Scheme of Instructions & Syllabi

of

Bachelor of Science (Honors) in Computer Science

(Effective from session 2018-19)

Department of Computer Applications

INVERTIS UNIVERSITY
Bareilly-243123 U.P.

B. Sc. (Honors) in Computer Science
Scheme of Instructions
(Effective from session 2016-17)
3rd YEAR

V Semester				**Teaching Scheme**			**Marks Distribution**		
PAPER	**CODE**	**SUBJECT**	**CREDIT**	**L**	**T**	**P**	**ESM**	**MSM**	**Total**
Paper 1	CSH 501	IntroductiontoJava Programming	4	3	1	0	70	30	100
Paper 2	CSH 502	Internet Technologies	4	3	1	0	70	30	100
Paper 3	CSH 503	Theory of Computation	4	3	1	0	70	30	100
Paper 4	CSH 504	Elective – I	4	3	1	0	70	30	100
Lab 1	CSH 551	Java Programming Lab	2	0	0	4	35	15	50
Lab 2	CSH 552	Internet Technologies Lab	2	0	0	4	35	15	50
Total			20	12	4	8	350	150	500
Elective – I **i.** Artificial Intelligence **ii.** Artificial Neural Network **iii.** Data Mining									
VI Semester									
PAPER	**CODE**	**SUBJECT**	**CREDIT**	**L**	**T**	**P**	**ESM**	**MSM**	**Total**
Paper 1	CSH 601	GUI using .Net Framework	4	3	1	0	70	30	100
Paper 2	CSH 602	Digital Image Processing	4	3	1	0	70	30	100
Paper 3	CSH 603	Elective – II	4	3	1	0	70	30	100
Paper 4	CSH 604	Elective – III	4	3	1	0	70	30	100
Lab 2	CSH 651	GUI using .Net Framework Lab	2	0	0	4	35	15	50
Lab 3	CSH 652	Image Processing Lab using MATLAB	2	0	0	4	35	15	50
Total			20	12	4	8	350	150	500
Elective – II **i.** Numerical Algorithms and Operation Research **ii.** Simulation and Modeling **iii.** Advanced Algorithms			**Elective – III** **i.** Project Work **ii.** Dissertation						

L – Lecture
T – Tutorial
P – Practical
ESM – End Semester Marks MSM – Max. Sessional Marks

CSH 501: Introduction to Java Programming

Teaching Scheme	Examination Scheme	
Lectures: 3 hrs/Week	Class Test	– 12 Marks
Tutorials: 1 hr/Week	Teachers Assessment	– 6 Marks
	Attendance	– 12 Marks
Credits: 4	End Semester Exam	– 70 Marks

Prerequisite: C Programming, and OOPs Concepts.

Course Objectives:

1. To understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions.
2. To understand the importance of Classes & objects along with constructors, Arrays and Vectors.
3. Discuss the principles of inheritance, interface and packages and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces and packages.
4. To understand importance of Multi-threading & different exception handling mechanisms.
5. To learn experience of designing, implementing, testing, and debugging graphical user interfaces in Java using applet and AWT that respond to different user events.
6. To understand Java Swings for designing GUI applications based on MVC architecture.

Detailed Syllabus:

Unit-1
Core Java: Introduction: Features of Java Language, JVM, Byte-code, Operator, Data type, Variable **Array:** Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array. Control Statements, Methods & classes, inheritance, Types of Inheritance, Inheriting Data Members and Methods.

Unit-2
Package, Interface and Exception Handling: Exceptions & Errors, Types of Exception, Control Flow in Exceptions, Use of try, catch, finally, throw, throws in Exception Handling. In-built and User Defined Exceptions, Checked and Un-Checked Exceptions.

Unit-3
I/O, String Handling and File Handling: Operation on String, Mutable & Immutable String, Tokenizing a String, Creating Strings using String Buffer. **I/O:** Buffered Reader class , Input Stream Reader class, Scanner class. **File Handling:** Creating File, Finding File Reading and Writing File (Doc File, Html File, Text File).

Unit-4
Multi-Threading: Understanding Threads, Needs of Multi-Threaded Programming, Solution of Producer consumer problem by Multi Thread, Thread Life-Cycle, Thread Priorities, Synchronization of Thread.

