ANNAMALAI UNIVERSITY

ANNAMALAINAGAR

FACULTY OF SCIENCE

DEPARTMENT OF COMPUTER & INFORMATION SCIENCE

(Syndicate Res. No:3 dt. 15.12.2015)

M.Sc., COMPUTER SCIENCE

(Choice Based Credit System)

HAND BOOK
2016 – 2017 ONWARDS

ANNAMALAI UNIVERSITY

FACULTY OF SCIENCE
Division of Computer and Information Sciences

M.Sc. COMPUTER SCIENCE (CBCS - Choice Based Credit System)

REGULATIONS

Eligibility: A pass in B.Sc. Computer Science/B.Sc., Information Technology/B.Sc., Software Development/B.Sc., Software Engineering/B.C.A or an examination accepted by the syndicate as equivalent thereto.

MASTER PROGRAMME

A Master's programme consists of a set of Core courses and Optional courses. Core courses are basic courses required for each programme. The number and distribution of credits for core courses will be decided by the respective faculties. Optional courses, suggested by the respective departments, may be distributed in all four semesters. A course is divided into five units to enable the students to achieve modular and progressive learning.

SEMESTERS

An academic year is divided into two semesters, Odd semester and Even semester. The normal semester periods are:

Odd semester: July to November (90 working days)
Even semester: December to April (90 working days)

CREDIT

The term credit is used to describe the quantum of syllabus for various programmes in terms of hours of study. It indicates differential weightage given according to the contents and duration of the courses in the curriculum design.

The minimum credit requirement for a two year Master's Programme shall be 90. The core courses shall carry 70 credits and the optional courses shall carry 20 credits.

COURSES

A course carrying one credit for lectures, will have instruction of one period per week during the semester, if four hours of lecture is necessary in each week for that course then 4 credits will be the weightage. Thus normally, in each of the courses, credits will be assigned on the basis of the lecture, tutorials/laboratory work and other form of learning in a15 week schedule:

I. One credit for each lecture period per week.
II. One credit for every three periods of laboratory or practical work per week

GRADING SYSTEM

The term Grading System indicates a 10 point scale of evaluation of the performance of students in terms of marks, grade points, letter grade and class.

DURATION

The duration for completion of a two year Master's Programme in any subject is four semesters.

STRUCTURE OF THE PROGRAMME

The Master's Programme will consist of :

I. Core courses which are compulsory for all students.
II. Optional courses which students can choose from amongst the courses offered by the other Department of a faculty as well as by the Departments of other faculties. (Arts, Science, Education and Indian Language)
III. The Optional subjects will be allotted by counseling by a committee of the respective Heads of the Department under the Chairmanship of the Dean of the Faculty.

ATTENDANCE

Every teaching faculty handling a course shall be responsible for the maintenance of attendance register for candidates who have registered for the course.

The teacher of the course must intimate the Head of the Department atleast Seven Calendar days before the last instruction day in the semester about the attendance particulars of all students.

Each student should earn 80% attendance in the courses of the particular semester failing which he or she will not be permitted to sit for the end-semester examination.

However, it shall be open to the authorities to grant exemption to a candidate who has failed to obtain the prescribed 80% attendance for valid reasons on payment of a Condonation fee and such exemptions should not under any circumstance be granted for attendance below 70%.

EXAMINATIONS

The internal assessment for each theory course carries 25% marks and practical course 40% of marks which is based on two sessional tests and a variety of assessment tools such as seminar and assignment. The pattern of question paper will be decided by the respective faculty. **The tests are compulsory**.

There will be one End Semester Examination (75% marks) of 3 hours duration for each theory course. The pattern of question paper will be decided by the respective faculty.

EVALUATION

The performance of a student in each course is valuated in terms of Percentage of Marks (PM) with a provision for conversion to Grade Point (GP). The sum total performance in each semester will be rated by GPA while the continuous performance from the 2nd Semester onwards will be marked by (OGPA).

MARKS AND GRADING

The student cannot repeat the assessment of Sessional test I and Sessional test II. However, if for any compulsive reason, the student could not attend the test, the prerogative of arranging a special test lies with the teacher in consultation with the

Head of the Department.

- A student has to secure 50% minimum in the End Semester Examination.

The student who has not secured minimum of 50% of marks (sessional plus end semester examination) in a paper shall be deemed to have failed in that paper.

A candidate who has secured a minimum of 50% marks in all the papers prescribed in the programme and earned a minimum of 90 credits will be considered to have passed the Master's Programme.

GRADING

A ten point rating scale is used for the evaluation of the performance of the student to provide letter grade for each course and overall grade for the Master's Programme.

Marks	Grade Points	Letter Grade	Class
90+	10	S	Exemplary
85-89	9.0	D + +	Distinction
80-84	8.5	D +	Distinction
75-79	8.0	D	Distinction
70-74	7.5	A + +	First Class
65-69	7.0	A +	First Class
60-64	6.5	A	First Class
55-59	6.0	B	Second Class
50-54	5.5	C	Second Class
49 or Less		F	Fail

The successful candidates are classified as follows.

I – Class; 60% marks and above in overall percentage of marks (OPM)
II – Class; 50% marks in overall percentage of marks.

Candidates who obtain 75% and above but below 90% of marks (OPM) shall be deemed to have passed the examination in FIRST CLASS (Distinction) provided he/she passes all the course prescribed for the programme at the first appearance.

Course-Wise Letter Grades

The percentage of marks obtained by a candidate in a course will be indicated in a letter grade.

A student is considered to have completed a course successfully and earned the credits if he/she secures an overall letter grade other than F. A letter grade F in any course implies a failure in that course. A Course successfully completed cannot be repeated for the purpose of improving the Grade point.

The F grade once awarded stays in the grade card of the student and is not

deleted even when he/she completes the course successfully later. The grade acquired later by the student will be indicated in the grade sheet of the Odd/Even semester in which the candidate has appeared for clearance of the arrears.

If the student secures F grade in the Project / Field Work / Practical Work / Dissertation, he/she shall improve it and resubmit it, if it involves only rewriting incorporating the clarification of the evaluators or he/she can re-register and carryout the same in the subsequent semesters for evaluation.

