

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Scheme of teaching and examination

B.E. VII Semester Computer Science & Engineering

S.No	Board of Study	Subject Code	Subject Name	Periods per week			Scheme of Exam			Total Marks	Credit L+(T+P)/2
				L	T	P	Theory/Practical				
							ESE	CT	TA		
1	Information Technology	322731(33)	Mobile Computing & Application	3	1		80	20	20	120	4
2	Comp. Science & Engg.	322732(22)	Parallel Processor and Computing	3	1		80	20	20	120	4
3	Comp. Science & Engg.	322733(22)	Network Programming	3	1		80	20	20	120	4
4	Comp. Science & Engg.	322734(22)	Cryptography & Network Security	3	1		80	20	20	120	4
5	Refer Table-2		Professional Elective-2	4			80	20	20	120	4
6	Comp. Science & Engg.	322761(22)	Soft Computing Lab (Matlab/Sci lab)			4	40		20	60	2
7	Comp. Science & Engg.	322762(22)	Network Programming Lab			4	40		20	60	2
8	Information Technology	322763(33)	Android Lab			4	40		20	60	2
9	Comp. Science & Engg.	322764(22)	Minor Project			5	100		40	140	3
10	Management	322765(76)	Innovative & Entrepreneurial Skills			2			40	40	1
11	Comp. Science & Engg.	322766(22)	** Practical Training ** Evaluation / Library			1			40	40	1
			TOTAL	16	4	20	620	100	280	1000	31

L:Lecture T:Tutorial P:Practical ESE: End Semester Examination CT: Class Test

TA: Teacher's Assessment

Note 1: Duration of All theory papers will be of Three Hours

Note 2: ** To be completed after VI semester and before the commencement of VII Semester

Table-2 : Professional Elective-2

S. No.	Board of Study	Subject Code	Subject
1	Computer Science & Engg.	322740(22)	Digital Image Processing
2	Computer Science & Engg.	322741(22)	Advanced Computer Architecture
3	Computer Science & Engg.	322742(22)	Operation Research
4	Computer Science & Engg.	322743(22)	E-Commerce & Strategic IT
5	Computer Science & Engg..	322744(22)	Natural Languages Processing
6	Computer Science & Engg.	322745(22)	OODBMS
7	Computer Science & Engg.	322746(22)	Cloud Computing
8	Computer Science & Engg.	322747(22)	Grid Computing

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY
BHILAI (C.G.)**

Semester: VII
Subject: Mobile Computing and Application
Total Theory Periods: 40
Total Marks in End Semester Exam: 80

Branch: Computer Science & Engg.
Code: 322731(33)
Total Tutorial Periods: 12
Minimum number of CT to be conducted: 02

Course Objective

- To introduce the fundamental design principles & issues in cellular & mobile communications.
- To enable the student to understand the basic features of cellular-mobile communication systems and digital radio system.
- To motivate students to understand the different technology for working of mobile devices, their advantages and disadvantages and emerging problems.

Unit- I Introduction, Cell Coverage &, Frequency Management: Mobile and wireless devices, Frequencies for radio transmission, A basic cellular system, Cell Size. Elements of cellular radio systems, Design and Interference, Concept of frequency reuse, cell splitting, Channels, Multiplexing, Access Techniques, Medium Access control, Spread spectrum, Specialized MAC, Cell Throughput,, Co-channel interference reduction factor, Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment, Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.

Unit- II GSM Architecture & Services: GSM Services and Features, GSM System Architecture, GSM Radio Subsystem, GSM Channel Types, Example of a GSM Call, Signal Processing in GSM, Channel Coding for Data Channels, Channel Coding for Control Channels, Frequency and Channel Specifications. **New Data Services:** DECT Functional Concept, DECT Radio Link, Personal Access Communication Systems, PACS System Architecture, PACS Radio Interface, UMTS

UNIT-III: Wireless Networks: Wireless LAN, Hidden Nodes in Wireless Networks, Ordered MAC Techniques and Wireless Networks, Deterministic MACs for Wireless Networks, Comparison Of MAC Techniques for Wireless Networks; Infrared V/S Radio Transmission; IEEE 802.11, Architecture, Layers, Management; HIPERLAN; Bluetooth; Wireless Broadband (WiMAX), RFID, Java Card., WLL.

UNIT-IV: Mobile network and Transport layer: Mobile Network Layer; Mobile IP, DHCP, ADHOC Networks; Mobile Transport Layer; Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP; Fast Transmit/Fast Recovery, Transmission/Time Out Freezing, Selective Retransmission, Transaction Oriented TCP.

UNIT-V: Mobile System Development and Support: Wireless Application Protocol (WAP) – WAP Model, WAP Gateway, WAP Protocols WAP User Agent Profile and Caching, Wireless Bearers for WAP, WAP Developer Toolkits, Mobile Station Application Execution Environment Third-Generation Mobile Services - Paradigm Shifts in Third-Generation Systems W-CDMA and cdma2000, Improvements on Core Network, Quality Service in 3G Wireless Operating System for 3G Handset, Third- Generation Systems and Field Trials, Other Trial Systems, Impact on Manufacture and Operator Technologies.

Course Outcome: After successful completion of the course students will be able to

- Understand the basic physical-layer architecture of a mobile communication system.
- Understand various multiple-access techniques for mobile communications, and their advantages and disadvantages.
- Students will be able to acknowledge about the working and development of mobile and wireless devices in detail, services provided by them and recent application development trends in this field.

Text Books

1. Mobile Communications – Schiller, Jochen; 2nd Indian Reprint, Pearson Education Asia – Addison Wesley Longman PTE. Ltd.
2. Wireless Communication Principles and Practice, Theodore S Rappaport, 2nd Ed, Pearson Education.

Reference Books:

1. Mobile Data Wireless LAN Technologies – Dayem, Rifaat A.; Prentice Hall International.
2. The Essential Guide to Wireless Communication Applications – Dornan, A.; 1st Indian Reprint, Pearson Education Asia.
3. Sandeep Singhal, “The Wireless Application Protocol”, Pearson Education Asia,
4. P. Stavronlakis, “Third Generation Mobile Telecommunication systems”, Springer Publishers.