Unit-5
GUI Application Development: Introduction to AWT, AWT controls Java Applet, Layout Managers, Menus, Images, Graphics, Event Handling, Swing, Containers, Panes, Frames, Dialogue boxes, working with image controls.

Unit-6

JDBC: The connectivity Model, JDBC/ODBC Bridge, Java, SQL package, connectivity to remote database, navigating through multiple rows retrieved from a table/ multiple tables of a database.

Suggested Readings:

1. The Complete Reference Internet, Margaret Levine Young, TMH, 1999.
2. The Complete Reference JAVA 2, Naughton Schildt, TMH, 5th Edition.
3. Programming in JAVA, E. Balagurusamy E, TMH, 3rd Edition, 2006.
4. Java Black book, Steven Helzner, Dreamtech , 2002.

Course Outcomes:

After completing the course, students will be able to:

1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
2. Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem
3. Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
4. Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
5. Identify and describe common abstract user interface components to design GUI in Java using Applet & AWT along with response to events
6. Identify, Design & develop complex Graphical user interfaces using principal Java Swing classes based on MVC architecture.

CSH 502: Internet and Information Technologies	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	**Examination Scheme** Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: -

1. Familiarity with the cryptography and network security.
2. Knowledge of MIS and networking.

Course Objectives:

1. The Information Technology (IT) program will educate students to analyze, design, integrate, and manage information systems using information technology.
2. Developed a product or process by applying knowledge of programming, web, database, human computer interaction, networking and security tools.
3. Made decisions related to work that demonstrate understanding of the importance of being an ethical computing professional
4. Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.

Detailed Syllabus

UNIT I (10 Hours)

The Internet And www : Evolution of the Internet, Intranet, Extranet, Application areas: E-commerce, Education, Entertainment, ISPs, Growth of the World Wide Web , protocols governing the web, Internet accessing tools, Access methods: dialup, ISDN, ADSL/2+, cable, LAN, WIFI, Mobile & Satellite, Proxy servers. Mechanism of accessing internet on different devices, Search engines and their Searching techniques, Article on searching techniques used by various search engines: GOOGLE, YAHOO, BING.

UNIT II (10 Hours)

Process, Standards And Protocols : TCP/IP model ,TCP/IP fixed and dynamic IP addressing, IPv4 and IPv6, DNS and URLs. Servers and gateways. Remote login: telnet, HTTP and HTTPS, Internet governing bodies: Role of W3C, ISO .

UNIT III (10 Hours)

Security And Performance: Security policies/ Identification/ Authentication /Access control. Threats and attack methods such as Viruses, Spam, "phishing", Firewalls.

Performance: speed, reliability, downtime, and bandwidth.

Transmission Security: Encryption Techniques, Symmetric Encryption- Keys and Data Encryption Standards, triple encryption, Asymmetric encryption- Secret key encryption, public and private pair key encryption, Virtual Private Network.

UNIT IV (10 Hours)

Website Development: Web development strategies, Web applications. Client-Server model, applications running over the internet and their types ,HTML Formatting Tags, Images, Links, Lists, Tables, Frames, Forms, Comments in HTML, DIV and SPAN, CSS. Introduction to web development IDE: Dreamweaver -its working.

UNIT V (6 Hours)

Client-side scripting: DHTML, JavaScript Introduction, Statements, Loops, Arrays, Functions, Objects in JavaScript, Events and Event Handling, Validation, DOM model, Introduction to AJAX.

Server Side Programming: Introduction to server side scripting, Introduction to Active Server Pages (ASP) and Java Server Pages (JSP)

UNIT VI (10 Hours)

PHP (Hypertext Preprocessor): Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form ,GET and POST Methods, Cookies, Sessions**.**

Database action: Connectivity using Register , Signup, Login facilities.

Text and Reference Books

1. Pankaj Sharma, Introduction to Web Technology,S.K. Kataria and Sons,3rd Edition
2. Web Technology and Design, Xavier, C, New Age International, 1st Edition 2010
3. HTML, DHTML, Java Script, Perl & CGI, Ivan Bayross, BPB Publication, 2008
4. Internet and Web Design, Ramesh Bangia, New Age International, 2nd Edition, 2007
5. Data Communication and Networking, Behrouz A Frouzan, TMH, 4th Edition 2004.
6. Ullman, "PHP for the Web: Visual QuickStart Guide", Pearson Education

Course Outcomes:

After completing the course, students will be able to:

1. Be able to apply knowledge of computing and mathematics appropriate to the discipline.
2Be able to analyze a problem, and identify and define the computing requirements appropriate to its solution
3. Be able to function effectively on teams to accomplish a common goal
4. Understand professional, ethical, legal, security and social issues and responsibilities
5. Be able to analyze the local and global impact of computing on individuals, organizations, and society
6. Recognize the need for and an ability to engage in continuing professional development

CSH 503: Theory of Computation

Teaching Scheme	Examination Scheme
Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: Sets, Relations, Trees, Graphs, Boolean Algebra etc.

