

ANNA UNIVERSITY :: CHENNAI – 600 025

DEGREE OF BACHELOR OF ENGINEERING  
(8 SEMESTER PROGRAMME)

BRANCH: COMPUTER SCIENCE AND ENGINEERING

## LIST OF ELECTIVE SUBJECTS

Code No.	Course Title	L	T	P	M
<b>FIFTH SEMESTER</b>					
MA038	<a href="#">Numerical Methods</a>	3	1	0	100
CS038	<a href="#">Neural Computing</a>	3	0	0	100
CS044	<a href="#">Multimedia</a>	3	0	1	100
CS046	<a href="#">Advanced Databases</a>	3	0	0	100
CS049	<a href="#">Visual Programming</a>	2	0	3	100
CS058	<a href="#">Advanced Java Programming</a>	3	0	0	100
<b>SIXTH SEMESTER</b>					
CS034	<a href="#">Advanced Operating System</a>	3	0	0	100
CS035	<a href="#">Design of Algorithms</a>	3	0	0	100
CS039	<a href="#">Real Time Systems</a>	3	0	0	100
CS040	<a href="#">Digital Speech and Image Processing</a>	3	1	0	100
CS041	<a href="#">Pattern Recognition</a>	3	0	0	100
CS047	<a href="#">High Performance Microprocessors</a>	3	0	0	100
CS048	<a href="#">Robotics</a>	3	0	0	100
CS052	<a href="#">Graph Theory</a>	3	0	0	100
CS054	<a href="#">UNIX Internals</a>	3	0	1	100
CS059	<a href="#">Java Virtual Machine</a>	2	0	2	100
CS062	<a href="#">C# and .NET Framework</a>	3	0	1	100
<b>EIGHTH SEMESTER</b>					
CS036	<a href="#">Parallel Computing</a>	3	0	0	100
CS037	<a href="#">Algorithms for VLSI Design Automation</a>	3	0	0	100
CS042	<a href="#">Parallel Algorithms</a>	3	0	0	100
CS043	<a href="#">ATM Networks</a>	3	0	0	100
CS045	<a href="#">Software Testing</a>	3	1	0	100
CS050	<a href="#">Advanced Software Engineering</a>	3	0	0	100
CS053	<a href="#">Custom Computing</a>	2	0	2	100
CS055	<a href="#">Resource Management Technique</a>	3	0	0	100
CS056	<a href="#">Distributed Objects</a>	3	0	0	100
CS057	<a href="#">TCP/IP-Design and Implementation</a>	3	0	0	100
CS060	<a href="#">Component ware Architectures</a>	2	0	2	100
CS061	<a href="#">Mainframe Computing</a>	3	0	0	100
CS063	<a href="#">Quantum Computing</a>	3	0	0	100

<b>COMMON ELECTIVES TO BE OFFERED IN VI OR VIII SEMESTER</b>					
HS053	<a href="#">Communication Skills For Engineers</a>	2	0	2	100
GE034	<a href="#">Creativity, Innovation and New Product Development</a>	2	0	2	100
GE037	<a href="#">Intellectual Property Right (IPR)</a>	3	0	0	100
GE038	<a href="#">Indian Constitution and Society</a>	3	0	0	100
<b>LANGUAGE ELECTIVES</b>					
HS034	Technical Tamil	2	0	2	100
HS035	Technical German I	3	1	0	100
HS036	Technical German II	3	1	0	100
HS037	Technical Japanese I	3	1	0	100
HS038	Technical Japanese II	3	1	0	100
HS039	Technical French I	3	1	0	100
HS040	Technical French II	3	1	0	100
HS041	English I	3	1	0	100
HS042	English II	3	1	0	100



## **CS035 DESIGN OF ALGORITHMS**

### **1. ADVANCED ALGORITHMS 12**

Polynomials – Evaluation – Matrices – Multiplication – FFT and Convolution – Binary matrices – Transitive closure – Number theoretic Algorithm – Chinese remainder theorem – RSA Public-key crypto system.