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY
BHILAI (C.G.)**

Semester: VIII
Subject: Parallel processor and computing
Total Theory Periods: 40
Total Marks in End Semester Exam: 80

Branch: Computer Science & Engg.
Code: 322732(22)
Total Tutorial Periods: 12
Minimum number of CTs to be conducted: 02

Course Objective

- To develop structural intuition of how the hardware and the software work, starting from simple systems to complex shared resource architectures.
- Get a broad understanding of parallel computer architecture and different models for parallel computing
- To understand concepts related to memory consistency models, cache coherence, interconnection networks, and latency tolerating techniques.
- To know about current practical implementations of parallel architectures.
- To learn how to design parallel programs and how to evaluate their execution

UNIT-I: Introduction & Technique of Parallelism: Trends towards parallel computing, parallelism in Uni-processor systems, Architectural classification schemes, Amdahl's law, Moore's law, Principles of Scalable Performance, Parallel Processing in Memory, Parallel Algorithms, Parallel Algorithm Complexity, Models of Parallel Processing, Cache coherence, Cache coherence Protocols.

UNIT-II: Pipeline & Vector Processing: Conditions of Parallelism: Data & Resource dependencies, Program flow mechanisms: Control-flow .vs. Data flow computers Principle of pipelining and vector processing: principles of linear pipelining, classification of pipeline processors. General pipelines and reservation tables. Instruction and arithmetic pipelines, vector processing, architecture of Cray –1, Pipeline hazards, VLIW computers, Array Processing.

UNIT-III : Parallel Models & Mesh-Based Architectures: PRAM and Basic Algorithms, Data Broadcasting, Parallel Prefix Computation, Shared- Memory Algorithms, Parallel Selection Algorithm, Sorting and Selection Networks, Selection Networks, Circuit-Level Examples, Tree-Structured Dictionary Machine, Parallel Prefix Networks, Sorting on a 2D Mesh or Torus, Routing on a 2D Mesh or Torus, Types of Data Routing Operations, Greedy Routing Algorithms, Wormhole Routing, Numeric al 2 D Mesh Algorithms, Other Mesh-Related Architectures, Meshes of Trees, Low-Diameter Architectures, Hyper-cubes and Their Algorithms, Sorting and Routing on Hypercubes, Bitonic Sorting on a Hypercube, Dimension-Order Routing, Broadcasting on a Hypercube, Other Hypercubic architectures, Butterfly and Permutation Networks, Plus-or-Minus-2'Network, The Cube-Connected Cycles Network , Shuffle and Shuffle-Exchange Networks, A Sampler of Other Networks, Star and Pancake Networks, Ring-Based Networks.

UNIT-IV: Multiprocessor architecture and Programming: Emulation and Scheduling, Emulations among Architectures, Distributed Shared Memory, Data Storage, Input, and Output, Multithreading and Latency Hiding, Parallel I/O Technology, Defect-Level Methods, Fault-Level Methods, Error-Level Methods, Parallel Programming Parallel Operating Systems, Parallel File Systems.

UNIT-V: Parallel System Implementations: Shared-Memory MIMD Machines, Variations in Shared Memory, MIN-Based BBN Butterfly, Vector-Parallel Cray Y-MP, CC-NUMA Stanford DASH, Message-Passing MIMD Machines, Data-Parallel SIMD Machines, Processor and Memory Technologies.

Outcomes: On completion of this subject the student is expected to:

- Have an understanding of parallel algorithms, analysis and architectures.
- Be able to reason about ways to parallelize a problem
- Design and analyze the algorithms that execute efficiently on parallel computers

Name of Text Books:-

1. Computer Architecture & Parallel processing - Kai Hwang 7 Briggs.(MGH).
2. Parallel Computers: Arch.& Prog., Rajaraman & Siva Ram Murthy, PHI.

Name of Reference Books :-

1. Parallel Computer 2 –Arch.& Algo., Adam Hilger, R.W. Hockney, C.R. Jesshope,.
2. Advanced Computer Architecture with Parallel Programming", K. Hwang, MGH.
3. Parallel computing- Theory and practice - Michael J Quinn- Mc Graw Hill

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY
BHILAI (C.G.)**

Semester: VIII
Subject: Network Programming
Total Theory Periods: 40
Total Marks in End Semester Exam: 80

Branch: Computer Science & Engg.
Code: 322733(22)
Total Tutorial Periods: 12
Minimum number of CTs to be conducted: 02

Course Objective

- The main goal of this course is to enable the students to develop the necessary skills for developing robust & high performance scalable network applications.
- To learn about raw sockets and socket programming.
- To understand simple network management protocols and basics of TCP & UDP sockets.

Unit- I Networking & TCP/IP: Communication protocols, Network architecture, UUCP, XNS, IPX/SPX for LANs, TCP & IP headers, IPv4 & v6 address structures, Programming Applications: Time & date routines, Internet protocols: Application layer, Transport layer, Network layer, Datalink layer protocols, Chat, Email, Web server working method & programming.

UNIT-II Socket Programming: Creating sockets, Posix data type, Socket addresses, Assigning address to a socket, Java socket programming, Thread programming, Berkeley Sockets: Overview, socket address structures, byte manipulation & address conversion functions, elementary socket system calls – socket, connect, bind, listen, accept, fork, exec, close, TCP ports (ephemeral, reserved), Berkeley Sockets: I/O asynchronous & multiplexing models, select & poll functions, signal & *fcntl* functions, socket implementation (client & server programs), UNIX domain protocols.

UNIT- III APIs & Winsock Programming: Windows socket API, window socket & blocking I/O model, blocking sockets, blocking functions, timeouts for blocking I/O, API overview, Different APIs & their programming technique, DLL & new API's, DLL issues, Java Beans.

UNIT- IV Web Programming & Security: Java network programming, packages, RMI, Overview of Javascript, WAP architecture & WAP services, Web databases, Component technology, CORBA concept, CORBA architecture, CGI programming, Firewall & security technique, Cryptography, Digital Signature.

UNIT- V Client Server Programming: Client side programming: Creating sockets, implementing generic network client, Parsing data using string Tokenizer, Retrieving file from an HTTP server, Retrieving web documents by using the URL class. Server side programming: Steps for creating server, Accepting connection from browsers, creating an HTTP server, Adding multithreading to an HTTP server.

