-source Shortest Paths, Al l-Pairs Shortest Paths, Maximum Flow, and Traveling Salesman Problem.

Unit -V

Selected Topics: Randomized Algorithms, String Matching, NP Completeness, Approximation Algorithms.

References:

1. Coreman, Rivest, Lisserson, “Algorithm", PHI.
2. Basse, "Computer Algorithms: Introduction to Design & Analysis", Addision Wesley.
3. Horowitz, Sahani, and Rajasekaran "Fundamental of Computer Algorithms", Universities Press

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Computer Science and Engineering, VI-Semester

Open Elective – CS 605 (A) Digital signal Processing

Unit – I: Discrete-Time Signals and Systems

Discrete-time signals, discrete-time systems, analysis of discrete-time linear time-invariant systems, discrete time systems described by difference equation, solution of difference equation, implementation of discrete-time systems, stability and causality, frequency domain representation of discrete time signals and systems.

UNIT –II: z-Transform

The direct z-transform, properties of the z-transform, rational z-transforms, inversion of the z transform, analysis of linear time-invariant systems in the z- domain, block diagrams and signal flow graph representation of digital network, matrix representation.

Unit – III: Frequency Analysis of Discrete Time Signals

Discrete fourier series (DFS), properties of the DFS, discrete Fourier transform (DFT), properties of DFT, two dimensional DFT, circular convolution.

Unit – IV: Efficient Computation of the DFT

FFT algorithms, decimation in time algorithm, decimation in frequency algorithm, decomposition for 'N'composite number.

Unit – V: Digital filters Design Techniques

Design of IIR and FIR digital filters, Impulse invariant and bilinear transformation, windowing techniques rectangular and other windows, examples of FIR filters, design using windowing.

References:

1. Oppenheim and Schafer: Digital Signal Processing, PHI Learning.
2. Johnny R. Johnson: Introduction to Digital Signal Processing, PHI Learning.
3. Proakis: Digital Signal Processing, Pearson Education.
4. Rabiner and Gold: Theory and Application of Digital Signal Processing, PHI Learning.
5. Ingle and Proakis: Digital Signal Processing- A MATLAB based Approach, Thompson, Cengage Learning.

Course Outcomes: At the end of this course, students will demonstrate the ability to:-

- Represent signals mathematically in continuous and discrete-time, and in the frequency domain.
- Analyse discrete-time systems using z-transform.
- Understand the Discrete-Fourier Transform (DFT) and the FFT algorithms.
- Design digital filters for various applications.
- Apply digital signal processing for the analysis of real-life signals.

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Computer Science and Engineering, VI-Semester

Open Elective – CS 605 (B) Machine Learning

COURSE CONTENTS:

Unit –I

Introduction to machine learning, scope and limitations, regression, probability, statistics and linear algebra for machine learning, convex optimization, data visualization, hypothesis unction and testing, data distributions, data preprocessing, data augmentation, normalizing data sets, machine learning models, supervised and unsupervised learning.

Unit –II

Linearity vs non linearity, activation functions like sigmoid, ReLU, etc., weights and bias, loss function, gradient descent, multilayer network, backpropagation, weight initialization, training, testing, unstable gradient problem, auto encoders, batch normalization, dropout, L1 and L2 regularization, momentum, tuning hyper parameters,

Unit –III

Convolutional neural network, flattening, subsampling, padding, stride, convolution layer, pooling layer, loss layer, dance layer 1x1 convolution, inception network, input channels, transfer learning, one shot learning, dimension reductions, implementation of CNN like tensor flow, keras etc.

Unit –IV

Recurrent neural network, Long short-term memory, gated recurrent unit, translation, beam search and width, Bleu score, attention model, Reinforcement Learning, RL-framework, MDP, Bellman equations, Value Iteration and Policy Iteration, , Actor-critic model, Q learning, SARSA

Unit –V

Support Vector Machines, Bayesian learning, application of machine learning in computer vision, speech processing, natural language processing etc, Case Study: ImageNet Competition

TEXT BOOKS RECOMMENDED:

1. Christopher M. Bishop, “Pattern Recognition and Machine Learning”, Springer-Verlag
2. New York Inc., 2nd Edition, 2011.
3. Tom M. Mitchell, “Machine Learning”, McGraw Hill Education, First edition, 2017.
4. Ian Goodfellow and Yoshua Bengio and Aaron Courville, “Deep Learning”, MIT Press,2016

REFERENCE BOOKS:

1. Aurelien Geon, “Hands-On Machine Learning with Scikit-Learn and Tensorflow: Concepts, Tools, and Techniques to Build Intelligent Systems”, Shroff/O'Reilly; First edition (2017).
2. Francois Chollet, "Deep Learning with Python", Manning Publications, 1st Ed. 2018.
3. Andreas Muller, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Shroff/O'Reilly; First edition (2016).
4. Russell, S. and Norvig, N. “Artificial Intelligence: A Modern Approach”, Prentice Hall Series in Artificial Intelligence. 2003.

PRACTICAL:
Different problems to be framed to enable students to understand the concept learnt and get hands-on on various tools and software related to the subject. Such assignments are to be framed for ten to twelve lab sessions.

COURSE OUTCOMES:
After Completing the course student should be able to:
1. Apply knowledge of computing and mathematics to machine learning problems, models and algorithms;
2. Analyze a problem and identify the computing requirements appropriate for its solution;
3. Design, implement, and evaluate an algorithm to meet desired needs; and
4. Apply mathematical foundations, algorithmic principles, and computer science theory to the modeling and design of computer-based systems in a way that demonstrates comprehension of the trade-offs involved in design choices.

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Computer Science and Engineering, VI-Semester

Open Elective - CS604 (C) Project Management

Course Learning Objectives:

Understand the different activities in software project development i.e, planning, design and management.

Course content:

Unit-1. Conventional Software Management.

Evolution of software economics. Improving software economics: reducing product size, software processes, team effectiveness, automation through software environments. Principles of modern software management.

Unit 2. Software Management Process

Framework,: Life cycle phases- inception, elaboration, construction and training phase. Artifacts of the process- the artifact sets, management artifacts, engineering artifacts, pragmatics artifacts. Model based software architectures. Workflows of the process. Checkpoints of the process.

3. Software Management Disciplines

Iterative process planning. Project organisations and responsibilities. Process automation. Project control And process instrumentation- core metrics, management indicators, life cycle expections. Process discriminants.

Books

1. Software Project management, Walker Royce, Addison Wesley, 1998.
2. Project management 2/e ,Maylor.
3. Managing the Software Process, Humphrey.
4. Managing global software Projects, Ramesh, TMH,2001.