Course Objectives:

1. Introduce concepts in automata theory and theory of computation.
2. Identify different formal language classes and their relationships.
3. Design grammars and recognizers for different formal languages.
4. Prove or disprove theorems in automata theory using its properties.
5. Determine the decidability and intractability of computational problems.

Detailed Syllabus

UNIT I

Introduction: Basic Concepts: Formal proofs, Additional form of Proofs, Inductive proof, Sets, Relation, Kleen Closures, Graphs, Trees, Symbol, Alphabets, strings and languages, automata and grammar, Applications of automata theory.

UNIT – II

Finite Automata: Basic Machine and Finite State Machine. Finite Automata: Definition And Types of Automata- DFA , NFA, Construction of DFA and NFA, NFA with epsilon-Moves, Minimization Of FA, Equivalence of NFA and DFA, Conversion of NFA with epsilon moves to NFA, Conversion of NFA With epsilon moves to DFA, Moore and Mealy Machines, Inter-conversion between Moore and Mealy Machines.

UNIT – III

Regular Expressions, Regular Grammar And Languages: Definition and Identities of Regular Expressions, regular and non regular language, operations on RE and their precedence, Algebraic laws for RE, Regular Expression and Finite Automata, Conversion from RE to FA and DFA to RE, Ardens theorem, Pumping Lemma for RL.

UNIT – IV

Context Free Grammar And Languages: Definition and Construction of CFG, Definition and Generation of CFL from CFG, Derivation, derivation trees, Ambiguous Grammar and Removal of Ambiguity. Simplification of CFGs. Normal Forms of Grammar: CNF and GNF.

UNIT - V

Pushdown Automata: Definition of push down automata, The language of PDA, Definition and Construction of DPDA and NPDA. Equivalence of PDAs and CFGs, Closure Properties Of CFLs.

UNIT – VI

Turing Machines: Definition and Construction of Turing Machines. Languages of TM. Types of TM. Comparison And Applications of DFA, PDA and TM.

Text and Reference Books

1. John C. martin, "Introduction to Language and Theory of Computation", TMH, Third Edition.
2. Michel Sipser "Introduction to Theory of Computation" Thomson Course Technology, Second Edition .
3. Kavi Mahesh, "Theory of Computation" Wiley-India.

Course Outcomes:

After completing the course, students will be able to:

1. Acquire a fundamental understanding of the core concepts in automata theory and formal languages.
2. An ability to design grammars and automata (recognizers) for different language classes.
3. An ability to identify formal language classes and prove language membership properties.
4. An ability to prove and disprove theorems establishing key properties of formal languages and automata.
5. Acquire a fundamental understanding of core concepts relating to the theory of computation and computational models including (but not limited to) decidability and intractability.

CSH 511:Artificial Intelligence	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	**Examination Scheme** Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - CSH101 C Programming, CSH201 Discrete Mathematics.

Course Objectives:

1. To understand how these algorithms works so the main objective of this course is and how to analyse the data to make a proper decision.
2. To know the application areas and building blocks of AI as presented in terms of intelligent agents.
3. To initiate the concepts of a Rational Intelligent Agent and the different types of Agents that can be designed to solve problems in different fields.
4. To evaluate the different stages of development of the AI field from human like behavior to Intelligent Agents.
5. To build intelligent machine which can perform and act like humans.