Course Outcome: After successful completion of the course, students will be

- Familiar with protocols, network interfaces, and Design/performance issues in local area networks and wide area networks,
- Familiar with basics of Socket and Socket programming.
- Familiar with contemporary issues in networking technologies,
- Familiar with network tools and network programming.
- Familiar with client server programming

Text Books:-

1. UNIX Network Programming, Steven.W.R, PHI (VOL I& II)
2. Window Socket Programming by Bobb Quinn and Dave Schutes

Reference Books :-

1. Windows Network Programming, Davis.R., Addison Wesley
2. Network Programming With Windows Socket By Baner .P., PH New Jersey

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C. G.)**

Semester: **VIII**
Subject: **Cryptography and Network Security**
Total Theory Periods: **40**
Total Marks in End Semester Exam: **80**
Minimum number of class tests to be conducted: **02**

Branch: **Computer Science & Engg.**
Code: **322734(22)**
Total Tutorial Periods: **12**
Assignments: **1 per Unit**

Course Objective:

- To understand the principles and practices of cryptography and network security
- To understand the practical applications that have been implemented and are in use to provide network security

UNIT I: Overview: Security trends, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security. **Symmetric (Private Key) Ciphers: Classical Encryption Techniques:** Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Rotor Machines, Steganography. **Block Ciphers and the Data Encryption Standard:** Block Cipher Principles, The Data Encryption Standard (DES), The Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design Principles.

UNIT II: Symmetric Ciphers (continued): Basic Concepts in Number Theory and Finite Fields: Groups, Rings, and Fields, Modular Arithmetic, the Euclidian algorithm, Finite Fields of the Form $GF(p)$, Polynomial Arithmetic, Finite Fields of the Form $GF(2^n)$. **Advanced Encryption Standard:** The Origins AES, Evaluation criteria for AES, the AES Cipher. **Stream cipher:** Stream ciphers and RC4. **Confidentiality using symmetric encryption:** Placement of encryption function, traffic confidentiality, key distribution.

UNIT III: Asymmetric (Public Key) Ciphers: Introduction to Number Theory: Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms. **Public-Key Cryptography and RSA:** Principles of Public-Key Cryptosystems. **Key Management-Other Public-Key Cryptosystems:** Key management, Diffie-Hellman Key Exchange, Elliptic Curve Arithmetic, Elliptic Curve Cryptography.

UNIT IV: Asymmetric Ciphers (continued): Message Authentication and Hash functions: Message authentication requirements, authentication functions, Message authentication codes, Hash functions, Security of Hash functions and MAC, SHA, HMAC, CMAC. **Digital Signatures and Authentication protocols:** Digital signature, Authentication protocols, Digital signature standards,

UNIT V: Network Security applications: Authentication applications: Kerberos, X.509 Authentication services, Public key infrastructure. **Electronic mail security:** PGP, S/MIME. Overview of IP Security. **Web Security:** Web security considerations, SSL and TLS, Secure electronic transaction. **System Security:** Intruders, Intrusion detection, password management, viruses and related threats, virus counter measures, Firewall design principles, and trusted systems.

Course Outcome: after successful completion of this course, the students will be able to explain

- Conventional encryption algorithms for confidentiality and their design principles
- Public key encryption algorithms and their design principles
- Use of message authentication codes, hash functions, digital signature and public key certificates
- Network security tools and applications
- System-level security issues like threat of and countermeasures for intruders and viruses, and the use of firewalls and trusted systems.

Text Book:

1. William Stallings, "Cryptography and Network Security, Principles and Practices", Pearson Education, Prentice Hall, 4th Edition.
2. Cryptography and Network Security, Atul Kahate, McGraw Hill Education (India) Private Limited; Third edition.

Reference books:

1. Applied Cryptography: Protocols & Algorithms, Schneier & Bruce, MGH International.
2. Cryptography and Security – by Dr T R Padmanabhan N Harini, Wiley India Pvt Ltd, 2011.

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY

BHILAI (C. G.)

Semester: VII

Branch: Computer Science & Engg.

Subject: Soft Computing Lab

Code: 322761(22)

Total practical Periods: 42

Total Marks in End Semester Exam: 40

Course Objective:

- To introduce students tools and techniques of Soft Computing;
- To develop skills thorough understanding of the theoretical and practical aspects of Soft Computing.
- Introduce students to fuzzy systems, fuzzy logic and its applications
- To familiarize with neural networks and learning methods for neural networks;
- To introduce basics of genetic algorithms and their applications in optimization and planning;

Course outcome: After successful completion of the course students will be able to -

- Understand the need for Soft Computing;
- Understand different uses of Soft Computing in various areas;
- Understand the steps involved in the development of Soft Computing;
- Acquire a working knowledge of some popular tools for Soft Computing;
- Design, implement and verify computing systems by using appropriate Soft Computing techniques and tools

NOTE: All programming should be done using C/C++/Java/MATLAB/SciLab.

1. Write Matlab/Scilab Program for Following

- $AREA = r^2$ (USING ARITHMETIC OPERATOR).
- e^{150} (USING EXPONENTIAL OPERATOR).
- $y = \sin^2 \theta / 3 + \cos^2 \theta / 3$ (USING TRIGONOMETRY OPERATOR).
- $y = \cos \theta / 4 + i \sin \theta / 4$ (USING COMPLEX NUMBER).
- $y = \log_{10}(10^6)$ (USING LOGARITHMS OPERATOR).

2. Compute y- coordinates of a STRAIGHT LINE $y = mx + c$, where slope of line $m = 0.5$, intercept $c = -2$ and x- coordinates : $x = 0$ to 10 for 0.5 increments.

3. Create following vectors t with 10 elements 1 to 10.

- $x = t \sin(t)$ [A MULTIPLE VECTORS }
- $y = (t-1) / (t+1)$ [A DIVIDE VECTORS }
- $z = [\sin(t^2) / (t^2)]$ [A EXPONENTIAL VECTORS }

4. PLOT $y = \sin x$ where $0 \leq x \leq 2\pi$.

5. PLOT $y = e^{-0.4x} \sin x$ where $0 \leq x \leq 4$.

6. Write a script file to draw a unit circle.

7. Write a function factorial to compute the factorial $n!$ for any integer n.

8. Write a function factorial to compute factorial $n!$ using RECURSION for any integer n.

9. Write a function file *crossprod* to compute the cross product of two vectors u and v.

10. Write a Matlab program (*m.file*) to calculate union, intersection, complement and difference of two fuzzy sets.

Find whether the given matrix is (a) reflexive (b) tolerance and (c) transitivity matrix or not.