SCHEME OF EXAMINATION

Course Code	Course	Marks (E + IA)	Credits
FIRST SEMESTER			
PCSC101	Mathematical Foundations of Computer Science	75 + 25	5
PCSC102	Soft Skills Development	75 + 25	3
PCSC103	Microprocessor and Applications	75 + 25	5
PCSC104	Advanced Data Structure	75 + 25	5
PCSC105	Relational Database Management System	75 + 25	5
PCSP106	Programming Lab – I (Advanced Data structure)	60 + 40	2
PCSP107	Programming Lab – II (RDBMS Lab)	60 + 40	2
	Total		**27**
SECOND SEMESTER			
PCSC201	Advanced JAVA Programming	75 + 25	5
PCSC202	Operating System	75 + 25	4
PCSC203	Computer Networks	75 + 25	4
PCSC204	Advanced Software Engineering	75 + 25	5
PCSC205	Data Mining and Data Warehousing	75 + 25	4
PCSP206	Programming Lab – III (Advanced JAVA Programming Lab)	60 + 40	2
PCSP207	Programming Lab – IV (Network Lab)	60 + 40	2
	Total		**26**
THIRD SEMESTER			
PCSC301	.NET Framework	75 + 25	4
PCSC302	System Software	75 + 25	5
PCSC303	Web Technology	75 + 25	4
PCSC304	Artificial Intelligence And Expert Systems	75 + 25	5

PCSE305	Elective – I (Cloud Computing)	75 + 25	3
PCSP306	Programming Lab – V (Web Technology)	60 + 40	2
PCSP307	Programming Lab – VI (Mini Project)	60 + 40	2
Total			**25**
FOURTH SEMESTER			
PCSC401	Soft Computing	75 + 25	4
PCSE402	Elective – II(Network Security)	75 + 25	3
PCSP403	Dissertation and Viva-Voce	60 + 40	5
Total			**12**
Grand Total		**2400**	**90**

INTERNAL ASSESSMENT MARKS

THEORY	**MARKS**
Internal Assessment Test-I	10
Internal Assessment Test-II	10
Assignment/Seminar	5
Total	**25**
PRACTICAL	**MARKS**
Test – I	15
Test – II	15
Record	10
Total	**40**

ELECTIVES

Apart from the various courses offered in the curriculum of the branch of specialization, a student can choose two electives from any specialization under the faculty during the entire period of study, with the approval of the Head of the Department offering the course.

Elective Courses

Elective – I - PGCSE119

1. Mobile Computing
2. Cloud computing
3. Digital Image Processing

Elective – II - PGCSE123

1. Network Security
2. Genomics
3. Distributed Computing

SYLLABUS

FIRST SEMESTER

PGCS101 - Mathematical Foundations of Computer Science

Aim: To enable the student to learn the mathematical foundations of computer science.

Unit-I - Matrices - Types of Matrices - Matrix Operations - Inverse of a Matrix - Properties of Determinants - Eigen Values - Cayley-Hamilton Theorem. Set Theory: Basic Set Operations - Relations and Functions – Relation Matrices - Principle of Mathematical Induction.

Unit-II - Introduction to Probability - Sample Space and Events - Axioms of Probability - Conditional Probability – Independence of Events - Bayes Theorem. Regression and Correlation : Introduction – Linear Regression – Method of Least Squares – Normal Regression Analysis – Normal Correlation Analysis.

Unit-III - Grammars and Languages - Context Free Grammars – Introduction – Context Free Grammars – Derivation Trees. Finite Automata: Finite State Systems – Basic Definitions – Non Deterministic Finite Automata.

Unit-IV - Mathematical Logic: Statements and Notations – Connectives – Consistency of Premises and Indirect Method of Proof – Automatic Theorem Proving.

Unit-V - Numerical Methods - Finding Roots : Bisection Method – Regula – Falsi Method - Newton – Raphson Method. Solution of Simultaneous Linear Equations: Gaussian Elimination - Gauss-Seidal Method. Numerical Integration: Trapezoidal Rule - Simpson s Rule.

Text Books and References:

1. Venkataraman, M. K., Engineering Mathematics, Vol. II, National Publishing Company, 2001.
2. John E. Freunds, Irwin Miller and Marylees Miller, Mathematical Statistics, Pearson Education, Sixth Edition, 2004.
3. Hopcroft and Ullman, Introduction to Automata Theory, Languages and Computation , Pearson Education, Second Edition, 2001.
4. Tremblay and Manohar, Discrete Mathematical Structures with Applications to Computer Science , Tata McGraw-Hill, 1997.
5. Rama B. Bhat and Snehashish Chakraverty, Numerical Analysis in Engineering , Narosa Publishing House, 2004.
6. Radha Muthu and T. Santha, "Discrete Mathematics for Computer Science and Applications, Kalaikathir Achchagam, Coimbatore, 2003.

PGCS102 - Soft Skills Development

Unit-I - Soft skills and developing positive Attitude - Soft skills: introduction – what are soft skills? - selling your soft skills - attribute regarded as soft skills – soft skills – social soft skills- thinking soft skills –Negotiating –exhibiting your soft skills- indentifying your soft skills- improving your soft skills - soft skills training –train yourself-top 60 soft skills - Developing positive attitude: introduction – meaning - features of attitudes- attitude and behavior formation of attitudes– change of

attitudes – what can you do to change attitude?-ways of changing attitude in a person – attitude in a workplace – the power of positive attitude-developing positive attitude-example of positive attitude- example of negative attitude-overcoming negative attitude- negative attitude and its result.

Unit-II - Art of speaking and writing - Art of speaking: Introduction-what make communication important? - Defining communication-special features of communication – communication process- channel of communication-importance of communication - tips for effective communication - tips for powerful presentation-art of public speaking - importance of public speaking - Art of writing: Introduction – importance of writing –creative writing - writing tips- drawbacks of writing communication.

Unit-III - Body language - Introduction – body talk – voluntary and involuntary body language-forms of body language-parts of body language - origin of body language - uses of body language - body language in building interpersonal relations – body language in building industrial relations-reason to study body language-improving your body language – types of body language-Gender differences-female interest and body language - shaking hands with women - interpreting body language-developing confidence with correct body language.

Unit-IV - Group discussion - Introduction – meaning of GD – why group discussion? - characters tested in a GD – tips on GD – types of GD - skills required in a GD - consequences of GD - behavior of a GD - essential elements of GD - different characters in GD - traits tested in a GD - GD etiquette - areas to be concentrated while preparing for a GD - imitating a GD - techniques to initiate a GD - Non-verbal communication in GD – movement and gestures to be avoided in a GD-topics for GD - **Interview skills -** Introduction – why an interview?.- types of interview - interview panel-types of questions asked-reason for selecting a candidate –reason for rejecting a candidate – on the day of interview– on the interview table – attending job fair-common mistakes that you would't want to do-questions the candidate should not ask during the interview –post- interview etiquette-how does one follow up?-telephonic interview –dress code at interview – typical questions asked – interview mistakes –quick tips- how to present well in interview –tips to make a good impression in an interview – job interview-basic tips-how to search for job effectively – interview quotations.

Unit-V - Time management - Introduction- the 80:20 rule- take a good look at the people around you- examine your work-sense of time management – time is money – features of time- three secretes of time management - time management matrix-analysis of time matrix-effective scheduling – grouping of activities – five steps to successful time management –difficulties in time management- evils of not planning - time management is a myth – overcoming procrastination – ways of find free time-time management tips for students – interesting facts about time- ideal way of spending a day- time wasters – time savers – realizing the value of time-time circle planner.

Text Book:

1. Alex, K., Soft Skills: Know yourself and know the world, S.Chand & company Pvt. Ltd, Third revised Edition, 2014.

Reference Books:

1. Gopalaswamy Ramesh and Mahadevan Ramesh, The ACE of Soft Skills, Attitude, Communication and Etiquette for Success, Pearson; First edition, 2013.