### **2. DIVIDE AND CONQUER 8**

General methods – Typical problems – Finding the minimum and maximum – Strassen's matrix multiplications – Convex Hull.

### **3. GREEDY METHOD 8**

General method – Knapsack problem – Tree vertex splitting – Job sequencing with deadlines.

### **4. DYNAMIC PROGRAMMING 8**

General method – 0/1 knapsack – Traveling salesman problem – Flow shop scheduling.

### **5. BACKTRACKING AND BRANCH AND BOUND TECHNIQUES 9**

General method – 8 Queens problems – Graph coloring – Branch and bound method – 0/1 knapsack – Traveling Salesman.

#### **TEXT BOOK**

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, "Introduction to Algorithms", Prentice Hall of India Pvt., Ltd., 1998.

#### **REFERENCES**

1. Sara Baase, "Computer Algorithms – Introduction to Design and Analysis", Addison-Wesley Publishing Company, 1989.
2. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Computer Algorithms", Galgotia Publications Pvt., Ltd., 1999.
3. S.Sahni, "Data Structures, Algorithms and Applications in C++", McGraw-Hill, 1998.

## **CS036 PARALLEL COMPUTING**

### **1. INTRODUCTION 6**

Computational demands of parallel applications – Taxonomy – Performance metrics and measures – Speed up laws – Scaling and speed up – Evaluating a real machine.

### **2. PARALLEL COMPUTING PARADIGMS 7**

Pipelining and superscalar processors, Vector processors, Array Processors, SIMD processors, Systolic architecture, Data flow.

### **3. MULTIPROCESSORS 10**

Shared memory and message passing Architectures – Interconnection network – Topologies – Routing – Switch design – Issues in multiprocessors.

**4. CACHE COHERENCE IN SHARED MEMORY SYSTEMS 10**

Snooping protocols – Synchronization – Memory consistency models – Hardware / Software support for implementation.

**5. CACHE COHERENCE IN SCALABLE MULTIPROCESSORS 12**

Directory based cache coherence protocols – Synchronization issues – Implementation issues and Latency tolerance in multiprocessors – Current trends.

**TOTAL: 45**

**TEXT BOOK**

1. Culler D.E., J.P.Singh, A.Gupta – “Parallel Computer Architecture – A Hardware / Software Approach”, Harcourt Asia, Morgan Kaufmann, 1999.

**REFERENCES**

1. K.Hwang, “Advanced Computer Architecture – Scalability”, Tata McGraw-Hill, 1994.
2. M.J.Quinn, “Parallel Computing – Theory & Practice”, McGraw-Hill, 1994.
3. Rajkumar Buyya, “High Performance Cluster Computing”, Vol.1, PTRPH, 1999.

**CS038 NEURAL COMPUTING**

**1. BACK PROPAGATION 9**

Introduction Artificial neural systems – Principles and promises – Perception – Representation – Linear separability – Learning – Training algorithm – The back propagation network – The generalized delta rule – Practical considerations – BPN applications.

**2. STATISTICAL METHODS 9**

Hopfield nets – Cauchy training – Simulated annealing – The Boltzman machine – Associative memory – Bi-directional associative memory – Applications.

**3. COUNTER PROPAGATION NETWORK AND SELF ORGANIZING MAPS 9**

CPN building blocks – CPN data processing – An image classification example, SOM data processing – Applications of SOMs.

**4. ADAPTIVE RESONANCE THEORY AND SPATIO TEMPORAL PATTERN CLASSIFICATION 9**

ART network description – ART1 – ART2 – Applications. The formal avalanche – Architecture of Spatio temporal networks – The sequential competitive avalanche field – Applications of STNS.

**5. NEO-COGNITRON 9**

Cognition – Structure & training – The neocognitron architecture – Neocognitron data processing – performance – Addition of lateral inhibition and feedback to the neocognitron. Optical neural networks – Holographic correlators.