Detailed Syllabus

Unit-1 **Introduction:** Overview of Artificial Intelligence- Problems of AI, AI and related fields. **Problem Solving:** Problems, Problem Space & Search: Defining the Problem as State Space Search, Production System, Problem Characteristics, issues in the design of Search Programs.
Unit-2 **Search Techniques:** Uniform Search Strategies: Breadth First Search, Depth First Search, Depth Limited Search, Comparing Uniform Search Strategies, Greedy Best-First Search, A* Search, Memory Bounded Heuristic Search: Local Search Algorithms & Optimization Problems: Hill Climbing Search.
Unit-3 **Knowledge representation:** Knowledge Representation Issues, Representation and Mapping, Approaches to Knowledge Representation, Issues in Knowledge Representation, Knowledge manipulation, Knowledge acquisition.
Unit-4 **Using Predicate Logic:** Representing Simple Fact in Logic, Representing Instant & ISA Relationship, Computable Functions & Predicates, Resolution, natural deduction. **Representing Knowledge Using Rules:** Procedural Verses Declarative Knowledge, Logic Programming, Forward Verses Backward Reasoning, Matching, Control Knowledge.
Unit-5 **Natural Language Processing:** Introduction, Syntactic Processing, Semantic Analysis, Discourse & Pragmatic Processing.
Unit-6 **Expert System:** Rule based system architecture, Non production system architecture, knowledge organization and validation, Existing Systems (DENDRAL, MYCIN).

Text and Reference Books

1. "Artificial Intelligence", Ritch & Knight, TMH, 2006.
2. "Introduction to Artificial Intelligence & Expert Systems", Patterson, PHI, 2007.
3. "Artificial Intelligence: A Modern Approach", Russell, S., Norvig, P, Pearson Education, 2006.
4. "Introduction to A.I.", Charnick, Addision Wesley, 1999.

Course Outcomes:

After completing the course, students will be able to:

1.	How to solve a particular problem by using different algorithms which is impossible for humans.
2.	How to make proper decisions by gathering information and analyzing them.
3.	How expert system works and perform tasks.
4.	How to convert a particular sentence into logical statement.
5.	Analyze the problem as a state space, graph, design heuristics and select amongst different search based techniques to solve them.
6.	Apply concept Natural Language processing to problems leading to understanding of cognitive computing.

CSH 512: Artificial Neural Networks	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	**Examination Scheme** Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - Machine Learning

Course Objectives:

1. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
2. Introduce students to artificial neural networks and fuzzy theory from an engineering perspective
3. To give design methodologies for artificial neural networks
4. To provide knowledge for network tunning and overfitting avoidance
5. To offer neural network implementations.
6. To demonstrate neural network applications on real-world tasks

Detailed Syllabus

Unit-1

Fundamental of Neural Networks: Introduction, Model of Artificial Neuron, Architectures, Learning Methods, Taxonomy of NN Systems, Single Layer NN System, Applications.

Unit-2

Multilayer NN System and Backpropagation Networks: Background, Backpropagation Learning, Backpropagation Algorithm, Learning in Multilayer NN Systems. Applications of Backpropagation Algorithm.

Unit-3

Associative Memory: Introduction, Auto-associative Memory, Bi-directional Hetro-associative memory. Applications of Associative Memory.

Unit-4

Self Organizing Maps (SOMs): Introduction to supervised and unsupervised learning. Competitive Learning, SOMs and their working principles, applications.

Unit-5

Adaptive Resonance Theory: Stability-Plasticity Dilemma, ART Networks, Iterative Clustering, Unsupervised Learning, ART Networks and their working principles, applications.

Unit-6

Introduction to Soft Computing: Basics of Soft Computing, Components of Soft Computing. Introduction to Fuzzy Logic, Genetic Algorithms.

Text and Reference Books

1. Neural Networks, Fuzzy Logic and Genetics Algorithms- Synthesis and Applications by
2. Rajasekaran and G.A. Vijaylakshmi Pai, Prentice Hall.
3. Neural Networks: A Comprehensive Foundation by Simon S. Hakin, Prentice Hall.
4. Fundamental of Neural networks: Architecture, Algorithms and Applications by Laurene V. Fausett, Prentice Hall.

Course Outcomes:

After completing the course, students will be able to:

1. Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.
2. Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic
3. To understand the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations
4. Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications
5. Reveal different applications of these models to solve engineering and other problems.

CSH513:Data Mining	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	**Examination Scheme** Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - CSH301 RDBMS
Course Objectives:

1. To understand Data Mining, its origin and applications.
2. To understand types of data and to improve the quality of data and efficiency and the ease of the mining process.
3. Differentiate OnLine Transaction Processing and OnLine Analytical processing
4. Learn Multidimensional schemas suitable for data warehousing along with OLAP operations.
5. To understand how to identify associations among objects and to learn various algorithms to find them.
6. To understand applications and algorithms for Clustering along with methodologies of data mining.