$R =$

1 1 0 0 0

1 1 0 0 1

0 0 1 0 0

0 0 0 1 0

0 1 0 0 1

by writing an M-file.

11. Find whether the given matrix is symmetry or not

$R =$

1 0.5 0.3 0.6 0

0.5 1 0.7 0.5 0.9

0.3 0.7 1 0.6 0

0.6 0.5 0.6 1 0.5

0 0.9 0 0.5 1

by a Matlab program.

12. Find the fuzzy relation between two vectors R and S

$R =$

0.7	0.5
0.8	0.4

$S =$

0.9	0.6	0.2
0.1	0.7	0.5

Using max-product and max-min method by a Matlab program

13. Use Matlab command line commands to display the Gaussian membership function. Given $x = 0-10$ with increment of 0.1 and Gaussian function is defined between 0.5 and -5 .
14. Use Matlab command line commands to display the triangular membership function. Given $x = 0-10$ with increment of 0.2 triangular membership function is defined between [3 4 5]

15. Consider the water tank with following rules

1. IF (level is okay) THEN (valve is no_change) (1)
2. IF (level is low) THEN (valve is open_fast) (1)
3. IF (level is high) THEN (valve is close_fast) (1)

Using *Mamdani* method and *max-min* method for *fuzzification* and method of *centroid* for *defuzzification* method construct a FIS. Before editing that rules, membership functions must be defined with membership function editor

16. Use Matlab's Fuzzy Logic Toolbox to model the tip given after a dinner for two, where the food can be disgusting, not good, bland, satisfying, good, or delightful, and the service can be poor, average, or good. To get started, you type fuzzy in a Matlab window. Then use the fuzzy inference system and membership function editors to define and tune your rules.

17. Derive expressions for the weights and thresholds of a McCulloch-Pitts neuron that can compute the following input-output mappings:

<i>in1</i>	<i>in2</i>	<i>out</i>
0	0	1
0	1	0
1	0	0
1	1	0

Write Matlab code for the above ANN.

18. Write a program in Matlab to implement Roulette wheel and ranking selection method. Design 128, 64, 32, 16, 8 and 4-level uniform quantizers and quantize the gray-level image, lena.pgm. Compare the results by these six different quantizers. Explain the artifacts (e.g., the visibility of undesirable contours).
19. Divide the image lena.pgm into blocks and each block has the size 4 x 4 pixels. Replace each block by the intensity of the (2, 2) pixel within the block. The new image will be 1/4th the size in both dimensions. Display the down-sampled image Spatial Transforms and Filtering
20. Apply power law transformation to the city.pgm image taking different values for gamma ($\gamma = 3$, $\gamma = 4$, and $\gamma = 5$).
21. Compute and plot (show the image and its histogram) the histogram of lena.pgm and city.pgm. Comment on what information can be discerned about the images from an examination of the histogram.
22. Apply histogram equalization to the input images lcgrain.pgm and darkgrain.pgm; submit your code and the output images.
23. Extract the gradient parts from the input image brain.pgm. Perform edge detection, Segmentation and Object recognition
24. Extract the rice objects from the input image rice.pgm.
25. Develop an imaging application to detect and count text lines and number of words in a scanned document.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C. G.)**

Semester: **VII**
Subject: **Network Programming Lab**
Total practical Periods: 42

Branch: **Computer Science & Engg.**
Code: **322762(22)**
Total Marks in End Semester Exam: **40**

- Minimum 12 experiments to be performed
 - All network programs must be executed in UNIX environment.
1. Write an echo program with client and iterative server using TCP.
 2. Write an echo program with client and concurrent server using TCP.
 3. Write an echo program with client and concurrent server using UDP.
 4. Write a client and server program for chatting.
 5. Write a program to retrieve date and time using TCP.
 6. Write a program to retrieve date and time using UDP.
 7. Write a client and server routines showing Blocking I/O.
 8. Write a client and server routines showing I/O multiplexing.
 9. Write an echo client and server program using Unix domain stream socket.
 10. Write an echo client and server program using Unix domain Datagram socket.
 11. Write a client and server program to implement file transfer.
 12. Write a client and server program to implement the remote command execution
 13. Write a client program that gets a number from the user and sends the number to server for conversion into hexadecimal and gets the result from the server.

Text Books:

1. Steven.W.R: UNIX Network Programming, PHI (VOL I& II)

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY
BHILAI (C. G.)**

Semester: **VII**
Subject: **Android Lab**
Total practical Periods: 42

Branch: **Computer Science & Engg.**
Code: **322763(33)**
Total Marks in End Semester Exam: **40**

Course objective:

- Understanding the working of Android applications
- To learn how to create GUI and handle events in Android applications.
- Understanding development of applications with data storage, APIs and Databases

Suggested List of Experiments (but should not be limited to)

1. Download and setup Android Environment
2. Using the Development environment
 - a. Create a new Project using wizard
 - b. Add source and resource files.
 - c. Import existing projects into workspace
 - d. Create testing Emulator
 - e. Compile and run the project
 - f. Debug the project
 - g. Debug on android device.
3. XML Files
 - a. AndroidManifest.xml
 - a.i. Edit the manifest and change min sdk and target sdk of application.
 - a.ii. Add main activity entries in manifest.
 - a.iii. Add second activity entries in manifest.
 - a.iv. Add Entries for Service, Broadcast receivers.
 - a.v. Add uses permissions for reading files, internet, camera.
 - b. Layouts
 - b.i. Create Linear Layout in xml
 - b.ii. Create Relative Layout in xml
 - b.iii. Create frame layout in xml
 - b.iv. Create a complex mixed layout using all above layouts
 - c. Drawables
 - c.i. Create xml drawable for rectangular, oval and other basic shapes
 - c.ii. Create xml drawable with Layer list for complex shapes.
 - d. Values
 - d.i. Create strings.xml to store all your application strings.
 - d.ii. Create color.xml to store all your color values
 - d.iii. Create styles.xml to store all your custom themes and style objects
 - e. Alternate resources based on qualifiers
 - e.i. Create separate drawables folders and xml files based on screen density (LDPI, MDPI, HDPI, XHDPI, XXHDPI)
 - e.ii. Create separate styles.xml based on different android versions.
 - e.iii. Create separate layout folders based on device screen sizes and orientations.
4. Creating User Interface
 - a. Create application with Basic Views (Textview, Button, ListView)
 - b. Create application with different Layouts (Linear, Relative, Frame)
 - c. Create application to handle and respond on click using Click Listeners
5. Assets and Images
 - a. Create application which will access files from Assets folder (Images, sounds, Custom Fonts)