**TOTAL: 45**

**TEXT BOOK**

1. James Freeman A. and David Skapura M., “Neural Networks – Algorithms, Application and Programming techniques”, Addison Wesley Publishing Company, 1991.

**REFERENCES**

1. Yegnanarayana B., “Artificial Neural Networks”, Prentice Hall of India Private Ltd., New Delhi, 1999.
2. Robert J. Schalkoff, “Artificial Neural Networks”, McGraw-Hill International Editions, 1997.

**CS039 REAL TIME SYSTEMS**

Prerequisite: CS238

**1. INTRODUCTION 6**

Architecture of Real time Systems / Embedded Systems – Operating Systems issues – Performance Measures – Estimating Program runtimes.

**2. TASK ASSIGNMENT AND SCHEDULING 10**

Uniprocessor Scheduling – IRIS Tasks – Tasks Assignment Mode charges – Fault tolerant scheduling.

**3. PROGRAMMING LANGUAGES AND TOOLS 6**

Desired characteristics based on ADA – Data typing – Control Structures – Packages – Exception Handling – Overloading – Multitasking – Timing specification – Task Scheduling – Just-in-time Compilation – Runtime support.

**4. REAL TIME DATABASES 12**

Basic Networking principles – Real time databases – Transaction processing – Concurrency control – Disk scheduling algorithms – Serialization and Consistency.

**5. FAULT TOLERANCE, RELIABILITY AND SYNCHRONIZATION 11**

Fault types – Fault detection and containment – Redundancy – Data diversity – Reversal checks – Obtaining parameter values – Reliability models for hardware redundancy – Software error models – Clocks – Fault tolerant synchronization – Synchronization in software.

**TOTAL: 45**

**TEXT BOOK**

1. C.M. Krishna, Kang G.Shin, “Real Time Systems”, McGraw-Hill, 1997.

**REFERENCES**

1. Raymond J.A. Buhr, Donald L. Bailey, “An Introduction To Real Time Systems”, Prentice Hall International, 1999.

2. Raymond J.A. Buhr, “ An Introduction to Real Time System from Design to Networking C and C++”, Prentice Hall, 1999.

## **CS041 PATTERN RECOGNITION**

### **1. INTRODUCTION 7**

Pattern and features – Training and learning in pattern recognition systems – Pattern recognition approaches – Statistical pattern recognition – Syntactic pattern recognition – Neural pattern recognition – Reasoning driven pattern recognition – Discriminant functions – Linear and Fisher’s discriminant functions.

### **2. STATISTICAL PATTERN RECOGNITION 10**

Gaussian model – Supervised learning – Parametric estimation – Maximum likelihood estimation – Bayesian parameter estimation – Perceptron algorithm – LMSE algorithm – Problems with Bayes approach – Pattern classification by distance functions – Maximum distance pattern classifier.

### **3. CLUSTER ANALYSIS 8**

Unsupervised learning – Clustering for unsupervised learning and classification – C-means algorithm – Hierarchical clustering procedures – Graph theoretic approach to pattern clustering – Validity of clustering solutions.

### **4. SYNTACTICS PATTERN RECOGNITION 8**

Elements of formal grammar – String generation as pattern description – Recognition of syntactic description – Parsing – Stochastic grammar and applications – Graph based structural representation.

### **5. FEATURES EXTRACTION AND RECENT ADVANCES 12**

Entropy minimization – Karhunen –Loeve transformation – Neural network structures for pattern recognition – Unsupervised learning – Self organizing networks – Fuzzy pattern classifiers – Genetic algorithms – Application to pattern recognition.

## **TEXT BOOKS**

1. Earl Gose, Richard Johnsonbaugh, Steve Jost, “Pattern Recognition and Image Analysis”, Prentice Hall of India Private Ltd., New Delhi – 110 001, 1999.
2. Duda R.O. and Hart P.E., “Pattern Classification and Scene Analysis”, Wiley, New York, 1973.
3. Morton Nadler and Eric Smith P., “Pattern Recognition Engineering”, John Wiley and Sons, New York, 1993.
4. Tou and Gonzalez R. “Pattern Recognition Principles” Addison Wesley, 1974.