2. Barun K. Mitra, Personality Development and Soft Skills, Oxford university press, New Delhi, 2011.
3. Rao, M.S., Soft Skills - Enhancing Employability: Connecting Campus with Corporate, I K International Publishing House Pvt. Ltd, 2011.
4. Sanjay Kumar and Pushp Lata, Communication Skills, Oxford university press, New Delhi, 2011.

PGCS103 - Microprocessor and Applications

Aim: To understand about Microprocessor and Microcontroller and design methods and Interfacing Techniques to digital systems.

Unit-I - 8-bit Microprocessor - Introduction-Evolution of Microprocessor 8085 Architecture and Memory interfacing I/O devices- Instruction set-Addressing Modes-Assembly language programming- Counters and time delays- Interrupts- Timing diagrams- Microprocessor applications.

Unit-II - Microcontroller - Intel 8031/8051 Architecture- Special Function Registers (SFR)- I/O pins- ports and circuits- Instruction set-Addressing Modes-Assembly language programming- Timer and counter programming- Connection to RS 232-Interrupts Programming- External Memory Interfacing- Introduction to 16 bit Microcontroller.

Unit-III - 80x86 Processors - 8086 Architecture- Pin Configuration- 8086 Minimum and Maximum mode configurations- Addressing modes- Basic Instructions- 8086 Interrupts- Assembly levels programming- Introduction to 80186- 80286- 80386-80486 and Pentium processors.

Unit-IV - Peripherals and Interfacing - Serial and parallel I/O (8251 and 8255) – Programmable DMA Controller (8257)-Programmable interrupt controller (8259)-Keyboard display ADC/DAC interfacing-Inter integrated circuits interfacing (I2C standard).

Unit-V - Microprocessor based systems design-digital Interfacing - Interfacing to alpha numeric displays- Interfacing to liquid crystal display (LCD 16x2 line) – High power Devices and Optical motor shaft encoders- Stepper motor interfacing – Analog interfacing and Industrial control –Microcomputer based small scale – Industrial process control system – Robotics and Embedded control – DSP and Digital Filters.

Text Books:

1. Ramesh S. Gaonkar, Microprocessor Architecture Programming and Applications with 8085, Sixth Edition, Penram International Publishing, 2013.
2. Muhammad Ali Mazidi and Janice Gillespie Mazidi, The 8051 Microcontroller, Second Edition, Prentice Hall, 2005.
3. Douglas V. Hall, Microprocessor and interfacing, Programming and Hardware, Tata McGraw Hill, Revised Second Edition, 2007.

Reference Books:

1. Kenneth J. Ayala., The 8051 Microcontroller Architecture Programming and Applications, Penram International Publishing (India), Third Edition, 2004.
2. Kenneth J. Ayala., The 8086 Microprocessor, Programming and Interfacing the PC", Penram International Publishing. Second Edition, 2002.
3. Ray, A.K. and K.M. Bhurchandi., Advanced Microprocessor and Peripherals, Tata McGraw, Hill, 2002.

PGCS104 - Advanced Data Structures

Aim : To enable the student to learn the advanced concepts in data structure and sorting methods.

Unit-I - The Role of algorithm in computing - Insertion sort - Analyzing algorithm - Designing algorithm - Divide and Conquer - The maximum-sub array problem - Strasen's algorithm for matrix multiplication - The substitution method for solving recurrences - The recursion tree method for solving recurrences - Proof of the master theorem.

Unit-II - Sorting and order statistics - Heap sort - Maintaining the heap priority - Building a heap - The heap sort algorithm - Priority queues - Quick sort - Description of quick sort - Performance of quick sort - A randomized version of quick sort - Analysis of quick sort - Sorting in Linear Time - Lower bounds for sorting - Counting sort - Radix sort - Bucket sort - Medians and order statistics - Minimum and Maximum - Selection in expected linear time - Selection in worst case linear time.

Unit-III - Elementary Data Structures - Stacks and Queues - Linked Lists - Implementing pointers and objects - Hash tables - Direct-address tables - Hash functions - Open addressing - Perfect hashing - Binary search trees - Querying binary search trees - Insertion and deletion - Red-Black trees - Properties - Rotations - Insertion - Deletion.

Unit-IV - Advanced Design and Analysis Techniques - Dynamic Programming - Rod cutting - Matrix chain multiplication - Elements of dynamic programming - Longest common subsequence - Optimal binary search trees - Greedy algorithms - An activity-selection algorithm - Elements of greedy strategy - Huffman codes - Matroids and Greedy method - A task scheduling problem as matroid.

Unit-V - Advanced Data Structures - B- trees - Definition - Basic Operations on B-trees - Deleting a key from B-tree - Fibonacci heaps - Structure - Mergeable heap operations - Decreasing a key and deleting a node - Bounding the maximum degree - Van Emde Boas Trees - Preliminaries - Recursive structures - Data structure for disjoint sets - Disjoint set operations - Linked list representation of disjoint sets.

Text Book:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Cliford Stein, Introduction to Algorithms, Third Edition, The MIT press, 2009.

Reference Books:

1. Timothy Budd, An Introduction to Object Oriented Programming, Pearson Education, Second Edition, 1996.
2. Jean Paul Tremblay and Paul G. Sorenson, An Introduction to Data Structures with Applications, Tata McGraw Hill, Second Edition, 2010.
3. Sahini, Data Structures, Algorithms and Applications in C++, Tata McGrawHill, 1998.

PGCS105 – Relational Database Management System

Aim: To enable the student to learn the concepts of relational database management system and to learn the designing concepts of relational database systems

Unit-I - Introduction - Database System Applications – Purpose of Database Systems – View of Data – Database Languages – Relational Databases – Database design – Data storage and Querying – Transaction Management – Database Architecture – Data Mining and Information Retrieval – Database Users and Administrators – History of Database Systems.

Unit-II - Relational Databases - Structure of the relational databases - Database schema - Keys - Schema diagrams - Relational query languages - Relational operations - Overview of SQL query language - SQL data definition - Basic structure of SQL queries - Additional basic operations - Set operations - Null values - Aggregate functions - Nested sub queries - Modification of the database.

Unit-III - Relational Database design - Features of Good Relational Designs - Atomic Domains and First Normal Form - Decomposition Using Functional Dependencies - Functional-Dependency Theory - Algorithms for Decomposition - Decomposition Using Multivalued Dependencies - More Normal Forms - Database-Design Process.

Unit-IV - Indexing and Hashing - Basic Concepts - Ordered Indices - B+-Tree Index Files - B+-Tree Extensions - Multiple-Key Access - Static Hashing - Dynamic Hashing - Comparison of Ordered Indexing and Hashing - Bitmap Indices - Index Definition in SQL- Measures of Query Cost - Selection Operation - Sorting - Join Operation - Other Operations - Evaluation of Expressions.

Unit-V - Distributed Databases - Introduction - Homogeneous and Heterogeneous Databases - Distributed Data Storage - Distributed Transactions - Commit Protocols - Concurrency Control in Distributed Databases - Availability - Distributed Query Processing - Heterogeneous Distributed Databases - Cloud-Based Databases - Directory Systems.