Detailed Syllabus

UNIT 1- Data Mining:
Definition, Data Mining as the Evolution of Information Technology, Knowledge Discovery Process (KDP), Classification of Mining systems, Techniques involved.

UNIT 2- Data Preprocessing:
Needs, Pre-processing data, Data Cleaning, Data integration and transformation, data reduction, discretization, Concept of hierarchy generation.

UNIT 3- Data Warehouse:
Definition, Differences between Operational Database Systems and Data Warehouses, OLTP vs. OLAP, 3 Tier Architecture of Data Warehouse, Concept of ETL.

UNIT 4- Data Warehouse Modeling:
Data Cube- A Multidimensional Data Model, Stars, Snowflakes, and Fact Constellations: Schemas for Multidimensional Data Models, OLAP operation

UNIT 5- Data Mining Techniques:
Introduction to Association Rule and Association Rule Mining, Classification: Decision Tree Induction, K-nearest neighbor, Clustering: Cluster Analysis.

UNIT 6- Data Mining Trends:
Mining Complex Data Types, Methodologies of Data Mining, Data Mining Applications, Web Mining.

Text and Reference Books

1. Data Mining -Concepts and Techniques, Han, Kamber, Harcourt India, 2006.
2. Data Mining Introductory and advanced topics, Margaret H Dunham, Pearson, 2002.
3. Data Mining Techniques, Arjun K. Pujari, University Press, 2001.

Course Outcomes:

After completing the course, students will be able to

1. Understand the concept of data mining and its applications.
2. Understand pre-processing steps to improve the quality of data to ease data mining process.
3. Understand OLTP and OLAP as well as 3 tier architecture of data warehouse.
4. Understand various Multidimensional schemas and to apply OLAP operations.
5. Establish associations among objects by applying various algorithms.
6. Perform cluster analysis and understand the methodologies of data mining.

CSH 601: GUI using .Net Framework	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	**Examination Scheme** Class Test – 12 Marks Teachers Assessment – 6 Marks Attendance – 12 Marks End Semester Exam – 70 Marks

Prerequisite: HTML and CSS.

Course Objectives:

1. Learn about MS.NET framework developed by Microsoft.
2. You will be able to using XML in C#.NET specifically ADO.NET and SQL server
3. Be able to understand use of C# basics, Objects and Types, Inheritance
4. To develop, implement and creating Applications with C#.
5. To develop, implement, and demonstrate Component Services, Threading, Remoting, Windows services, web
6. To understand and be able to explain Security in the .NET framework and Deployment in the .NET.
7. To develop Assemblies and Deployment in .NET, Mobile Application Development.

Detailed Syllabus:

Unit-1
The .Net framework: An Overview of .NET Framework, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL), Just-In –Time Compilation.

Unit-2
C # Language Syntax: Why Datatype, Reference Type and Value Type, Datatypes & Variables Declaration, Boxing and Unboxing, Operators, Control Statements**,** creating Object and Classes, The Main method specification, IF statements, CASE (switch) statements, Looping in C#, Arrays

Unit-3
OOPs Concept: Class, Object, Encapsulation, Inheritance, Polymorphism etc.
Controlling program execution: Method Overloading and method overriding, Operator Overloading, Abstract Class, Inner Class, Interface. Delegates, Partial Classes. Exception Handling.

Unit-4
GUI –Controls and Event Handling: Text Box, Label, Link Label, Radio Button, Check Box, List Box, Combo Box, Date Time Picker Control, Calendar Control.

Unit-5
Containers and its Event Handling: Group Box, Panel, Tab Control. Dialog Boxes and its Event Handling: Message Dialog Boxes, Folder Browser Dialog, Open File Dialog, Save File Dialog.

Unit-6
Data Controls: Data Source, Data Set, and Data Grid View displaying Record in the Grid View Controls.
ADO.Net: Connected and Disconnected Architecture, Displaying Record from the Database, Inserting Record into Database, Creating Login using Database, Deleting Record from the Database, Fetching Record from the Database, Update Record in the Database.