## **REFERENCES**

1. Robert J, Schalkoff, “Pattern Recognition: Statistical, Structural and Neural Approaches”, John Wiley & Sons Inc., New York, 1992.
2. Melanie Mitchell, “An Introduction to Genetic Algorithms”, Prentice Hall of India Private Ltd., New Delhi, 1998.

**CS042 PARALLEL ALGORITHMS**

Prerequisites: CS231, CS238

**1. INTRODUCTION 9**

Models of parallel computation – Parallel Algorithms – Design and Development – Parallel programming languages – Parallelising sequential algorithms.

**2. SORTING AND SEARCHING 9**

Parallel sorting algorithms – Dictionary operations – Combinatorial search – Generating permutations and combinations in parallel.

**3. MATRIX AND NUMERICAL ALGORITHMS 9**

Matrix operations – Transposition – Multiplication – Numerical algorithm – Solving Systems of Linear Equations – Nonlinear equation – Partial Differential equations.

**4. FFT AND GRAPH ALGORITHMS 9**

Computing DFT – FFT in parallel – Finding connected components – Shortest paths – Minimum spanning trees of Graphs.

**5. COMPUTATIONAL GEOMETRY 9**

Inclusion Problem – Intersection – Proximity – Construction – Parallel Algorithms.

**TEXT BOOK**

1. Michael J. Quinn, “Parallel Computing – Theory and Practice”, McGraw-Hill Book Company, 1994.

**REFERENCES**

1. Rajumar Buyya, “High Performance Cluster Computing: Programming and Applications”, Vol – 2 Prentice Hall Pvt., 1999.
2. Selim G.Akl, “The Design and Analysis of Parallel Algorithms”, Prentice Hall International Inc., 1989.
3. Horowitz E., Sahni S., Rajasekaran S., “Computer Algorithms”, Galgotia, 1997.
4. Jeol M. Crichlow, “An Introduction to Distributed and Parallel Computing” PHI, 2<sup>nd</sup> edition, 1988.

**CS043 ATM NETWORKS**

Prerequisite: CS339

**1. INTRODUCTION 9**

ATM – Historical perspective – Protocol Architecture – Logical connections – Cells – Transmission of ATM cells – SDH – SONET – Switches.

**2. ATM PROTOCOL 9**

Connection setup – Routing Switching, Signaling, ATM Service categories – QOS parameters – Adaptation Layer.



<b>3. ROUTING ISSUES</b>	<b>10</b>
Routing for high speed networks – RSVP, Traffic and Congestion control – Achieving QOS – Traffic shaping – Generic cell rate algorithms – Rate based congestion control – Connection admission control.	
<b>4. HIGH SPEED LANS</b>	<b>7</b>
Fast Ethernet – ATM LAN’s – LANE	
<b>5. PROTOCOLS OVER ATM</b>	<b>10</b>
Multiple protocols over ATM, IP over ATM, TCP over ATM – Real time transport protocol – Wireless ATM – Current trends.	
<b>TOTAL: 45</b>	

**TEXT BOOK**

1. Rainer Handel, Manfred N. Huber, Stefan Schroder, “ATM Networks”, Addison Wesley, 1999.

**REFERENCES**

1. William Stallings, “High Speed Networks TCP/IP and ATM Design Principles”, Prentice Hall International, 1998.
2. Uyles Black, “ATM Vol.1 and 2”, PHPTR, 1999.
3. William Stalling, “ISDN with Broad Lane ISDN with frame relay and ATM”, PH, 4<sup>th</sup> edition, 1999.