6. Application Fundamentals
 - a. Activities
 - a.i. Create application with one activity and display a layout created in xml.
 - a.ii. Create application which will log all activity lifecycle events using Android log api.
 - a.iii. Create application which should be Saving and restoring app state (eg textview text, checkbox checked state)
 - b. Intents
 - b.i. Create application which will start another activity using intent.
 - b.ii. Create an activity which will pass data to second activity using intent.
 - b.iii. Create activity which will start second activity and get response back from second activity.
 - c. Services
 - c.i. Create
7. Content Providers
 - a. System provided content providers
 - a.i. Create application which can access/modify Contacts of device.
 - a.ii. Create application which can access & display Images available on device.
 - a.iii. Create application which can access and play Media files (Audio & Video)
 - b. Custom Contact providers
 - b.i. Create application which will provide some data to other applications using ContentProvider system.
8. Broadcast Receivers
 - a. Create application to Listen to following system events using Receivers
 - a.i. Incoming SMS
 - a.ii. In and outgoing Phone Call
 - a.iii. Low Battery
 - a.iv. Storage state changed
 - b. Create application which will broadcast Custom event to custom Receivers.
9. Create application which will display following Notifications
 - a.i. Toast notification
 - a.ii. Status bar notification
 - a.iii. Dialog notification
10. Preference & Data Storage
 - a. Create application which will save and read back data using Shared Preference
 - b. SQLite database
 - b.i. Create app to create database using Open helper
 - b.ii. Create app to read, write and delete database entries
11. Networking & Web API
 - a. HTTP connectivity
 - a.i. Create app to connect and fetch data from a Http server/ website using URLConnection
 - a.ii. Create app to connect and fetch data from a Http server/ website using HTTPClient library
 - a.iii. Create app to connect and post data to Http server/ website using URLConnection
 - a.iv. Create app to connect and post data to Http server/ website using HTTPClient library
 - b. TCP Sockets or Sockets
 - b.i. Create a server app using tcp socket, it will send "Welcome" to client when its connected.
 - b.ii. Create a client app using tcp socket, it will send "Hello" to server once connected.
12. Google API
 - a. Create application using Maps api, it should display marker on current location of user
 - b. Create application which will display ads using Admob api
13. Accessing android hardware
 - a. Create Application to take picture and save it to file storage using camera api
 - b. Create application to display current direction using sensor api
 - c. Create application to show a toast if phone is waved in air.
 - d. Create application to show list of paired and nearby bluetooth devices.
14. Facebook SDK
 - a. Create application which can share link on facebook using Facebook sdk.

- b. Create application which can share photo on facebook using Facebook sdk.
15. Publish to playstore
- a. Enable Obfuscation for your application using Proguard
 - b. Export Signed application package
 - c. Prepare Store listing
 - d. Upload and publish apk

COURSE OUTCOMES: Once the student has successfully completed this course, he/she will be able to answer the following questions or perform following activities:

- Understands basic concepts and technique of developing applications for the Android phone.
- Able to use the SDK and other development tools.
- Acquaintances with how to publish Android applications to the Android Market.

Reference Books:

Head First Android- By Jonathan Simon

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY
BHILAI (C.G.)**

Semester: VII
Subject: Digital Image Processing
Total Theory Periods: 50
Total Marks in End Semester Exam: 80

Branch: Computer Science & Engg.
Code: 322740(22)
Total Tutorial Periods: NIL
Minimum number of CT to be conducted: 02

Course Objective

- Cover the basic theory and algorithms that are widely used in digital image processing
- Expose students to current technologies and issues that are specific to image processing systems
- Develop hands-on experience in using computers to process images
- Develop critical thinking about shortcomings of the state of the art in image processing

UNIT I: Introduction:

Image formation model, Spatial & Gray level resolution, Image enhancement in special domain: Piecewise transformation functions, Histogram equalization, Histogram specification, image averaging, spatial filters- smoothing and sharpening, Laplacian filter, Canny edge detector.

UNIT II: Image Enhancement in Frequency Domain & Image segmentation :

2D discrete Fourier transform & its inverse, filtering in frequency domain, Ideal & Gaussian low pass filters, High pass filtering, FFT, Line detection, Edge detection, Edge linking & boundary detection, Thresholding, Region based segmentation.

UNIT III: Morphological Image Processing:

Logic operations involving binary image, Dialation & Erosion, Opening & Closing, Applications to Boundary extraction, region filling, connected component extraction.

UNIT IV: Image compression:

Coding redundancy- Huffman coding, LZW coding, run length coding, Lossy compression- DCT, JPEG, MPEG, video compression.

UNIT V: Image representation & 3D:

Boundary descriptors, Shape numbers, Texture, Projective geometry, Correlation based and feature based stereo correspondence, shape from motion, optical flow.

Outcomes: After successful completion of the course, student will be able to

- Describe, analyze and reason about how digital images are represented, manipulated, encoded and processed, with emphasis on algorithm design, implementation and performance evaluation.
- Apply principles and techniques of digital image processing in applications related to digital imaging system design and analysis.
- Analyze and implement image processing algorithms.

Name of Text Books:-

1. Ganzalez and Woods, Digital Image Processing, Pearson education.
2. Sonka and Brooks, Image Processing, TSP ltd,

Name of Reference Books:-

1. Jain and Rangachar, Machine Vision, MGH.
2. Schalkoff, Digital Image Processing, John Wiley and sons.

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY
BHILAI (C.G.)**

Semester: VII
Subject: Advanced Computer Architecture
Total Theory Periods: 50
Total Marks in End Semester Exam: 80

Branch: Computer Science & Engg.
Code: 322741(22)
Total Tutorial Periods: NIL
Minimum number of CT to be conducted: 02

Course Objective

- To provide in-depth coverage of current and emerging trends in computer architectures, focusing on performance and the hardware/software interface.
- To analyzing fundamental issues in architecture design and their impact on application performance.