Text Book:

1. Abraham Silberschatz, Henry F. Korth and S. Sudharshan, Database System Concepts, Sixth Edition, Tata McGraw Hill, 2002.

Reference Books:

1. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publications, 2002.
2. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems, Third Edition, Tata McGraw Hill Higher Education, 2003.
3. Elmasri and Navathe, Fundamentals of Database Systems, Sixth Edition, Pearson Education Asia, 2010.

Second Semester

PGCS108 - Advanced JAVA Programming

Aim: To enable the student to learn the advanced programming concepts in java

Unit-I

Java Utilities: Collections – I/O streams – Networking – Event Handling.

Unit-II

AWT: Windows, Controls, Layout Managers and Menus – Swing. Multimedia: Images,

Animation and Audio – JDBC.

Unit-III

Java Servlets: Design – Life Cycle – Constituents of javax.servlet package – cookies – session tracking – Java Server Pages: Overview – Implicit Objects – Scripting – Standard actions – Directives.

Unit- IV

Remote Method Invocation: Remote Interface – The Naming Class – RMI Security Manager Class – RMI Exceptions – Creating RMI Client and Server classes – RMI – I IOP.

Unit-V

Java Beans: Events – Customization – Introspection – Persistence – EJB: Introduction – EJB Container – Classes – Interfaces – Deployment description – Session Bean – Entity Java Bean – Jar file.

Text Book:

1. Herbert Schildt, The Complete Reference – JAVA 2, Fourth Edition, 2001.

Reference Books:

1. Muthu, Programming with Java, Vijay Nicole Imprints Private Ltd., 2004.
2. Deitel, H.M. and P.J. Deital, Java How To Program, Prentice-Hall of India, Fifth Edition, 2003.
3. Cay.S. Horstmann and Gary Cornel, Core Java 2 – Vol. II- Advanced Features, Pearson Education, 2004.
4. Tom Valsky, Enterprise JavaBeans – Developing Component Based Distributed Applications, Pearson 1999.

PGCS109 - Operating System

Aim: The basic objective of this lesson is to provide students with the understanding and knowledge of Operating System Concepts.

Unit-I - Introduction – Operating System Structure - Operating System Operations – Protection and Security – Kernel Data Structures - Computing Environments - Open Source Operating Systems - Operating System Services – User operating system Interface – System calls – Types of system calls – System programs – Operating System design and Implementation – Operating System-debugging - Operating System-Generation – System Boot.

Unit-II - Process Management – Process Concepts – Process Scheduling – Operation on Processes – Interprocess Communication – Threads – Multicore Programming - Multithreading Models – Thread Libraries - Implicit Threading - Threading Issues – Process Synchronization – The Critical Section Problem – Peterson's Solution – CPU Scheduling – Scheduling Criteria – Scheduling Algorithms - Deadlocks – System Model – Deadlock Characterization – Methods for handling Deadlocks – Deadlock Prevention – Deadlock Avoidance – Deadlock Detection – Recovery from Deadlock.

Unit-III - Memory Management – Background – Swapping – Contiguous Memory Allocation – Paging – Structure of the Page Table – Virtual Memory Background - Demand Paging – Copy-on-Write – Page Replacement – Allocation of Frames – Thrashing – Memory- Mapped Files – Allocating Kernel Memory – Other Considerations – Operating System Examples.

Unit-IV - Storage Management – Overview of Mass Storage Structure – Disk Structure – Disk Attachment – Disk Scheduling – Disk Management – Swap Space Management- RAID Structure – Stable Storage Implementation – Tertiary Storage Structure – I/O Hardware – Application of I/O Interface – Kernal I/O Subsystem - 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 – Efficiency and Performance.

Unit-V

Case study - **Windows 7**- History - Design Principles - System Components - Terminal Services and Fast User Switching - File System - Networking - Programmer Interface - **Android -** Overview of Android Operating System - The Android ecosystem - Android Architecture - Android Versioning.

Text Book:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, Operating Systems Concepts, John Wiley & Sons, Inc., Ninth Edition, 2004.

Reference Books:

1. Andrew S. Tanenbaum, Modern Operating Systems, Prentice Hall of India, Third Edition, 2007.
2. Deitel ,H. M., Operating Systems, Pearson Education, Third Edition, 2004.
3. https://android.googlesource.com

PGCS110 - Computer Networks

AIM: To study the various protocol models and Network services based on the Computer Networks.

Unit-I - Introduction - Use of Computer Networks – Network Hardware – Network Software-Reference Models – Example of Networks. The Physical Layer: The Theoretical Basis for Data Communication - Guided Transmission Media – Wireless Transmission – Communication Satellites – The Public Switched Telephone Network.

Unit-II - Data Link Layer - Data Link Layer Design Issues – Error Detection and Correction – Elementary Data Link Protocols – Sliding Window Protocols. Medium Access Control Sublayer: The Channel Allocation Problem - Multiple Access Protocols - Wireless LANs – Bluetooth.

Unit-III - Network Layer - Network Layer Design Issues – Routing Algorithms – Congestion Control Algorithms – Quality of Service – Internetworking.

Unit-IV - Transport Layer - The Transport Service – Elements o f Transport Protocol – A Simple Transport Protocol. The Internet Transport Protocols: UDP – TCP – Performance Issues.

Unit-V - Application Layer - Domain Name System - Electronic Mail - World Wide Web. Network Security: Cryptography - Symmetric-Key Algorithms - Public Key Algorithms - Digital Signatures - Communication Security - E-Mail Security.

Text Books:

1. Andrew S. Tanenbaum, Computer Networks, Pearson Education, Fifth Edition, 2011.

Reference Books:

1. William Stallings, Data and Computer Communications- PHI, Eight Edition, 2007.
2. Douglas E. comer, "Internetworking with TCP/IP-Volume-I", PHI, Sixth Edition, 2013.

PGCS111 - Advanced Software Engineering

AIM : To create software based on a set of procedures so that it can comply with some predefined standards.

Unit-I - Introduction - A Generic Process model - Process Assessment and Improvement - Perspective Process Models - The Waterfall Model- The Incremental Process Model - Evolutionary Process Model - Concurrent Models - A Specialized Process Models - The Unified Process – Personal and Team Process Models - Agile Process – Extreme Programming - Other Agile Process Models.

Unit-II - Understanding Requirements - Requirement Engineering - Establishing the Groundwork - Identifying stakeholders - Recognizing Multiple viewpoints - Working toward Collaboration - Eliciting Requirements - Collaborative Requirements Gathering - Quality Function Deployment - Usage Scenarios - Elicitation Work Products - Developing the use cases - Building the Requirements Model - Elements of Requirements Model - Analysis Patterns - Negotiating Requirements - Validating Requirements.

Unit-III - Design Concepts - The Design Process - Software Quality Guidelines and Attributes - The Evolution of Software Design - Design Concepts - Abstraction - Architecture - Patterns - Separation of Concerns - Modularity - Information Hiding - Functional Independence - Refinement - Aspects - Refactoring - Object-Oriented Design Concepts - Design Classes - The Design Model - Data Design Elements - Architectural Design Elements - Interface Design Elements - Component-Level Design Elements - Deployment-Level Design Elements - .

