B. Sc. (HONS.) Computer Science

1st Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSHCS101	Introduction to Computer Programming through C	40	60	100
BSHCS102	Lab. Exercises based on course BSHCS101	60	40	100
Total		**100**	**100**	**200**

2nd Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSHCS201	Digital Logic and Circuits	40	60	100
BSHCS202	PC Software Lab	60	40	100
Total		**100**	**100**	**200**

3rd Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSHCS301	Computer Organization and Architecture	40	60	100
BSHCS302	Lab. Exercises based on course BSHCS301	60	40	100
Total		**100**	**100**	**200**

4th Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSHCS401	Numerical Computing	40	60	100
BSHCS402	Lab. Exercises based on course BSHCS401	60	40	100
Total		**100**	**100**	**200**

5th Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSHCS501	Object Oriented Programming using C++	40	60	100
BSHCS502	Net Centric Computing	40	60	100
BSHCS503	Discrete Mathematical Structures	40	60	100
BSHCS504	Operating System Concepts	60	40	100
BSHCS505	Lab. Exercises based on course BSHCS501	60	40	100
BSHCS506	Lab. Exercises based on course BSHCS502	60	40	100
Total		**300**	**300**	**600**

6th Semester

PAPER CODE	PAPER NAME	INTERNAL	EXTERNAL	TOTAL
BSHCS601	Database Management Systems	40	60	100
BSHCS602	Data and File Structures	40	60	100
BSHCS603	Any one of the following Major Elective Course I: BSHCS603A: System Analysis and Design BSHCS603B: E-Commerce	40	60	100
BSHCS604	Any one of the following Major Elective Course II: BSHCS604A: Graph Theory and Combinatorics BSHCS604B: Digital Signal Processing BSHCS604C: Operation Research	60	40	100
BSHCS605	Lab. Exercises based on course BSHCS601	60	40	100

BSHCS606	Lab. Exercises based on course BSHCS602	60	40	100
BSHCS607	Project	60	40	100
Total		**360**	**340**	**700**

B.Sc. (Hons.) Computer Science- SEMESTER I

BSHCS101- Introduction to Computer Programming through C

Basic Programming Concepts: Introduction to the basic ideas of problem solving and programming using principles of top-down modular design, Flowcharts, Abstraction Mechanisms, Stepwise Refinement.

Syntactic Elements of a Language, General Syntactic Criterion, Formal Definition of Syntax, Semantics, Storage Management, Static Storage Management, Stack-Based Storage Management, Heap Storage Management, Operating and Programming Environment.

Introduction to Programming Language C: Data Types, Instruction and its Types, Storage Classes, Operators and Hierarchy of Operations, Expressions in C, Control and Repetitive Statements, break, continue, Functions: User Defined Functions and Library Functions, Local and Global Variables, Parameter Passing, Pointers, Arrays, Strings, C Preprocessors, Structures, Input and Output in C, C-Library.

Introduction to the Major Programming Paradigms: Imperative Language, Object Oriented Languages, Functional Languages, Logic Languages, Parallel Languages etc.

Suggested Readings:

1. R. Sethi, Programming Languages: concepts and constructs, Addison-Wesley, 1996.

2. T.W. Pratt, Programming Languages, McGraw Hills.

3. C. Ghezzi & M. Jazayeri, Programming Languages Concepts, John Wiley.

4. M. Marcotty & H.F. Ledgard, Programming Language Landscape, Galgotia Publication.

5. B.W. Kernighan and D.M.Ritchie, the C Programming Language, PHI.

6. R.C. Hutchinson and S.B. Just, Programming using the C Language, McGraw-Hill.

7. B.S. Gottfried, Schaum's Outline of Theory and Problems of Programming with C, McGraw-Hill.

8. H. Schildt, C Made Easy, Osborne McGraw-Hill.

9. Y. Kanetkar, Let Us C, BPB Publications.

BSHCS102 Lab. Exercises based on course BSHCS101

This practical paper will consist of programming exercises based on course BSHCS101.