**CS045 SOFTWARE TESTING**  
Prerequisite: CS338

<b>1. INTRODUCTION</b>	<b>9</b>
Software testing – Role of software testing – A structural approach to testing – Test strategy – methods for developing test strategy Testing methodologies.	
<b>2. LIFE CYCLE TESTING APPROACH</b>	<b>9</b>
Test plan – Requirements testing – Walk through test tool – Risk matrix test tool – Testing for requirements phase and design phase – Design renew test tool – Test data and volume test tools.	
<b>3. INSTALLATION</b>	<b>9</b>
Installation phase testing – Tools for acceptance test – Software acceptance process – Software maintenance – Methodologies for testing – Training and change installation.	
<b>4. TESTING METHODS</b>	<b>9</b>
Tools and techniques – Cost estimate – For testing – Testing phase of life cycle – Point accumulation tracking system – Performance analysis of testing – Inspection plan and test plan documents.	

- 5. TESTING STRATEGY 9**
- Rapid prototyping – Spiral testing – Tool selection processes – Structural system testing – Documentation of test results – Test effectiveness evaluation – Test measurement process – Test metrics.

**TOTAL: 45**

**TEXT BOOK**

1. William Perry, “Effective Methods for Software Testing”, John Wiley & Sons, USA, 1995.
2. Ron Patton, “Software Testing”, Techmedia.

**CS046 ADVANCED DATABASES**

Prerequisite: CS234

- 1. INTRODUCTION 5**  
Review of relational Databases – Database tuning – Advanced Transaction Processing.
- 2. DISTRIBUTED DATABASES 10**  
Introduction – Architecture – Design – Query Processing – Transaction Management – Concurrency control – Recovery – Parallel databases.
- 3. OBJECT ORIENTED DATABASES 10**  
Introduction – Basic OO concepts – Modeling and design for Object Oriented databases – Persistence – Transaction, Concurrency, Recovery and Versioning.
- 4. SPECIAL PURPOSE DATABASES 8**  
Temporal databases – Active databases – Spatial and multimedia databases – Deductive databases – Mobile databases.
- 5. CURRENT TRENDS 12**  
Data warehousing – OLAP – Data mining techniques – Databases and the World Wide Web – Decision support system.

**TOTAL: 45**

**TEXT BOOKS**

1. M. Timer, Ozsu and Patrick Valduriez, “Principles of Distributed Database System”, Prentice Hall International, 1999.
2. Setrag Khos Shafian, “Object Oriented Databases”, John Wiley & Sons Inc., 1993.
3. Abdullah Uz Transelet-al (Edited), “Temporal Databases – Theory, Design & Implementation”, Benjamin / Cummings Publishing Company, 1993.

**REFERENCES**

1. Jennifer wisdom & Stefano Ceri (Edited), “Active Database Systems – Triggers & Rules for Advanced Database Processing”, Morgan Kaufmann Publishers Inc., 1996.
2. Setrag Khoshafian, A.Brad Baker, “Multimedia and Imaging Databases”, Morgan Kaufmann, 1996.

**CS047 HIGH PERFORMANCE MICROPROCESSORS**

Prerequisite : CS334

- |           |   |           |
|-----------|---|-----------|
| <b>1.</b> | <b>CISC PRINCIPLES</b>  | <b>5</b>  |
|           | Classic CISC microprocessors – Advanced processors of the Intel family – Architecture – Paging and Segmentation – Real and virtual mode execution – Protection mechanism – Task management. |           |
| <b>2.</b> | <b>CISC MICROPROCESSOR</b>  | <b>10</b> |
|           | Study of a current CISC microprocessor architecture – Operating modes – Bus cycles – Performance – Related features – Supporting devices – Bus system support.                              |           |
| <b>3.</b> | <b>RISC PRINCIPLES</b>  | <b>10</b> |
|           | RISC processors – Principles – Architectural features of DEC Alpha / Power PC / Sun sparc / MIPS RX100 family.  |           |
| <b>4.</b> | <b>RISC MICROPROCESSOR</b>  | <b>10</b> |
|           | Study of a current RISC microprocessor architecture – Performance related features – Supporting devices – Bus system support.   |           |
| <b>5.</b> | <b>CASE STUDIES</b>   | <b>10</b> |
|           | Case studies and comparison.  |           |

**Total: 45**

**Text Book**

1. D.Tabak, “Advanced Microprocessors”, McGraw-Hill, 1996.

**References**

1. Barrey B.Brey, “The Intel Microprocessor 8086 / 8088, 80186 / 80188, 80286, 8036, 80486, Pentium and Pentium Proprocessor – Architecture, Programming and Interfacing”, PHI, 1997.
2. Microprocessor Manuals (Intel / DEC / SUN SPARC – available at respective Websites).
3. Barrey B. Brey, “Programming the 80286, 80386, 80486 and Pentium-based Personal Computer”, PHI, 1999.