UNIT I: Pipeline:

Linear: pipeline processor, Non linear pipeline processor, Instruction pipeline design, Mechanisms, Dynamic instruction scheduling, Arithmetic pipeline design, Super-scalar processors, VLIW architecture.

UNIT II: Memory Hierarchy and I/O Organization ON:

Cache memories, Cache coherence, High bandwidth memories, High bandwidth I/O, Disk I/O, Bus specifications and standards.

UNIT III: Parallel Computer Models & Program Parallelism:

Classification of Machines, SISD, SIMD & MIMD, Condition of parallelism, data and resource dependencies, Program partitioning & scheduling, grain size latency, control flow versus data control, data flow architecture.

UNIT IV: synchronous Parallel processing :

Vector instruction types, vector access memory schemes, vector and symbolic processors, SIMD architecture, SIMD parallel algorithms, SIMD computers and performance enhancements.

UNIT V: System Interconnection:

Network properties and routing, static interconnection networks, dynamic interconnection networks, Multiprocessor system interconnection, Multistage & combining networks.

Course Outcomes: After successful completion of this course, students will be

- Discuss the organization of computer-based systems and how a range of design choices are influenced by applications
- Differentiate different processor architectures and system-level design processes.
- Understand the components and operation of a memory hierarchy and the range of performance issues influencing its design.
- Understand the organization and operation of current generation parallel computer systems, including multiprocessor and multi core systems.
- Understand the principles of I/O in computer systems, including viable mechanisms for I/O and secondary storage organization.

Text Books:-

1. Flynn Computer Architecture: Pipelined and parallel processor design, JB, Boston.
2. Computer Architecture & Parallel processing - Kai Hwang 7 Briggs. (MGH).

Reference Books:-

1. Parallel Computer 2 –Arch.& Algo, R.W. Hockney, C.R. Jesshope, Adam Hilger.
2. Advanced Computer Architecture with Parallel Programming, K. Hwang, MGH.
3. Parallel Computing, Theory and Practice, Michel J. Quinn, MGH.

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY
BHILAI (C.G.)**

Semester: VII
Subject: Operation Research
Total Theory Periods: 50
Total Marks in End Semester Exam: 80

Branch: Computer Science & Engg.
Code: 322742(22)
Total Tutorial Periods: NIL
Minimum number of CT to be conducted: 02

Course Objective

- To introduce use quantitative methods and techniques for effective decisions–making; model formulation and applications those are used in solving business decision problems.
- To model decision making problems using major modeling formalisms of artificial intelligence and operations research, including propositional logic, constraints, linear programs and Markov processes,
- To evaluate the computational performance of search, satisfaction, optimization and learning algorithms.
- To apply search, satisfaction, optimization and learning algorithms to real world problems.

UNIT –1 Linear Programming: LP formulations, Graphical method for solving LP with 2 variables, Simplex method, Application of simplex method for maximization and minimization of LP problems, Artificial variable technique for finding the initial basic feasible solution, The Big-M method, Degeneracy in simplex method, Duality theory in LP, Dual simplex method.

UNIT-2: Transportation Model: North – West corner rule, Least cost method, Vogel's Approximation method, Modi Method, Assignment problem, Dynamic Programming: Basic concepts, Bellman's optimality principle, Dynamic programming approach in decision making, Optimal subdivision problem.

UNIT- 3: Inventory Model: Introduction to the inventory problem, Deterministic models, The classical EOQ (Economic order quantity) model, Purchasing model with no shortage, Manufacturing model with no shortage, purchasing model with shortage, Manufacturing model with shortage, Inventory models with probabilistic demand.

UNIT –4: Sequencing and Queuing Theory: Sequencing problem, Johnson's algorithm for processing N-jobs through 2 machine problem, N-jobs through 3 machine problem, 2- job through N machine by graphical method, Characteristics of queuing system- steady state M/M/1, M/M/1K and M/M/C queuing models.

UNIT- 5: CPM and PERT: Arrow network, Time estimates – Earliest expected time, Latest allowable occurrence time and slack, Critical path, Probability of meeting scheduled date of completion of project, Calculation on CPM network, Various floats for activities, Critical Path, Updating project, Operation time cost trade off curve & project time cost trade off curve, selection of schedule based on cost analysis.

Course Outcome:

- Identify and develop operational research models from the verbal description of the real system.
- Understand the mathematical tools that are needed to solve optimization problems.
- Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

Name of Text Books:-

1. Operation Research, Panneerselvam, Prentice Hall of India
2. Operation Research: An Introduction - Hamdy a. Taha, Prentice Hall of India

Name of Reference Books:-

1. Gillett B.E, Introduction to Operation Research- A Computer Oriented algorithmic approach, Mc Graw Hill.
2. Kanti Swarup, Gupta.P.K.,Man Mohan, Operations Research, Sultan Chand & Sons.
3. Vohra N.D., Quantitative Techniques in Management, T.M.H.
4. Zoints. S.,Linear & Integer Programming,Prentice Hall.

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY
BHILAI (C.G.)**

Semester: VII
Subject: E-Commerce and Strategic IT
Total Theory Periods: 50
Total Marks in End Semester Exam: 80

Branch: Computer Science & Engg.
Code: 322743(22)
Total Tutorial Periods: NIL
Minimum number of CT to be conducted: 02

Course Objective:

- To understand the business impact and potential of e-commerce
- To learn about the technologies required to make e-Commerce viable
- To learn e-commerce from an enterprise point of view
- To learn about the working of various electronic payment systems

UNIT –Introduction:

What is E-Commerce, Forces behind E-Commerce, E-Commerce Industry Framework, and Brief History of E-commerce. Inter Organizational E-Commerce, Intra Organizational E-Commerce, and Consumer to Business Electronic Commerce, Architectural framework

Unit–II -Network Infrastructure:

LAN, Ethernet (IEEE standard 802.3) LAN , WAN , Internet, TCP/IP Reference Model, Domain Name Server , Internet Industry Structure.

UNIT–III: Electronic payment systems:

Types of electronic payment systems, digital token-based electronic payment systems, smart cards & electronic payment systems, credit card based electronic payment systems, risk and electronic payment systems, designing electronic payment systems.