Unit-IV - Architectural Design - Representing the System in Context - Defining Archetypes - Refining the Architecture into Components - Describing Instantiations of the System - Component Level Design - An Object-Oriented View - The Traditional View - A Process-Related View - Designing Class-Based Components - Basic Design Principles - Component-Level Design Guidelines - Cohesion - Coupling - Conducting Component-Level Design - User Interface Design - Interface Design Steps - Applying Interface Design Steps - User Interface Design Patterns - Design Issues.

Unit-V - Emerging Trends in Software Engineering - Technology Evolution - Observing Software Engineering Trends - Identifying Soft Trends- Managing Complexity - Open-World Software - Emergent Requirements - The Talent Mix - Software Building Blocks - Changing Perceptions of Value - Open Source - Technology Directions - Process Trends - The Grand Challenge - Collaborative Development - Requirements Engineering - Model-Driven Software Development - Postmodern Design - Test-Driven Development - Tools-Related Trends - Tools That Respond to Soft Trends - Tools That Address Technology Trends.

Text Book:

1. Roger Pressman, S., Software Engineering: A Practitioner's Approach, Seventh Edition, Tata McGraw Hill, 2010.

Reference Books:

1. Dinesh Verma, Introduction to Software Engineering, GPH, 2014.
2. Rod Stephensi, Beginning Software Engineering, Wiley India Private Limited, 2015.
3. Aggarval, K.K. and Yogesh Singh, Software Engineering , New age(New Delhi), 2008.

PGCS112 - Data Mining and Data Warehousing

Aim: To understand the current trend and basics of Data Mining and Data Warehousing Concepts.

Unit-I - Introduction - Definition of data mining - data mining vs query tools - machine learning - taxonomy of data mining tasks - steps in data mining process - overview of data mining techniques.

Unit-II - Data Warehousing - Definition - Multidimensional Data Model - Data Cube - Dimension Modelling - OLAP Operations - Warehouse Schema - Data Warehouse Architecture - Data Mart - Meta Data - Types of Meta Data - Data Warehouse Backend Process - Development Life Cycle.

Unit-III - Data Pre-Processing And Characterization - Data Cleaning - Data Integration and Transformation - Data Reduction - Discretization and Concept Hierarchy Generation - Primitives - Data Mining-Query Language - Generalization - Summarization - Analytical Characterization and Comparison - Association Rule - Mining Multi Dimensional data from Transactional Database and Relational Database.

Unit-IV - Classification - Classification - Decision Tree Induction - Bayesian Classification -Prediction - Back Propagation - Cluster Analysis - Hierarchical Method -Density Based Method - Grid Based Method - Outlier Analysis.

Unit-V - Cluster analysis - Types of data - Clustering Methods - Partitioning methods -Model based clustering methods - outlier analysis.Advanced topics: Web Mining - Web Content Mining - Structure and Usage Mining - Spatial Mining - Time Series and Sequence Mining - Graph Mining.

Text Books:

1. Paulraj Ponnaiah, Data Warehousing Fundamentals, Wiley Publishers, 2001.
2. Jiawei Han, Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufman Publishers, 2006.

Reference Books

1. Usama M.Fayyad, Gregory Piatetsky Shapiro, Padhrai Smyth and Ramasamy Uthurusamy, Advances in Knowledge Discover and Data Mining, The M.I.T.Press, 2007.
2. Ralph Kimball and Margy Ross, The Data Warehouse Toolkit, John Wiley and Sons Inc., 2002.
3. Alex Berson, Stephen Smith and Kurt Thearling, Building Data Mining Applications for CRM, Tata McGraw Hill, 2000.
4. Margaret Dunham, Data Mining: Introductory and Advanced Topics, Prentice Hall, 2002.
5. Daniel T. Larose, John Wiley & Sons and Hoboken, Discovering Knowledge in Data: An Introduction to Data Mining, New Jersey, 2004.

Third Semester
PGCS115 - C# and .NET Framework

Aim:: To Provide the Knowledge of Windows Programming Using Visual Basic and Visual C++

Unit-I - Review of OOP Concepts - Overview of .NET Framework - Basic Elements of C# - Program Structure and simple Input and Output Operations – Operators and Expressions – Statements – Arrays and Structures.

Unit-II - Inheritance - Namespace – Polymorphism – Interface and Overloading – Multiple Inheritance – Property – Indexes – Delegates – Publish/Subscribe Design Patterns- Operator Overloading-Method Overloading.

Unit-III - C# Concepts for creating Data Structures - File Operation – File Management systems – Stream Oriented Operations- Multitasking – Multithreading – Thread Operation – Synchronization.

Unit-IV - Working with XML – Techniques for Reading and Writing XML Data - Using XPath and Search XML - ADO.NET Architecture – ADO.NET Connected and Disconnected Models – XML and ADO.NET – Simple and Complex Data Binding– Data Grid View Class.

Unit-V - Application Domains – Remoting – Leasing and Sponsorship - .NET Coding Design Guidelines –Assemblies – Security – Application Development – Web Services - Building an XML Web Service - Web Service Client – WSDL and SOAP – Web Service with Complex Data Types – Web Service Performance.

Text Books:

1. Thamarai Selvi, S. and R. Murugesan, A Textbook on C# , Pearson Education, 2003.
2. Stephen C. Perry, Core C# and .NET, Pearson Education, 2006.

Reference Books:

1. Jesse Liberty, Programming C#, Second Edition, O'Reilly Press, 2002.
2. Robinson etal, Professional C#, Fifth Edition, Wrox Press, 2002.
3. Herbert Schildt, The Complete Reference: C#, Tata McGraw Hill, 2004.
4. Andrew Troelsen, C# and the .NET Platform , A! Press, 2003.
5. Thuan Thai and Hoang Q. Lam, **.**NET Framework Essentials, Second Edition, O'Reilly, 2002.

PGCS116 - System Software

Aim : To study the basic principles involved in Assemblers, Loaders and Linkers and System Software tools.

Unit-I Introduction - System software and machine architecture – The Simplified Instructional Computer (SIC) - Machine architecture - Data and instruction formats - addressing modes - instruction sets - I/O and programming.

Unit-II - Assemblers - Basic assembler functions - A simple SIC assembler – Assembler algorithm and data structures - Machine dependent assembler features - Instruction formats and addressing modes – Program relocation - Machine independent assembler features - Literals – Symbol-defining statements – Expressions - One pass assemblers and Multi pass assemblers - Implementation example - MASM assembler.

Unit-III - Loaders and Linkers - Basic loader functions - Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features - Relocation – Program Linking – Algorithm and Data Structures for Linking Loader - Machine-independent loader features - Automatic Library Search – Loader Options - Loader design options - Linkage Editors – Dynamic Linking – Bootstrap Loaders - Implementation example - MSDOS linker.