Suggested Readings:

1. Programming with C#, E. Balagurusamy, TMH, 1st Edition.
2. Beginning Visual C# 2008, John Wiley, Wrox, May 2008.
3. Microsoft .Net for Programmers, Fergal Grimes, SPI, 2002.

Course Outcomes:

After completing the course, students will be able to:

1. Learn to develop applications using C# and VB.NET.
2. Learn to apply these languages to develop server-side applications which make use of ADO.NET, ASP.NET, Web Services etc.
3. Understand use of C# basics, Objects and Types, Inheritance
4. Develop, implement and creating Applications with C#.
5. Develop, implement, and demonstrate Component Services, Threading, Remoting, Windows services, web.
6. Understand and be able to explain Security in the .NET framework and Deployment in the .NET.

CSH 602 Digital Image Processing

Teaching Scheme	Examination Scheme
Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - Basic Logical operations, Computer Graphics.

Course Objectives:

1. To describe and explain basic principles of digital image processing.
2. To study basic image operations.
3. To understand the algorithms that perform basic image processing (e.g. noise removal and image enhancement).
4. To design and implement algorithms for advanced image analysis (e.g. image morphing, image segmentation).
5. To expose students to current applications in the field of DIP.

Detailed Syllabus

UNIT I Introduction to digital image processing, applications, steps of digital image processing, Components of Image Processing system, Image sampling and Quantization.
UNIT II **Image Enhancement in Spatial Domain:** Meaning of spatial domain, image negatives, log transformation, power law transformation, Introduction to histogram Processing, histogram equalization, histogram specification, Enhancement using logical AND and logical OR operator, Image subtraction, Image Averaging.
UNIT III **Image Enhancement in Frequency Domain:** meaning of frequency domain, one dimensional Fourier frequency domain and its inverse, Two dimensional Fourier frequency domain and its inverse, filtering in frequency domain, Smoothing Frequency-Domain Filters- Ideal Low pass Filters, Butterworth Low pass Filters, Gaussian Low pass Filters, Sharpening Frequency Domain Filters- Ideal High pass Filters, Butterworth High pass Filters, Gaussian High pass Filters.
UNIT IV **Image Restoration:** Introduction to image restoration. Model of the Image Degradation/Restoration Process, Restoration in the Presence of Noise- arithmetic mean filter, geometric mean filter, harmonic mean filter, contra harmonic mean filter, Minimum Mean Square Error (Wiener) Filter, Geometric Mean Filter.
UNIT V **Morphological Image Processing:** Basic Concepts from Set Theory, Logic Operations Involving Binary Images, Dilation and Erosion, Opening and Closing, Hit or Miss Transformation, Extensions to Gray-Scale Images- Dilation, Erosion, Opening and Closing.
UNIT VI **Image Segmentation:** Detection of Discontinuities- Point Detection, Line Detection, Edge Detection, Global Processing via Graph-Theoretic Techniques, Thresholding- Foundation, Basic Global Thresholding, Basic Adaptive Threshold, Region-Based Segmentation- Basic Formulation, Region Growing, Region Splitting and Merging.

Text and Reference Books

1. Fundamentals of Digital Image Processing, Anil K. Jain, Pearson, IIIrd, 2004.
2. Digital Image Processing, Rafel C. Gonzalez & Richard E. Woods, PHI, 10th, 2005.
3. Digital Image Processing using MATLAB, Rafel, Richard & Steven, Pearson, IInd, 2007.
4. Digital Image Processing, Jayaraman S,Veerakumar T,Esakkirajan S, TMH, Ist, 2009.

Course Outcomes:

After completing the course, students will be able to:

1. Understand general terminology of digital image processing.
2. Examine various types of images, intensity transformations and spatial filtering.
3. Develop Fourier transform for image processing in frequency domain.
4. Evaluate the methodologies for image segmentation, restoration etc.
5. Implement image process and analysis algorithms.
6. Apply image processing algorithms in practical applications.

CSH- 611 Numerical Algorithms and Operation Research

Teaching Scheme	Examination Scheme
Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Course Objectives:

1. To comprehend various computational techniques to find approximate value for possible root(s) of non-algebraic equations, to find the approximate solutions of system of linear equations and ordinary differential equations.
2. To make the students familiar with the basic statistical concepts and tools which are needed to study situations involving uncertainty or randomness.
3. This course develops the ideas underlying the Simplex Method for Linear Programming Problem, as an important branch of Operations Research.
4. The course covers Linear Programming with applications to Transportation problem. Such problems arise in manufacturing resource planning and financial sectors.
5. To render the students to several examples and exercises that blend their everyday experiences with their scientific interests.