UNIT–IV: Information Distribution and Messaging:

FTP,E-Mail, www server, HTTP, Web service implementation, Information publishing , Web Browsers, HTML, Common Gateway Interface

UNIT –V: Mobile & wireless computing fundamentals:

Mobile computing framework, wireless delivery technology and switching methods, mobile information access devices, mobile data internetworking standards, cellular data communication protocols, mobile computing applications, personal communication service.

Course outcome: After successful completion of the course, students

- Will be able to apply the skills necessary for large-scale web based e-commerce project development.
- Will be able to work on information distribution and messaging services in e-commerce application.
- Will be able to work on business applications of wireless and mobile technologies for e-commerce.

Text books:

1. Frontiers of E-commerce by Kalakota & Whinston, Addison Wesley.
2. E-business road map for success by Dr. Ravi Kalakota& Marcia Robinson, Addison Wesley.

Reference book:

3. Electronic Commerce by Bharat Bhasker, TMH.

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY
BHILAI (C.G.)**

Semester: VII
Subject: Natural Language Processing
Total Theory Periods: 50
Total Marks in End Semester Exam: 80

Branch: Computer Science & Engg.
Code: 322744(22)
Total Tutorial Periods: NIL
Minimum number of CT to be conducted: 02

Course objective:

- To understand the concepts of morphology, syntax, semantics and pragmatics of the language.
- To recognize the significance of pragmatics for natural language understanding
- To describe the simple system based on logic and demonstrate the difference between the semantic presentation and interpretation of that presentation
- To describe the application based on natural language processing and to show the points of syntactic, semantic and pragmatic processing

Unit –I: Introduction and syntactic processing

The study of Language, Linguistic background, Grammars and Parsing, Features and Augmented Grammars, Grammars for Natural Language, towards efficient parsing, Ambiguity Resolution.

Unit –II: Semantic interpretation

Semantics and Logical Form, Linking Syntax and Semantics, Ambiguity Resolution, Strategies for Semantic Interpretation, Scoping and the Interpretation of Noun Phrases.

Unit –III: Pragmatics

Discourse: Reference Resolution, Syntactic and Semantic coherence, Text Coherence, An Inference based resolution algorithm. Dialogue and Conversational Agents: What makes dialogue different? Dialogue structure and coherence.

Unit –IV: Natural Language generation

Introduction to language generation, architecture for generation, surface realization, systemic grammar, functional unification grammar, discourse planning.

Unit –V: Machine translation

Language Similarities and Differences, transfer metaphor, syntactic transformations, lexical transfer, idea of Interlingua, direct translation, using Statistical Techniques

Course Outcomes: After successful completion of the course, students

- Can set up, implement and evaluate natural language technology experiment step by step
- Will be familiar with a sample of machine learning techniques and can assess which ones are suitable for a given problem
- Can explain the interaction between rule based and probabilistic methods in language technology.

Text Books:

1. Speech and Language Processing, by Jurafsky, D. & Martin, J.H.
2. Natural Language Understanding, Allen, J

Reference Books:

1. Foundations of General Linguistics by Atkinson, M, Kilby, D A & Roca, I
2. An Introduction to Language by Fromkin, V & Rodman, R
3. Natural Language Processing for Prolog Programmers by Covington, M A
4. Natural language processing in Prolog: an introduction to computational linguistics by Gazdar, G& Mellish.

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY
BHILAI (C.G.)**

Semester: VII
Subject: Object oriented DBMS (OODBMS)
Total Theory Periods: 50
Total Marks in End Semester Exam: 80

Branch: Computer Science & Engg.
Code: 322745(22)
Total Tutorial Periods: NIL
Minimum number of CT to be conducted: 02

Course objective:

- This course discusses the requirements for advanced database features in database applications.
- Introduce Parallel and Distributed databases.
- Understand the enhanced data models for advanced applications
- Examines the concepts of various emerging database technologies.

UNIT I: The extended Entity- Relationship Model and Object model:

The ER model revisited, Motivation for complex data types, User defined abstract data types and structured types, Subclasses, Super classes, Inheritance, Specialization and Generalization, Constraints and characteristics of specialization and Generalization, Relationship types of degree higher than two.

UNIT II: Object oriented databases:

Overview of Object-Oriented concepts, Object identity, Object structure, and type constructors, Encapsulation of operations, Methods, and Persistence, Type hierarchies and Inheritance, Type extents and queries, Complex objects; Database schema design for OODBMS; OQL, Persistent programming languages; OODBMS architecture and storage issues; Transactions and Concurrency control, Example of ODBMS.

UNIT III: Object relational and extended relational databases:

Database design for an ORDBMS - Nested relations and collections; Storage and access methods, Query processing and Optimization; An overview of SQL3, Implementation issues for extended type; Systems comparison of RDBMS, OODBMS, ORDBMS

UNIT IV: Parallel and distributed database and Client server architecture:

Architectures for parallel databases, Parallel query evaluation; Parallelizing individual operations, Sorting, Joins; Distributed database concepts, Data fragmentation, Replication, and allocation techniques for distributed database design; Query processing in distributed databases; Concurrency control and Recovery in distributed databases. An overview of Client-Server architecture.

UNIT V: Databases on the web and semi structured data:

Web interfaces to the Web, Overview of XML; Structure of XML data, Document schema, Querying XML data; Storage of XML data, XML applications; The semi structured data model, Implementation issues, Indexes for text data. **Enhanced Data Models for Advanced Applications:** Active database concepts. Temporal database concepts. Spatial databases, Concepts and architecture; Deductive databases and Query processing; Mobile databases, Geographic information systems.

Course outcome: After successful completion of the course, students will be

- Able to understand the needs and concepts of object-oriented database, spatial database, web database, data warehousing and data mining.
- Able to analyze, design and evaluate the construct of various advanced databases such as object-oriented, object-relational, semi-structured, unstructured and distributed databases.
- Be able to implement practical solutions to GIS database problems using OO/OR database, spatial database, data warehousing and data mining approaches.

Text Books:

1. Object Oriented Interfaces and Databases, Rajesh Narang, Prentice Hall of India
2. Database Management Systems, Raghu Ramakrishnan, Johannes Gehrke, McGraw-Hill

Reference books:

1. Fundamentals of Database Systems, Elmasri and Navathe, Pearson Education
2. Database System Concepts, Korth, Silberchatz, Sudarshan, McGraw-Hill.