SEMESTER II

BSHCS201- Digital Logic and Circuits

Number System: Binary, Octal, and Hexadecimal; Fixed and Floating Point Number Representations, Complements, Binary Arithmetic: Addition, Subtraction, Multiplication and Division, Binary Codes.

Boolean algebra and Logic Gates: Introduction to Boolean algebra, laws of Boolean algebra, logic gates, universal logic gates, POS and SOP notations, Canonical logic forms. Logic families: Simplification of Boolean Functions: Laws of Boolean algebra and K-Maps, Tabulation Method.

Combinational Circuits: Design Procedure of Combinational Circuits, Adders, Subtractors, Code Converters, Magnitude Comparator, Encoder, Decoder, Multiplexer, Demultiplexer, ROM, PLAs, PALs.

Sequential Circuits: Flip-Flops: SR, D, JK, T, Master/Slave F/F, Clocked F/F, Edge-trigerred F/F, Excitation Tables; Registers, Counters: synchronous and asynchronous, Shift Registers, RAM.

Logic Families: TTL, ECL, E2

L, CMOS, Characteristics of different logic families.

Suggested Readings:

1. M. M. Mano, Digital Logic and Computer Design, PHI.

2. M.M.Mano, Computer System Architecture, PHI.

3. M.M.Mano, Digital Design, Pearson Education.

4. M. M. Mano and C. R. Kime, Logic and Computer Design Fundamentals," 3rd ed., Prentice Hall, 2004.

5. Virendra Kumar, Digital Electronics : Theory and Experiments, New Age Publication.

6. Malvino, Leach, Digital Principles and Applications, McGraw-Hill.

7. V. Rajaraman, T. Radhakrishnan, An Introduction to Digital Computer Design, PHI, 2006.

8. Thomas C. Bartee, Digital Computer Fundamentals, McGraw-Hill.

9. B. Streetman, Integrated Digital Circuits, PHI

BSHCS202 PC Software Lab

MS-Office Package: MS Word, MS-Excel, MS-Powerpoint, MS Access and Latex.

Suggested Readings:

1. Jennifer Ackerman Kettell, Guy Hart-Davis, Curt Simmons, Microsoft Office 2003 : the complete reference, McGraw-Hill/Osborne, 2003.

2. Laurie Ann Ulrich, NetLibrary, Inc., Sams teach yourself Microsoft Office 2000 in 21 days, Sams publishing, 1999.

3. Gini Courter; Annette Marquis, Mastering Office XP for business professionals, SYBEX, 2003.

SEMESTER III

BSHCS301 Computer Organization and Architecture

Basic Organization : Von Neumann Machine (IAS Computer), Operational flow chart (Fetch,

Execute), Instruction Cycle, Organization of Central Processing Unit, Hardwired & micro programmed control unit, Single Organization, General Register Organization, Stack Organization, Addressing modes.

Memory Organization : Memory Hierarchy, Main memory (RAM/ROM chips), Auxiliary memory, Associative memory, Cache memory, Virtual Memory, Memory Management Hardware, hit/miss ratio, magnetic disk and its performance, magnetic Tape etc.

I/O Organization : Peripheral devices, I/O interface, Modes of Transfer, Priority Interrupt, Direct Memory Access, Input-Output Processor, and Serial Communication. I/O Controllers, Asynchronous data transfer, Strobe Control, Handshaking.

Instruction Formats, Op Codes Mnemonics, Data Transfer, Arithmetic, Branch, Loop, Logical , Shift and Rotate Instructions, String Instructions and Text Processing.

Stacks, Calls, Returns, Near and Far Procedures, Interrupts and Their Routines, Directives, Pseudoops, Macros and Conditional Machine Instructions, Disk File Handling, Input and Output Instructions, Device Drivers.