## **CS049 VISUAL PROGRAMMING**

Prerequisite: CS237

- 1. INTRODUCTION TO WINDOWS PROGRAMMING 3**  
Different paradigms of programming – Comparison – Event driven programming – Windows programming fundamentals – Applications.
- 2. VISUAL BASIC PROGRAMMING 7**  
Visual Basic Applications – Creating and using Controls – Menus and Dialogs – Managing projects – Programming fundamentals – Objects and instances – Debugging – Responding to mouse events – Using grid control – Creating graphics for application – Displaying and printing information – Interacting with the environment – File system controls - Processing files – Accessing databases with the data controls.
- 3. VISUAL C++ PROGRAMMING 10**  
Visual C++ components – Developing simple applications – Microsoft Foundation classes – Controls – Message handling - Document-view architecture – Dialog based applications – Mouse and keyboard events.
- 4. VISUAL JAVA – INTRODUCTION 3**  
Java basics – Java classes – Object references – Inheritance – Exception handling - File I/O – Java tools – Developing Java applications.
- 5. JAVA APPLETS AND NETWORKING 7**  
Visual J++ Applet wizard – Handling events – Multithreading – Animation techniques – Animating images – Applets and HTML – Java beans – JavaScript – Combining scripts and Applets – Applets over web and networking.

**L: 30 P: 45 Total: 75**

### **Text Books**

1. Charles Petzold, “Windows Programming”, Microsoft Press, 1995.
2. Marion Cottingham “Visual Basic”, Peachpit Press, 1999.
3. Kate Gregory ‘Using Visual C++’, Prentice Hall of India Pvt., Ltd., 1999.
4. H.M.Deitel and P.J.Deitel, “Java how to program with an Introduction to Visual J++”, Prentice Hall, 1998.

### **References**

1. C.H. Pappas, W.H. Murray, III “Visual C++: The Complete Reference”, Tata McGraw-Hill Publishing Company, 1999.
2. Stephen R.Davis, “Lean Java Now”, Microsoft Press, 1996.
3. Jamie Jaworski, “Java Unleashes”, SAMS Techmedia Publication, 1999.
4. Jason Blooberg. Jeff Kowski, and Paul Treffers, “Web Page Scripting Techniques”, Hayden books, 1996.



**CS051 NETWORK PROTOCOLS, MANAGEMENT & SECURITY**

Prerequisite : CS339

- |           |   |           |
|-----------|---|-----------|
| <b>1.</b> | <b>NETWORK MANAGEMENT FUNDAMENTALS</b>  | <b>6</b>  |
|           | Network monitoring – Network Control – OSI, Internet and IEEE network management standards.     |           |
| <b>2.</b> | <b>NETWORK MANAGEMENT PROTOCOLS</b>   | <b>12</b> |
|           | SNMP – Concepts, MIBs – Implementation issues – SNMPv2, SNMPv3 – RMON – CMIP.                   |           |
| <b>3.</b> | <b>CRYPTOGRAPHY</b>   | <b>9</b>  |
|           | Public Key, Private Key – DES/RSA – Authentication – PGP – PEM – Kerberos – Auditing & Logging. |           |
| <b>4.</b> | <b>SYSTEM SECURITY</b>  | <b>9</b>  |
|           | TCP / IP Security, NFS security, WWW Security – Firewalls.                                      |           |
| <b>5.</b> | <b>OTHER PROTOCOLS</b>  | <b>9</b>  |
|           | High speed network protocols – Secure protocols – Current Trends.                               |           |

**Total: 45**

**Text Books**

1. William Stallings, “SNMP, SNMPV2, SNMPV3 AND RMON1 and 2<sup>nd</sup>”, Addison Wesley, 1999.
2. Simson Garfinkel and Gene Spafford, “Practical Unix & Internet Security”, O’Reilly, 1999.
3. William Stallings, “Cryptography and Network Security” Principles and Practice, Practice Hall, 1999.