Unit-IV - Macro Processors - Basic macro processor functions - Macro Definition and Expansion – Macro Processor Algorithm and data structures - Machine-independent macro processor features - Concatenation of Macro Parameters – Generation of Unique Labels – Conditional Macro Expansion – Keyword Macro Parameters-Macro within Macro-Implementation example - MASM Macro Processor – ANSI C Macro language.

Unit-V - System Software Tools - Text editors - Overview of the Editing Process - User Interface – Editor Structure. - Interactive debugging systems - Debugging functions and capabilities – Relationship with other parts of the system – User-Interface Criteria.

Text Book:

1. Leland L. Beck, System Software – An Introduction to Systems Programming, Third Edition, Pearson Education Asia, 2009.

Reference Books:

1. Dhamdhere, D. M., Systems Programming and Operating Systems, Second Revised Edition, Tata McGraw-Hill, 2009.
2. John J. Donovan, Systems Programming, Tata McGraw Hill Edition, 2000.
3. John R. Levine, Linkers & Loaders, Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000.

PGCS117 - Web Technology

Aim : To enable the student to learn various Web Technology concepts.

Unit-I - HTML & CSS

HTML Introduction – Basic HTML – The Document Body – Text –Hyperlinks –Adding MoreFormatting – Lists – Tables – Using Color and Images – Images –Multimedia Objects – Frames –Forms – The HTML Document Head in Detail – XHTML – CSS Introduction – Using Styles – Definingyour Own Styles – Properties and Values in Styles – Formatting Blocks – Layers.

Unit-II - XML & Ajax

Basic XML – Document Type Definition – XML Schema – Document Object Model – Presenting XML –Using XML Parser - Essential Ajax - Ajax and the DOM, XML, CSS and Dynamic HTML.

Unit-III - JAVA Script
What is Dynamic HTML – Java Script Basics – Variables – String Manipulation – Mathematical Functions – Statements – Operators – Arrays – Functions – Data and Objects – Regular Expressions –Exception Handling – Built-in Objects – Events –Dynamic HTML with Java Script

Unit-IV: PHP & MySQL
Why PHP and MySQL - Server-Side Web Scripting - Getting Started with PHP - Adding PHP to HTML -Syntax and Variables - Control and Functions - Passing Information between Pages – Strings – Arrays and Array Functions – Numbers - MySQL Database Administration - PHP/MySQL Functions -Displaying Queries in Tables - Building Forms from Queries.

Unit-V: Perl
The Basic Perl Program – Scalars – Arrays – Hashes Control Structures –Processing Text – Regular Expressions – Using Files – Subroutines – Bits and Pieces –Handling XML with Perl – Handling the DOM with Perl.

Text Books:

1. Chris Bates, Web Programming (Building Internet Applications), Second edition, Wiley India private Ltd., New Delhi- 2002. Chapters Covers: 1-8, 14.
2. Steven Hoizner, Ajax Bible, Wiley India private Ltd, NewDelhi-2007, Chapters Covers 1,8-11.
3. Tim Converse, Joyce Park and Clark Morgan, PHP5 and MySQL Bible, Wiley Publishing, Inc. 2004. Chapters Covers: 1-10, 14-17.
4. Steven M. Schafer, HTML, CSS, JavaScript, Perl, Python and PHP - Web standards Programmer's Reference, Wiley Publishing, Inc., 2005.

PGCS118 - Artificial Intelligence And Expert Systems

Aim : To enable the student to Understand the problem states and AI, state space methods, problem reduction search methods, predicate calculus and knowledge engineering in expert systems.

Unit-I - The AI problems – AI techniques – problems, problems space & search – Defining the problem as a state Search – Production systems – problem characteristics – heuristic search techniques – Generate & test – Hill climbing – Best first search. Problem reduction – constraint satisfaction – means – ends analysis.

Unit-II - Game playing : Mini – max procedure – Adding Alpha – Beta cutoffs – Additional refinements – Searching AND/OR Graphs – Iterative deepening. Using Predicate Logic – Representing simple facts & logic – Representing instance & IS a Relationships – Computable functions & Predicates – Use of the predicate calculus in AI – Resolution – natural deduction.

Unit-III - Representing knowledge using Rules – Procedural verses declarative knowledge logic programming – forward versus backward reasoning – Resolving within AND/OR Graphs matching – control knowledge – symbolic Reasoning under uncertainity – non – monotonic reasoning – Implementation Issues – Augmenting a problem solver - Implementation of depth first & breadth first search. Statistical reasoning – Bayee's theorem – Certainity factors & Rule based Systems – Bayesian Networks – Dempston – Shafer theory – Fuzzy logic.

Unit-IV - Expert Systems – Architectural Components – Explanation facilities –

knowledge acquisition.

Unit-V - Expert System Development process – Non – formal representation of knowledge – semantic Networks – Frames – Scripts – Production Systems – Expert Systems tools.

Text Books:

1. Elain Rich and Kevin Kaight, Artificial Intelligence, Tata McGraw Hill, Second Edition, 1991. (For units – I , II , & III - Chapter 1,2,3,5,6,7,9).
2. David W. Roltson, Principles of Artificial Intelligence and Expert Systems Development, Tata McGraw Hill, 1998. (For units – IV & V - Chapters 1,4,7,8,9).

Reference Books:

1. Gunjan Goswami, Introduction to Artificial Intelligence, S.K. Kataria and Sons, 2013.
2. Pankaj Sharma, Artificial Intelligence, S.K. Kataria and Sons, 2013.

Fourth Semester
PGCS121 - Soft Computing

Aim : To study to soft computing concepts and fuzzy logic principles.

Unit-I - Fundamentals of Neural Networks - Basic Concepts of Neural Network-Model of an Artificial Neuron-Neural Network Architectures-characteristics of Neural Networks-Learning Methods-Taxonomy-History of Neural Network-Early Neural Network Architectures.

Unit-II - Backpropagation Networks - Architecture of Backpropagation Network-Backpropagation Learing-Illustratrations-applications-Effect of Tuning Parameters of the Backpropagation Neural Network-Selection of various parameters in Backpropagation Neural Network-Variations of Standard Backpropagation algorithms.

Unit-III - Adaptive Resonance Theory (ART) - Introduction- ART1- ART2-Applications

Unit-IV - Fuzzy Sets and Systems - Fuzzy Sets-Fuzzy Relations-Fuzzy Logic-Fuzzy Rule based system-Defuzzification Methods-Applications.

Unit-V - Fuzzy Backpropagation Networks - LR-Type Fuzzy Numbers-Fuzzy Neuron-Fuzzy Backpropagation Architecture- Learning in Fuzzy Backpropagation-inference in Fuzzy Backpropagation-Applications.

Text Books:

1. Rajasekaran. S. and Vijayalakshmi Pai, Neural Networks, Fuzzy Logic and Genetic Algorithms, PHI, 2008.

Reference Books:

1. Fakhreddine O. Karray and Clarence De Silva, Soft Computing and Intelligent Systems Design, Pearson, 2009.
2. Sivanandam, S. N and Deepa S. N, Principles of Soft Computing, Wiley India, 2008.