Suggested Readings:

1. Y.C. Liu and G.A. Gibson : Microcomputer System – 8086/8088 Family (P.Hall)

2. P. Abel : IBM PC Assembly Language Programming (PHI)

3. M. Thorn : Programming the 8086/8088 (Benjamin)

4. J.P. Hayes, Computer Architecture and Organization, 3rd ed., McGraw Hill.

5. M. M. Mano, Computer System Architecture, PHI.

6. M. M. Mano, Digital Logic and Computer Design (PHI).

7. V. Rajaraman, T. Radhakrishnan, An Introduction to Digital Computer Design, PHI, 2006.

8. William Stallings, Computer Organization And Architecture: Designing For Performance, Prentice Hall, 2005.

BSHCS302 Lab. Exercises based on course BSHCS301

Hands on experiments in Digital Logic Design and programming exercises based on course BSHCS-301: Computer Organization and Architecture.

SEMESTER IV

BSHCS401 Numerical Computing

Note : Emphasis is on computational methods

Errors in Computer Arithmetic, Normalization.

Bisection, Falsiposition and Newton-Raphson methods for solution of nonlinear equations. Errors in the solutions, Convergence of Solutions.

Gauss, Gauss-Siedel and Iterative methods for system of linear equations. Ill conditioned system, Pivotal Condensation, Matrix Inversion, Eigen-values, Eigen-vector, Diagonalization of Real Symmetric Matrix by Jacobi's Method.

Introduction to Finite Differences.

Polynomial Interpolation using Newton's and Lagrange's formulae.

Numerical Differentiation. Numerical Integration : Trapezoidal Rule, Simpson's Rule, Weddle's Rule, Gauss Quadrature Formula. Error in numerical Integration.

Numerical Solution of differential Equations: Picards Method, Taylor's Series Method, Euler's Method, Modified Euler's Method, Runge-Kutta Method, Predictor-Corrector Method.

Suggested Readings:

1. V. Rajaraman, Computer Oriented Numerical Methods, PHI.

2. F.Acton, Numerical Methods that Work, Harper and Row.

3. S.D.Conte and C.D.Boor, Elementary Numerical Analysis, McGraw Hill.

4. SS Shastri, “Introductory Methods of Numerical Analysis”, PHI.

5. C. F. Gerald and P.O. Wheatley, Applied Numerical Analysis, Addision Wesley.

BSHCS402 Lab. Exercises based on course BSHCS401

This practical paper will consists of programming exercises based on course BSHCS-401: Numerical Computing.

SEMESTER V

BSHCS501 Object Oriented Programming using C++

OOAD and OOP, Object Oriented Programming paradigm and design; General Concepts: Object, Class, Data Abstraction and Encapsulation, Inheritance, Polymorphism, Dynamic Binding, Message Passing; Benefits of OOP.

Object oriented Programming using C++: Data Types, Operators, Classes and Objects, Constructors and Destructors, Operator Overloading, Type Conversions, Inheritance, Pointers, Virtual Functions, Polymorphism, Stream I/O in C++, File Processing, Templates, Standard Template Library, Program defined exceptions, Events; Introduction to Class Wizard, Application Wizard and MFC.

Suggested Readings:

(1) B. Stroustrup, The C++ Programming Language, Addison-Wesley.

(2) E. Balagurusamy, Object oriented Programming with C++, 2/ed, TMH.

(3) G. Booch, Object Oriented Analysis and Design, Addison-Wesley.

(4) Rumbagh et al, Object Oriented Modeling, PHI.

(5) Dietel , H. M. and P. J. Dietel. C++ How to Program, 2ed. Prentice Hall, 1998.

(6) Bhushan Trivedi, Programming with ANSI C++, Oxford University Press, 2007.