**References**

1. Uday O. Pabrai, Vijay K. Gurbani, “Internet & TCP / IP Network Security”, McGraw-Hill, 1996.
2. Uyles Black, “Network Management Standards”, McGraw-Hill, 1995.

**CS052            GRAPH THEORY**

- |           |  |          |
|-----------|--|----------|
| <b>1.</b> | <b>FUNDAMENTAL CONCEPTS</b>  | <b>9</b> |
|           | Path – Circuit – Subgraph – Isomorphism – Operations on graphs – Euler tour – Hamiltonian graphs – Trees – Equivalent conditions.  |          |
| <b>2.</b> | <b>CUTSET, MATRICES AND VECTOR SPACES</b>  | <b>9</b> |
|           | Fundamental cutsets – Fundamental circuits – Adjacency matrix – Incidence matrix<br>Circuit matrix – Cutset matrix – Path matrix – Cutset space – Circuit space –<br>Properties and relationship among them.                             |          |
| <b>3.</b> | <b>CONNECTIVITY AND PLANARITY</b>  | <b>9</b> |
|           | Blocks – n connected graphs – Algorithm to find cutvertices, Blocks, Components<br>and maximum flow – Planarity – Geometric and combinational duals – Planarity<br>testing algorithm – kratowski graphs – Thickness and crossing number. |          |
| <b>4.</b> | <b>COLORING, COVERING AND MATCHING</b>   | <b>9</b> |
|           | Chromatic number – Independent sets – Chromatic partitioning – Chromatic<br>polynomial – 5-color theorem – Maximal matching – Dominating set – Covering.   |          |
| <b>5.</b> | <b>DIRECTED GRAPH</b>  | <b>9</b> |
|           | Euler diagraphs – Spanning arborescence – Tournament – Complete tournament –<br>connectedness – Matrices and their relationships.  |          |

Total: 45

**Text Book**

1. Narsing Deo, “Graph Theory with applications to engineering and computer science” PHI, Delhi, 1995.

**References**

1. Wilson, RJ, “Introduction to Graph Theory”, Fourth Edition, Longman, 1996.
2. West DB, “Introduction to Graph Theory”, PHI, 1996.

## **CS053 CUSTOM COMPUTING**

Prerequisite: CS238

- 1. INTRODUCTION** **4**  
The reconfigurability paradigm – computing requirements – cost constraints – Introduction to FPGAs, FPGA design methodology – Custom computing machines.
- 2. HARDWARE DESCRIPTION LANGUAGES** **5**  
VHDL-programming concepts – structural and behavioral modeling – Simulation and synthesis – Design using FPGAs.
- 3. CCM ARCHITECTURAL ISSUES** **7**  
Reconfigurable data path – spatial computational styles interconnection – use of Partial / dynamic reconfigurations – timing constraints – Reusability and sharing of resources.
- 4. PROGRAMMING FOR CCMS** **7**  
Methodologies - styles – languages – JHDL – Compilers for CCMS – compilation techniques for CCMS.
- 5. COMPARISON OF CCMS** **7**  
Performance issues – applications – Systems on a Chip design with FPGAs – Internet reconfigurability – Current trends.

**L: 30 P: 30 Total: 60**

### **References**

1. Arnole I.M. et al, 'Field Programmable custom computing technology – Architecture, tool & applications, Kluwer, 2000.
2. Z.Navabi, "VHDL Analysis and Modeling of digital systems", McGraw-Hill, 1998.
3. Douglas Perry, "VHDL", McGraw-Hill, 1999.
4. Selected papers from Proceedings of FCCM (FPGA based custom computing machines) – recent years – IEEE Press, and Field Programmable Logic & Application, Springer Verlag.