Detailed Syllabus

Unit-1

Computer Arithmetic: Floating point representation of numbers, arithmetic operations with normalization, consequences of normalized floating point representation of numbers, Errors in numbers.

Unit-2

Finding the roots of an equation: Iterative method: Introduction, Beginning an iterative method, Bisection method, Newton Raphson method, Regula Falsi method. Comparison of Iterative methods, Order of Convergence of Newton Raphson Method and Secant Method.

Unit-3

Ordinary differential equations: Euler‟s method, Taylor series method, Range Kutta II and IV order methods.

Numerical Integration: Simpson‟s 1/3 and 3/8 rule, Trapezoidal rule.

Unit-4

Solving simultaneous linear equations: Introduction, Gauss Elimination method, pivoting, ill conditioned equations, Gauss Jordon method, and Gauss-Seidel iterative method. Comparison of direct and iterative methods..

Unit-5

Some important definitions – Solutions to LPP, Feasible Solution, Basic Solutions, Basic Feasible Solution, Optimum Basic Feasible Solution, Unbounded Solution. Assumptions in LPP, Limitations of LPP, Applications of LPP and advantages of LPP

Standard Linear Programming – Formulation of a Linear Programming Solving L.P.P. by Graphical Method Problem and Simplex Method.

Unit-6

Transportation Problems – Method of finding initial basic feasible solution to Transportation problem-North West Corner, Least Cost Method and Vogel‟s Method. Method of finding initial basic feasible solution to Assignment Problem using Hungarian Method.

Reference Books:

1. Computer Oriented Numerical Methods by Rajaraman. V.
2. "Operation Research", by S.D.Sharma Kedarnath Ramnath Publishers 16th edition 2010
3. Numerical Methods by S.S. Sastry.

Course Outcomes:

1. Apply some numerical methods to find the zeroes of nonlinear functions of a single variable and solution of a system of linear equations, up to a certain given level of precision.
2. Understand the applications of numerical differentiation and integration to convert differential equations into difference equations for numerical solutions.
3. Establish a formulation helping to predict one variable in terms of the other, i.e., correlation and linear regression.
4. Solve an algebraic or transcendental equation using an appropriate numerical method.
5. Analyze and solve linear programming models of real life situations.
6. Find the graphical solution of LPP with only two variables, and illustrate the concept of convex set and extreme points. The theory of the simplex method is developed.

CSH612: Modeling and Simulation Techniques	
Teaching Scheme Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	**Examination Scheme** Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: -

1. Basic knowledge of numerical mathematics,
2. probability and statistics, and Programming skills

Course Objectives:

1. The main objective of this subject is to gain the knowledge about system and its behavior so that a person can transform the physical behavior of a system into a mathematical model that can in turn transform into a efficient algorithm for simulation purpose.
2. The area of experimentation and results analysis for simulation models is briefly introduced here. By the end of this module you will learn the verification and validation techniques to compare the defined model with real system's data.

Unit –I (10 Hours) Introduction of System Models & system simulation:Advantages and disadvantages of simulation,difficulties of simulationwhen to use simulation?modeling concepts(model classification)
Unit-II (6 Hours) VERIFICATION AND VALIDATION OF MODEL:Introduction of validation and verification,comparing model data with real system data,validating exiting systems,validating first time model
Unit-III(10 Hours) Discrete system simulation:time graph representation,discrete simulation,the single-server queue queue parameters,the multi-server queue,basic queuing relationships,SINGLE-SERVER QUEUES,MULTISERVER QUEUES,performance measures for queuing systems,the simulation of time sharing systems.
Unit-IV(10 Hours) Continuous simulation:Introduction of Continuous Simulation,Examples related to continuous simulation,Why do we use Continuous Simulation?The Uses of Simulation.
Unit-V(10 Hours) Simulation Language:Continuous Simulation Language,Classification of Continuous Simulation Languages,Discrete Simulation Language,Classification of Discrete Simulation Languages,Other Simulation Languages,Introduction of SIMULA.
Unit-VI(10 Hours) Use of DatabaseA.I. in modeling Simulation:Database in Modeling And Simulation,Definition of Simulation Data Model,Data Representation of Simulation Model,Data Representation For Input Files For a Simulation,Data Representation for Output Files for a Simulation ,A.I. in Modeling Simulation
Text and Reference Books 1. Jerry Banks and John Carson, "Discrete Event System Simulation", PHI, 2005 2. Geoffrey Gordon, "System Simulation", Second Edition, PHI, 2006 Frank L. Severance, "System Modeling and Simulation", Wiley, 2001 3. Averill M. Law and W. David Kelton, "Simulation Modeling and Analysis McGraw Hill, 2006. 4. Jerry Banks, "Handbook of Simulation: Principles, Methodology, Advances, Applications and Practice", Wiley, 1998. 5. Sheldon M. Ross: Introduction to Probability Models 7th Edition, Academic Press, 2002 6. Donald E. Knuth: The Art of Computer Programming - Volume 2: Semi Numerical Algorithms, 2nd Edition, PEARSON