Elective - I

Mobile Computing

Unit-I - Wireless Communication Fundamentals, Architecture -Frequencies Spectrum- Multiplexing- Spread spectrum-GSM vs CDMA - 2G Mobile Wireless Services -Comparison of 2G and 3 G - GSM Architecture-Entities-Call Routing-PLMN-Address and identifiers- Network Aspects-Mobility Management-Frequency Allocation-Authentication and Security-SMS Architecture-Value Added Service through SMS-GPRS-GPRS and Packet Data Network-Architecture- Network Operations-Data Service-Application .

Unit-II - Mobile Wireless Short Range Networks - Introduction-WLAN Equipment-WLAN Topologies-WLAN Technologies-IEEE 802.11 Architecture- WLAN MAC-Security of WLAN, Power Management-Standards- WAP Architecture-WAP 2.0-Bluetooth enabled Devices Network-Layers in Bluetooth Protocol-Security in Bluetooth- IrDA- ZigBee.

Unit-III - Mobile IP Network Layer, Transport Layer - IP and Mobile IP Network Layer- Packet delivery and Handover Management-Location Management-Registration- Tunneling and Encapsulation-Route Optimization- Dynamic Host Configuration Protocol– VoIP -IPsec -Mobile Transport Layer-Conventional TCP/IP Transport Layer Protocol-Indirect, Snooping, Mobile TCP .

Unit-IV - Mobile AD-HOC, Sensor Networks - Introduction to Mobile Ad hoc Network- MANET-Routing and Routing Algorithm-Security – Wireless Sensor Networks-Applications- Distributed Network and Characteristics-Communication Coverage- Sensing Coverage-Localization- Routing -Function Computation-Scheduling.

Unit-V - Mobile Application Development - Mobile Applications Development - Application Development Overflow-Techniques for Composing Applications - Understanding the Android Software Stack – Android Application Architecture – Developing for Android – The Android Application Life Cycle – The Activity Life Cycle – Creating Your First Android Activity – Creating Applications and Activities – Creating User Interfaces – Intents – Broadcast Receivers – Adapters – Data Storage, Retrieval, and Sharing.-Geo services- creating mobile applications like game, Clock, calendar, Convertor, phone book, Text Editor.

Text Books:

1. Asoke K Talukder, Hasan Ahmed and Roopa R Yavagal, Mobile Computing , Tata McGraw Hill Pub ,Second Edition, 2010.
2. Raj Kamal, Mobile Computing, Oxford Higher Education, Second Edition, 2012.
3. Jochen Schillar, Mobile Communications, Pearson Education second Edition, 2003.

Reference Books:

1. Pei Zheng, Larry L. Peterson, Bruce S. Davie and Adrian Farrell, Wireless Networking Complete, Morgan Kaufmann Series in Networking , 2009.
2. Vijay K Garg, Wireless Communications & Networking, Morgan Kaufmann Series, First Edition, 2010.
3. Donn Felker, Android Application Development For Dummies, Wiley, Second Edition , 2010.

Cloud Computing

Aim: To understand the current trend and basics of cloud computing and to learn cloud services from different providers.

Unit-I - Understanding Cloud Computing - Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Service.

Unit-II - Developing Cloud Services - Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development - Software as a Service – Platform as a Service – Web Services – On-Demand Computing – Discovering Cloud Services Development Services and Tools - Amazon Ec2 – Google App Engine – IBM Clouds.

Unit-III - Cloud Computing for Everyone - Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists – Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation .

Unit-IV - Using Cloud Services - Collaborating on Calendars, Schedules and Task Management – Exploring Online Scheduling Applications – Exploring Online Planning and Task Management – Collaborating on Event Management – Collaborating on Contact Management – Collaborating on Project Management – Collaborating on Word Processing - Collaborating on Databases – Storing and Sharing Files.

Unit-V - Other Ways to Colloborate Online - Collaborating via Web-based Communication tool - Evaluating Web Mail Services - Evaluating Web Conference Tools - Collaborating via Social Networks and Groupware - Collaborating via Blogs and Wikis.

Text Books and References:

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
2. Kumar Saurabh, Cloud Computing –Insights into New Era Infrastructure, Wiley Indian Edition, 2011.
3. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On -demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

Digital Image Processing

Aim:: To Provide the Knowledge of Image Processing concepts and mathematical background.

Unit-I - Introduction: What is Digital Image Processing? – Examples of Fields that Use Digital Image Processing – Fundamental Steps in Digital Image Processing – Components of an Image processing System – Digital Image Fundamentals: Elements of Visual Perception – Light and Electro Magnetic Spectrum – Image sensing and Acquisition – Image Sampling and Quantization – Some Basic Relationships between Pixels.

Unit-II - The Image, its Mathematical Background: Overview – Linear Integral Transforms. Data Structures for Image Analysis: Level of Image Data Representation – Traditional Image Data Structures – Hierarchical Data structures. Image Pre-processing: Pixel Brightness Transformations - Geometric transformations – Local pre-processing: Image smoothing, Edge Detectors – Image Restoration.

Unit-III - Segmentation : Thresholding – Edge Based Segmentation : Edge Image Thresholding, Border tracing - Region Based Segmentation – Matching – Shape Representation and **Description:** Region Identification – Contour Based Shape Representation and Description- Chain codes, Simple Geometric Border Representation - Region Based Shape Representation and Description, Simple Scalar Region Descriptors.

Unit-IV - Object recognition: Knowledge Representation – Statistical Pattern Recognition – Neural Nets – Fuzzy Systems- Mathematical Morphology – Basic Morphological concepts – Binary Dilation and Erosion.

Unit-V - Image Data Compression: Image Data Properties – Discrete Image Transforms in Image Data Compression – Predictive Compression Methods – Vector Quantization – Hierarchal and Progressive Compression Methods – Comparison of Compression Methods – Coding –JPEG Image Compression.

Text Books:

1. Rafael C. Gonzalez and Richard E.Woods, Digital Image Processing, Prentice Hall, Third Edition, 2008.
2. Sonka, Hlavac and Boyle, Digital Image Processing and Computer Vision, Cengage Learning, 2009.

Reference Books:

1. Anil.K.Jain, Fundamentals of Digital Image Processing, Prentice-Hall, 1989.
2. Chanda & Majumdar, Digital Image Processing and Analysis, Prentice Hall, Third Edition, 2011.

Elective - II
Network Security

Aim: To understand the basics of Network Security and importance of Security.

Unit-I - Introduction - Attacks, Services, and Mechanisms – Security Attacks: Passive Attacks –Active Attacks – Security Services – Model for Internetwork Security – Internet Standards and RFCs: Internet Society – RFC Publication – Standardization Process – Non- Standardization Track Documents – Conventional Encryption and Message Confidentiality: Conventional Encryption Principles: Cryptography – Cryptanalysis – Feistel Cipher Structure – Conventional Encryption Algorithms – Cipher Blocks Models of Operation: Cipher Block Chaining Mode – Cipher Feedback Model – Location of Encryption Devices – Key distribution.