BSHCS502 Net Centric Computing

Data Communication and Networking: Background and history of networking and the Internet, Network architectures, Network standards and standardization bodies, The ISO 7-layer reference model in general and its instantiation in TCP/IP; Circuit switching and packet switching, Streams and datagrams;

Physical layer networking concepts (theoretical basis, transmission media, standards);

Data link layer concepts (framing, error control, flow control, protocols);

Internetworking and routing (routing algorithms, internetworking, congestion control);

Transport layer services (connection establishment, performance issues).

Applications, Protocols at the application layer; Domain names and name services, Issues for Internet service providers (ISPs), Network Security, Overview of the issues of network management, Quality of service issues: performance, failure recovery.

Building Web Applications: Web technologies: Server-side programs, Common gateway interface (CGI) programs, Client-side scripts, The applet concept; Characteristics of web servers: Handling permissions, File management, Capabilities of common server architectures, Role of client computers; Nature of the client-server relationship, Web protocols, Support tools for web site creation and web management, Developing Internet information servers, Publishing information and applications

Suggested Readings:

1. Comer, Douglas E. Computer Networks and Internets with Applications, 3/e PrenticeHall 2001.

2. Peterson & Davie Computer Networks 2nd ed.Morgan Kaufman 2000.

3. Stallings, William Data & Computer Communications 7th ed. Prentice-Hall 2003.

4. Tanenbaum, Andrew Computer Networks 4th ed. Prentice-Hall 2002.

BSHCS503 Discrete Mathematical Structures

Sets , Relations & Functions : Property of binary relations, equivalence, compatibility, partial ordering relations, hasse diagram, functions, inverse functions, composition of functions, recursive functions.

Mathematical Logic : Logic operators, Truth tables, Theory of inference and deduction, mathematical calculus , predicate calculus, predicates and quantifiers.

Groups & Subgroups : Group axioms, Monoids , semigroups, Isomorphism, homomorphism , automorphism.

Lattices & Boolean Algebra : Truth values and truth tables, the algebra of propositional functions, boolean algebra of truth values.

Combinatorics & Recurrence Relations : Permutation, Combination, Principle of Inclusion and Exclusion, Recurrence Relations, Generating Functions

Graph theory : Basic Concepts of Graphs and Trees, Adjacency and Incidence Matrices, Spanning Tree, Transitive Closure, Shortest Path, Planar Graphs, Graph Coloring, Eularian and Hamiltonian graphs, Applications of Graph Theoretic Concepts to Computer Science.

Suggested Readings:

1. J.P. Trembley and R.P.Manohar, Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill.

2. Dornhoff and Hohn, Applied Modern Algebra, McMillan.

3. N. Deo, Graph Theory with Applications to Engineering and Computer Science, PHI.

4. R. Johnsonbaugh, Discrete Mathematics, Pearson Education, 2001.

5. R. P. Grimaldi, Discrete and Combinatorial Mathematics, Pearson Education, 1999.

6. C.L. Liu, Elements of Discrete Mathematics, McGraw-Hill.

7. Rosen, Discrete Mathematics, Tata McGraw Hill.

BSHCS504 Operating System Concepts

Introduction: Definition, Design Goals, Evolution; Concept of User, job and Resources; Batch processing, Multi-programming, Time sharing; Structure and Functions of Operating System.

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

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

Concurrent Processes: Process Interaction, Shared Data and Critical Section, Mutual Exclusion, Busy form of waiting, Lock and unlock primitives, Synchronization, Classical Problems of Synchronization, Semaphores, Monitors, Conditional Critical Regions, System Deadlock, Wait for Graph, Deadlock Handling Techniques: Prevention, Avoidance, Detection and Recovery.

File and Secondary Storage Management: File Attributes, File Types, File Access Methods, Directory Structure, File System Organization and Mounting, Allocation Methods, Free Space management; Disk Structure, Logical and Physical View, Disk Head Scheduling, Formatting, Swap Management.

Protection & Security.

UNIX/ LINUX and WINDOWS as example systems.