Course Outcomes:

1. Have a clear understanding of the need for the development process to initiate the real problem.
2. Have a clear understanding of principle and techniques of simulation methods informed by research direction.
3. Cognitive skills (thinking and analysis) –
4. Be able to describe the components of continuous and discrete systems and simulate them.
5. Be able to model any system from different fields
6. Be able to implement numerical algorithm to meet simple requirements, expressed in English
7. Be able to discuss the simulation methods and select the suitable technique on the problems.

CSH 613 Advanced Algorithms

Teaching Scheme	Examination Scheme
Lectures: 3 hrs/Week Tutorials: 1 hr/Week Credits: 4	Class Test -12Marks Teachers Assessment - 6Marks Attendance – 12 Marks End Semester Exam – 70 marks

Prerequisite: - C Programming Concepts, Data Structure Concepts, Discrete Mathematics concepts.

Course Objectives:

1. To analyze the asymptotic performance of algorithms.
2. To analyze of Advanced Data Structure Concepts.
3. To analyze Divide and Conquer and Dynamic Programming Concepts and its application
4. To analyze Branch and Bound and Lower Bound Theory Concepts.
5. To analyze Dynamic Programming and Backtracking Concepts and its applications.
6. To analyze Advanced String Matching Concepts.

Detailed Syllabus

UNIT I

Introduction- Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements, analyzing recursive algorithms using recurrence relations, Recursion-tree method, Master method.

UNIT II

Sorting and order Statistics - Shell sort, Quick sort, Merge sort, Heap sort, Comparison of sorting algorithms, Sorting in linear time.

UNIT III

Divide and Conquer, and Greedy Algorithm Design Methodologies- Introduction, Strassen's matrix multiplication, Minimum spanning tree (Prim's and Kruskal's algorithms), Single source shortest path problem (Dijkstra's and Bellman Ford algorithms) and their performance analysis.

UNIT IV

Branch-and-Bound, and Lower Bound Theory- Introduction, 0-1 knapsack problem, Traveling salesman problem, Searching.

UNIT V

Dynamic Programming and Backtracking Algorithm- Design Methodologies Introduction, Traveling salesperson problem, Knapsack problem, multistage graphs, Floyd-Warshall algorithm, N-Queens problem, and their performance analysis.

UNIT VI

Advanced String Matching Algorithms- Naïve string matching algorithm, Robin-Karp algorithm, string matching with finite automata, Knuth Morris-Pratt algorithm.

Text and Reference Books

1. Cormen, Leiserson, Rivest and Stein : Introduction to algorithms; Prentice-Hall of INDIA.
2. Horowitz, Sahni and Rajsekaran : Fundamentals of Computer Algorithms, Golgotha Publications.
3. Aho, Hopcroft, Ullman : The Design and analysis of algorithms", Pearson Education.

Course Outcomes:

After completing the course, students will be able to:

1.	Understand Asymptotic Notation.
2.	Understand Advanced Data Structure Concepts and searching concepts.
3.	Understand the Concepts of Divide and Conquer and Greedy Methods and solve problem related with its.
4.	Understand the concepts of branch and bound and solve problem related with its.
5.	Understand the concepts of Backtracking and Dynamic Programming Concepts and solve problem related with its.
6.	Understand the Concepts of String Matching and solve string matching problems.