Unit-II - Public Key Cryptography and Message Authentication - Approaches to Message Authentication: Authentication using Conventional Encryption – Message Authentication without Message Encryption – Message Authentication Code – One Way Hash Function – Secure Hash Function and HMAC: Hash Function Requirements – Simple Hash Functions the SHA–1 Secure Hash Function – Other Secure Hash Functions – HMAC Design Objectives – HMAC Algorithm – Public Key Cryptography Principles: Public Key Encryption Structure Application for Public Key

Cryptosystems – Requirements for Public Key Cryptography – Public Key Cryptography Algorithms: RSA Public Key Encryption Algorithms – Diffie-Hellman Key Exchange – Other Public Key Cryptography Algorithms – Digital Signature – Key Management.

Unit-III - Electronic Mail Security - Pretty Good Privacy (PGP): Notation – Operational Description – Cryptography Keys and Key Rings – Public Key Management – S/MIME: RFC 822 – Multipurpose Internet Mail Extensions – S/MIME Functionality – S/MIME Messages – S/MIME Certificate Processing – Enhanced Security Services – IP Security: IP Security Overview: Application of IPSec – Benefits of IPSec – Routing Applications – IP Security Architecture: IPSec Documents – IPSec Services – Security Associations – Transport and Tunnel Modes – Authentication Header – Encapsulating Security Payload – Combining Security Associations – Key Management: Oakley Key Determination Protocol – ISAKMP

Unit-IV - Web security - Web security Requirements: Web security Threats – Web Traffic Security Approaches – Secure Socket Layer (SSL) and Transport Layer Security (TLS): SSL Architecture – SSL Record Protocol – Change Cipher Spec Protocol – Alert Protocol - Handshake Protocol – Cryptographic Computations – Transport Layer Security – Secure Electronics Transaction (SET): SET Overview – Dual Signature – Payment Processing – Network Management Security: Basic Concepts of SNMP: Network Management Architecture – Network Management Protocol Architecture – Proxies – snmpv2 – snmpv1 Community Facility – snmpv3: SNMP Architecture – Message Processing and the User Security Model – View Based Access Control.

Unit-V - System Security - Intruders and Viruses: Intruders: Intrusion Techniques – Password Protection – Password Selection Strategies – Intrusions Detection – Viruses and Related Threats: Malicious Programs – The Nature of Viruses – Types of Viruses – Macro Viruses – Antiviruses Approaches – Advanced Antiviruses Techniques – Firewalls: Firewall Design Principles: Firewall Characteristics – Types of Firewalls – Firewall Configuration – Trusted Systems: Data Access Control – The Concept of Trusted Systems – Trojan Horse Defense.

Text book:

1. William Stallings, Network Security Essentials, Prentice Hall, Third Edition, 2006.

Reference Books:

1. Manish Tiwari, Handbook of Network Security and Anti Terrorism Laws, Neha Publishers and Distributors, 2012.
2. Adesh K. Pandey, Network Security and Administration, S.K. Kataria and Sons, 2010.

Genomics

Unit-I - Definition of genomics - Rationale for mapping and sequencing genomes - Types of gene map - Genetic mapping using linkage analysis. Physical mapping – low and high resolution - Subdividing the genome using restriction enzymes, PFGE, FACs. - Molecular markers for mapping – RFLPs, microsatellites and SNPs.

Unit-II - Assembling a physical map of the genome – chromosome walking and jumping. Restriction enzyme fingerprinting - Sequence tagged sites, radiation hybrid mapping, ESTs. Hybridization assays – hybridization mapping, hybridization reference library, *in situ* hybridization.

Unit-III - Conventional genome sequencing - Sequencing without mapping - STC

approach - Whole genome sequencing - cDNA sequencing - Hierarchical shotgun sequencing and shotgun sequencing - Analyzing sequence data – database searches - sequence analysis at whole genome level.

Unit-IV - Gene identification by positional cloning - DNA microarrays - SAGE and cluster analysis - Analysis of genetic variations by SNPs - Comparison of transcriptomes by differential screening - subtractive hybridization - differential display and array – based methods - Functional genomics – techniques for large – scale gene inactivation.

Unit-V - Genome Projects: genome sequence data of model organisms – E.coli - D.melanogaster - A.thaliana and mouse - The human genome project – goals - mapping strategies - markers - sequencing technologies, results of final sequence, potential benefits and risks - Ethical, legal and social issues (ELSI).

Therapeutic genomics: Human somatic cell gene therapy – gene delivery systems, ex vivo and in vivo strategies, gene therapy for single gene disorders, AIDS and cancer. Generation of mouse models for gene therapy. Antisense therapy.

Text and Reference Books:

1. Primrose , Principles of Genome Analysis, Blackwell Science. 2003.
2. Dale and Schantz . From Genes to Genomes, 2002.
3. Brown TA. Genomes, John Wiley & Sons, Second Edition, 2002.

Distributed Computing and Linux

Unit-I - Characterization of Distributed Systems – Examples – Resource Sharing and the Web – Challenges – System Models – Architectural and Fundamental Models – Networking and Internetworking – Types of Networks – Network Principles – Internet Protocols – Case Studies: Ethernet, WiFi, Bluetooth.

Unit-II - Interprocess Communication – The API for the Internet Protocols – External Data Representation and Marshalling – Client– Server Communication – Group Communication – Case Study – Distributed Objects and Remote Invocation – Communication between Distributed Objects – Remote Procedure Call – Events and Notifications– Case Study: Java RMI

Unit-III - The OS Layer – Protection – Processes and Threads – Communication and Invocation – OS Architecture – Security – Security Techniques – Cryptographic Algorithms – Digital Signatures – Cryptography Pragmatics – Case Studies – Distributed File Systems – File Service Architecture – Sun Network File System.

Unit-IV - Name Services – Domain Name System – Discovery Services – Case Study: Global Name Service , X.500 Directory Service – Clocks , Events and Process States – Synchronizing Physical Clocks – Logical Time and Logical Clocks – Global States – Distributed Debugging – Distributed Mutual Exclusion – Elections – Multicast Communication.

Unit-V - Transactions – Nested Transactions – Locks – Optimistic Concurrency Control – Timestamp Ordering – Comparison – Flat and Nested Distributed Transactions – Atomic Commit Protocols – Concurrency Control in Distributed Transactions – Distributed Deadlocks – Transaction Recovery – Replication and Distributed Multimedia Systems.

Text Books:

1. George Coulouris, Jean Dollimore and Tim Kindberg, Distributed Systems Concepts and Design, Pearson Education, Fourth Edition, 2009.

Reference Books:

1. Albert Fleishman, Distributed Systems Software Design and Implementation, Springer Verlag, 2004.
2. M. L .Liu, Distributed Computing Principles and Applications, Pearson Education, 2004.
3. Andrew S Tanenbaum and Maartenvan Steen, Distributed Systems, Principles , Pearson Education, 2002.
4. Mugesh Singhal and Niranjan G Shivaratri, Advanced Concepts in Operating Systems, Tata McGraw Hill Edition, 2001.