Suggested Readings:

1. Silberschatz and Galvin, Operating System Concepts 6/ed, Addison Wesley.

2. William Stalling, Operating Systems: Internals and Design Principles 5/ed, PHI.

3. Tanenbaum, Modern operating Systems, PHI.

4. J Bach, The Design of UNIX Operating System, Pearson Education.

5. Vijay Mukhi, The C Odessy, BPB.

6. Peterson and Silberschatz, Operating System Concepts, Addison Wesley.

7. P. B. Hansen, Operating System Principles, PHI.

8. K. Christian, The UNIX Operating System, John Wiley.

9. A. N. Haberman, Introduction to Operating System Design, Galgotia.

10. Manuals of DOS, UNIX and Netware.

BSHCS505 Lab. Exercises based on course BSHCS501

This practical paper would carry the exercises based on course BSHCS501: C++ programming.

BSHCS506 Lab. Exercises based on course BSHCS502

Laboratory experiments should involve data collection and synthesis, empirical modeling, protocol analysis at the source code level, network packet monitoring, software construction, and evaluation of alternative design models, Web designing.

SEMESTER VI

BSHCS601 Database Management Systems

Database Systems, View of Data Models, Database Languages, DBMS Architecture, Database Users and Data Independence.

ER Modeling, relation types, role and Structural Constraints, Extended ER Modeling Features, Design of an ER Database Schema, Reduction of ER Schema to Tables. Relational Model: Relational Model Concepts, Relational Algebra, Relational Calculus.

Introduction to SQL: SQL data types and literals, Types of SQL commands, SQL operators, Tables,

views and indexes, Queries and sub queries, Aggregate functions, Cursors in SQL.

Relational Database Design: Functional and multi-valued Dependencies, Desirable Properties of Decomposition, Normalization up to 5 NF.

Concept and Design of Object Oriented Database.

Selected Database Issues: Security, Transaction Management, Basic Algorithms to Query Processing and Query Optimization, Concurrency Control, Recovery Techniques.

Case Study: Oracle/MS-SQL.

Suggested Readings:

1. C.J.Date, An Introduction to Database Systems, Vol I & II, Addison Wesley.

2. Korth Silberschatz, Data Base System Concepts, 4th ed., McGraw Hill.

3. J.D.Ullman, Principles of Database Systems, Golgotha, New Delhi.

4. Wiederhold, Database Design, McGraw Hill.

5. R. Elmasri, and S.B. Navathe, Fundamentals of Database Systems, Pearson Education Asia.

6. Raghu Ramakrishnan, Database Management Systems, McGraw-Hill Education.

BSHCS602 Data and File Structures

Basic Data Structures : Arrays, Linked Lists, Stack, Queue, Dequeue, Tree, Heap, Hashing, Hash Table and Collision resolution, Representation of Graphs and Applications. Basic algorithms for Creation, Manipulation and Applications of Data Structures. Algorithm Complexity and TimeSpace trade-off.

Internal Sorting Algorithms : Selection, Bubble, Insertion, Heap, Quick Sort. External Sorting Algorithms: Merge Sort.

File Structures: Primary File Organization: Sequential, Direct, Indexed Sequential, Multi-list File Organization, Inverted Files.

Suggested Readings:

1. Lipshutz, Data Structure, McGraw Hill.

2. Standish, Data Structure, Addison-Wesley.

3. B. Salzberg, File Structures - An Analytic Approach, Prentice-Hall.

4. A.L. Tharp, File Organization and Processing, John Wiley and Sons.

5. A. M. Tennenbaum, Y. Langsam and M. J. Augenstein, Data Structures using C, PHI, 1996.

6. S. Lipschutz, Data Structure, Schaum Series.

7. D. E. Knuth, Fundamental Algorithms, Narosa Publication.

8. N. Wirth, Algorithms+Data Structures= Program, Prentice Hall.

9. Robert Lafore, Data Structures and Algorithms in Java, Sams.

10. Sahni S, data Structures, Algorithms and Applications in C++ , Mc Graw- Hill, 2002.

BSHCS603A System Analysis and Design

Introduction to System, Software development life cycle, specification, analysis, design, implementation and testing.