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY
BHILAI (C.G.)**

Semester: VII
Subject: Cloud computing
Total Theory Periods: 50
Total Marks in End Semester Exam: 80

Branch: Computer Science & Engg.
Code: 322746(22)
Total Tutorial Periods: NIL
Minimum number of CT to be conducted: 02

Course objective:

1. Cloud computing represents a latest in the long history computing mainframe, Personal computing networked computing and expected to revolutionize the business is done.
2. This course covers the theoretical and practical aspects of cloud computing. At the end of the course, student will be able to appreciate the cloud computing paradigm, recognize its various forms and able to implement some cloud computing features.

UNIT I Introduction to Cloud Computing, The Emergence of Cloud Computing, Cloud-Based Service Offerings, Benefits of using a Cloud Model, Key Characteristics of Cloud Computing, Understanding- Public & Private cloud environments, The Evolution of Cloud Computing – Hardware & Internet Software Evolution.

UNIT II Cloud Security Challenges, Software-as-a-Service, Security Management People, Security Governance, Security Portfolio Management, Security Architecture Design, Identity Access Management (IAM), Data Security.

UNIT III Cloud as: Communication-as-a-Service (CAAS), Infrastructure-as-a-Service (IAAS), Monitoring-as-a-Service (MAAS), Platform-as-a-Service (PAAS), Software-as-a-Service (SAAS).

UNIT IV The MSP Model, Evolution from the MSP Model to Cloud Computing and Software-as-a-Service, TheCloud Data Center, Basic Approach to a Data Center-Based SOA, Open Source Software, Service- Oriented Architectures as a Step Toward Cloud Computing.

UNIT V Virtualization concepts & Smartphone: virtualization benefits, Hardware virtualization, Software Virtualization, Memory Virtualization, Storage Virtualization, Data Virtualization, Network Virtualization, Virtualization Security Recommendations, Introduction to Various Virtualization OS VMware , KVM, Virtual Machine Security, Smartphone, Mobile Operating Systems for Smartphone's (iPhone, Windows Mobile), Google(Android) Blackberry, Ubuntu Mobile Internet.

Course Outcome:

1. Students will be able to perform cloud oriented analysis.
2. Students will be able to model cloud candidate derived from existing business documentation.
3. Students will be able to design the composition of a cloud services.
4. Students will be able to design application services for technology abstraction.

Text Books:

1. Toby Velte, Anthony Vote and Robert Elsenpeter, "Cloud Computing: A Practical Approach", McGraw Hill, 2002.

Reference Books:

1. George Reese, "Cloud Application Architectures: Building Applications and Infrastructures in the Cloud", O'Reilly Media, 2003.
2. Tim Matherm, SubraKumaraswamy and ShahedLatif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", O'Reilly Media, 2005.

**CHHATTISGARH SWAMI VIVEKANAD TECHNICAL UNIVERSITY
BHILAI (C.G.)**

Semester: VII
Subject: Grid Computing
Total Theory Periods: 50
Total Marks in End Semester Exam: 80

Branch: Computer Science & Engg.
Code: 322747(22)
Total Tutorial Periods: NIL
Minimum number of CT to be conducted: 02

Course objective:

- To understand the need for and evolution of Grids in the context of processor- and data-intensive applications
- To be familiar with the fundamental components of Grid environments, such as authentication, authorization, resource access, and resource discovery

UNIT I: Concepts and Architecture:

Introduction-Parallel and Distributed Computing-Cluster Computing-Grid Computing Anatomy and Physiology of Grid- Web and Grid Services-Grid Standards - OGSAWSRF- Trends, Challenges and applications.

UNIT II: Grid Monitoring: GRID MONITORING

Grid Monitoring Architecture (GMA) - An Overview of Grid Monitoring Systems- R-GMA –Grid ICE – MDS- Service Level Agreements (SLAs) - Other Monitoring Systems Ganglia, Grid Mon, Hawkeye and Network Weather Service.

UNIT III: Grid Security and Resource Management:

Grid Security-A Brief Security Primer-PKI-X509 Certificates-Grid Security-Grid Scheduling and Resource Management, Gridway and Gridbus Broker-principles of Local Schedulers- Overview of Condor, SGE, PBS, LSF- Grid Scheduling with QoS.

UNIT IV: Data Management and Grid Portals

Data Management-Categories and Origins of Structured Data-Data Management Challenges-Architectural Approaches-Collective Data Management Services-Federation Services-Grid Portals-Generations of Grid Portals.

UNIT V: Grid Middleware

List of globally available Middlewares - Case Studies-Recent version of Globus Toolkit and gLite - Architecture, Components and Features. Features of Next generation grid.

Course Outcome: After successful completion of the course students will be

- be able to justify the applicability, or non-applicability of Grid technologies for a specific application
- be able to evaluate enabling technologies such as high-speed links and storage area networks for building computer grids;
- be able to design a grid computing application in one of the key application areas e.g. Computer Animation, E-Research;

Text Books:

1. Ian Foster, Carl Kesselman, The Grid 2: Blueprint for a New Computing Infrastructure, Elsevier Series, 2004.
2. Parvin Asadzadeh, Rajkumar Buyya, Chun Ling Kei, Deepa Nayar, and Srikumar Venugopal, High Performance Computing: Paradigm and Infrastructure, Wiley Press.

Reference Books:

1. Vladimir Silva, Grid Computing for Developers, Charles River Media, January 2006.
2. Jarek Nabrzyski, Jennifer M. Schopf, Jan Weglarz, Grid Resource Management: State of the Art and Future Trends , (International Series in Operations Research & Management Science), Springer; First edition, 2003
3. Fran Berman , Geoffrey Fox, Anthony J.G. Hey, Grid Computing: Making The Global Infrastructure a Reality,Wiley, 2003
4. Maozhen Li , Mark Baker , The Grid: Core Technologies, Wiley, 2005
5. Joshy Joseph , Craig Fellenstein Grid Computing, IBM Press, 2004 19
6. Borja Sotomayor , Lisa Childers, Globus Toolkit 4 : Programming Java Services , The Elsevier Series in Grid Computing, Morgan Kaufmann, 2005.