Modular top-down analysis, design and testing, Project Feasibility, System Requirements Analysis, Fact Finding Techniques, Data Flow Diagram, Data Dictionary, Decision Tree, Decision Tables, Structured English, Systems Proposal.

System Design, CASE tools for system analysis and design, data modeling and process modeling (data flow diagrams, entity relationship diagrams), traditional and prototyping approaches, ObjectOriented Analysis and Modeling, design and development of relational database systems. I/O design, input validation and user interface design (GUI).

Suggested Readings:

1. Elias M. Awad, Systems Analysis and Design, McGraw-Hill Professional.

2. Jeffery L. Whitten, Lonnie D. Bentley and Kevin C. Dittman, Systems Analysis and Design Methods, McGraw-Hill.

3. Kenneth E. Kendall, Systems Analysis and Design, Pearson Education.

4. Valacich Joseph S., George Joey F., Hoffer Jeffrey A, Essentials Of Systems Analysis

And Design, Prentice Hall of India.

5. V. Rajaraman, “System Analysis and Design”, Prentice Hall.

6. J.A. Sern, “Analysis & Design of Information System”, McGraw Hill.

BSHCS603B E-Commerce

Introduction, Definition, Objectives, Advantages and disadvantages, Forces driving E-Commerce,

Traditional commerce Vs. E-Commerce, E-Commerce opportunities for industries, Growth of ECommerce.

E-Commerce Models: Business to consumer, Business to Business, Consumer to Consumer, other models – Brokerage Model, Aggregator Model, Info-mediary Model, Community Model and value chain Model.

Electronic Payment Systems: Special features required in payment systems, Types of E-payment systems, E-Cash, E-cheque, credit card, Smart Card, Electronic Purses.

E-Marketing, E-Customer Relationship Management, E-Supply Chain Management.

Security Issues in E-Commerce: Security risk of E-Commerce, Types of threats, Security tools and risk management approach. Cyber laws, Business Ethics, IT Acts.

Suggested Readings:

1. Bharat Bhaskar, Electronic Commerce – Frameroork Technologies and Applications,

Tata McGraw Hill.

2. Ravi Kalakota & A.B. Whinston, Frontiers of Electronic Commerce, Pearson Education.

3. Ravi Kalakota & A.B. Whinston, Electronic Commerce – A Manager’s Guide, Pearson

Education.

4. Agarwala Kamlesh, N and Agarwala Deeksha, Business on the Net_Introduction to the ECom., Macmillan India.

5. P. T. Joseph, E-Commerce: A Managerial Perspective, PHI, 2002.

BSHCS604A Graph Theory and Combinatorics

Graph Theory: Basic definitions, Trees, cycles, bipartite graphs and other basic concepts. Matchings in bipartite graphs; Hall's theorem and its variants. Euler circuits and Hamilton cycles. Turan's theorem. Planar graphs; the five colour theorem.

Combinatorics: Introduction to combinatorics, The Pigeonhole Principle, Permutations and Combinations

Binomial identities, combinatorial proofs, binomial and multinomial theorems.

The Principle of Inclusion and Exclusion, permutations with forbidden positions, circular permutations with forbidden relations.

Suggested Readings:

1. Richard A. Brualdi, Introductory Combinatorics, Prentice Hall, 4 edition, 2004.

2. Behzad M. and G. Chartrand, Introduction to the Theory of Graphs. Allyn and Bacon Inc., Boston.

3. G. Chartrand and L. Lesniak, Graphs and Digraphs, Chapman & Hall/CRC, 4 edition, 2004.

4. Bondy J.A. and U.S. R. Murty, Graph Theory with Applications, The Macmillan Press Ltd.

5. Deo Narsingh, Graph Theory with Applications to Engineering and Computer Science, Prentice-Hall, India, 1994.

6. Harary F., Graph Theory, Addison-Wesley publishing Co.

7. Swamy M. N. Sand K. Thulasiraman, Graphs, Networks and Algorithms, The wiley InterScience publication.

8. Wilson R.J., Introduction to Graph Theory, Addison Wesley; 4th edition, 1996.

9. Peter J. Cameron, Combinatorics: Topics, Techniques, Algorithms, Cambridge University Press, 1995.

BSHCS604B Digital Signal Processing

Communication systems: Amplitude and frequency modulation, single side-band modulation, PAM, PCM, PSK, FSK.

Fundamentals of information theory: measure of information, mutual information, entropy, capacity, lossless source coding schemes like Huffman code, run-length code etc., delta modulation.

Signal Processing: Fourier series, Fourier transform, discrete time Fourier series and fourier transform, discrete Fourier transform, FFT, z-transform, Properties of the above transforms, LTI systems, stability of LTI systems, IIR and FIR filters.

Suggested Readings:

1. Understanding Digital Signal Processing by Richard G. Lyons, Prentice Hall PTR; 2nd edition , 2004.

2. The Scientist and Engineer's and Guide to Digital Signal Processing by Steven W. Smith, California Technical Pub.; 1st ed edition , 1997.

3. Digital Signal Processing and the Microcontroller by Dale Grover and John R. (Jack) Deller with illustrations by Jonathan Roth, Prentice Hall, 1998.

4. A.V. Oppenheim, R.W. Schafer, J.R. Buck: Discrete-Time Signal Processing , 2nd Edition, Prentice Hall, 1999.

5. Digital Signal Processing: Principles, Algorithms, and Applications by J. G. Proakis and D. G. Manolakis, Prentice-Hall, 1999.

6. Digital Signal Processing in Communication Systems by Marvin E. Frerking, Van Nostrand Reinhold, 1994.

7. R. E. Crochiere and L. R. Rabiner, Multirate Digital Signal Processing, Prentice-Hall.

8. L.R. Rabiner, B. Gold, Theory and application of digital signal processing, Prentice-Hall.

9. Alan V. Oppenheim and Ronald W. Schafer, John R. Buck, Digital Signal Processing, Prentice Hall.

10. William D. Stanley, Gary R. Dougherty, Ray Dougherty, Digital Signal Processing, Reston Pub Co.

BSHCS604C Operation Research

Network Analysis: Terminology of network, shortest route problem, minimal spanning tree problem, max-flow problem.

Project Scheduling by PERT, CPM: Diagram, representation, critical path calculation, construction of time chart and resource labeling, probability and cost consideration in project scheduling, project control.

Linear Programming: Simplex Method, Revised simplex method, Duality in Linear programming, Application of Linear Programming to Economic and Industrial Problems.

Nonlinear Programming: The Kuhn-Tucker conditions, Quadratic programming, Convex programming.

Replacement Models: Introduction, Replacement policies for items whose efficiency deteriorates with time, Replacement policies for items that fail completely.

Sequencing Model: Classification of self problems, processing of n jobs through two machines, three machines, processing of two jobs through m machines.

Suggested Readings:

1. Taha, Operations Research, Macmillan.

2. B.E. Gillet, Introduction to Operations Research, McGraw-Hill.

3. S.S.Rao, Optimization Theory and Applications, Wiley Eastern.

4. G.Hadley, Linear programming, Addison-Wesley.

BSHCS605 Lab. Exercises based on course BSHCS601

This practical paper would carry the exercises based on course BSHCS601: DBMS.

BSHCS606 Lab. Exercises based on course BSHCS602

This practical paper would carry the exercises based on course BSHCS602: Data and File Structures.

BSHCS607 Project

Students will be required to pursue a project work allotted to them in accordance with their preference subject to their supervisor's approval. They will have to submit a report of the project work done by them during the semester.