**CS056            DISTRIBUTED OBJECTS**  
Prerequisites: CS 237, CS 339

<b>1.    INTRODUCTION</b>	<b>4</b>
Objects – Distributed objects – Historical perspective Distributed objects and computing methodologies.	
<b>2.    CORBA</b>	<b>15</b>
Architecture – Interface Definition Language – Static and dynamic method invocation -Interface Repository – Basic Object Adaptor – Services.	
<b>3.    DEVELOPMENT OF A CORBA APPLICATION</b>	<b>6</b>
Client applet – Server – IDL contract – Database interface.	
<b>4.    DCOM</b>	<b>12</b>
Model and Services – Objects and Object hierarchies – Location transparency - Configuration information – Interface Definition Language (MIDL) – Applications.	
<b>5.    CURRENT ISSUES</b>	<b>8</b>
Internet Inter Orb Protocol – CORBA-DCOM interoperability issues – CORBA facilities – CORBA domains – CORBA migration process – Other distributed object paradigms.	
	<b>Total: 45</b>

**Text Book**

1. T.J.Mowbary and W.A. Ruh, ‘Inside CORBA’, Addison Wesley, 1997.

**References**

1. R.Orfali and D.Harkey, “Client / Server Programming with Java and CORBA”, 2<sup>nd</sup> ed., John Wiley and Sons, 1999.
2. M.Henning and S.Vnonski, “Advanced CORBA Programming with C++”, Addison Wesley, 1999.
3. Stama, Garbis, Russel, “Enterprise CORBA”, Addison Wesley, 1999.
4. F.E.Redmond, “DCOM: Microsoft Distributed Component Object Model”, IDG Books Worldwide Inc., 1997.
5. R.Sessions, ‘COM and DCOM’, John Wiley and Sons, 1998.
6. T.I.Thai, “Learning DCOM”, O’Reilly, 1999.

**CS058            ADVANCED JAVA PROGRAMMING**

Prerequisite: CS237

- |           |  |           |
|-----------|--|-----------|
| <b>1.</b> | <b>JAVA BASICS-REVIEW</b>  | <b>10</b> |
|           | Java Streaming – Components and events handling – Threading concepts – Networking features – Byte code interpretation – Media Techniques.  |           |
| <b>2.</b> | <b>JAVA DATA STRUCTURES</b>  | <b>9</b>  |
|           | Lists – Linear Structures – Ordered Structures – Sorting – Trees.  |           |
| <b>3.</b> | <b>ADVANCED NETWORKING AND BEANS</b>   | <b>10</b> |
|           | Client-Sever computing – Sockets – Content and Protocols handlers – Developing distributed applications – RMI – Remote objects – Object serialization – Bean Concepts – Events in Bean Box – Bean customization and persistence. |           |
| <b>4.</b> | <b>JAVA DATABASE PROGRAMMING</b>   | <b>10</b> |
|           | Connecting to Databases – JDBC principles – Databases access – Interacting – Database search – Accessing Multimedia databases – Database support in Web applications.  |           |
| <b>5.</b> | <b>RELATED JAVA TECHNIQUES</b>   | <b>10</b> |
|           | 3D graphics – JAR file format and creation – Internationalization – Swing Programming – Advanced Java Scripting Techniques.  |           |

**Total : 45**

**Text Book**

1. Jame Jaworski, “Java Unleashed”, SAMS Techmedia Publications, 1999.

**References**

1. Campione, Walrath and Huml, “The Java Tutorial”, Addison Wesley, 1999.
2. Duane A.Bailey, “Java Structures”, McGraw-Hill Publications, 1999.
3. Jeff Frentzen and Sobotka, ‘Java Script’, Tata McGraw-Hill, 1999.

**CS059            JAVA VIRTUAL MACHINE**

Prerequisite: CS337

- |           |  |          |
|-----------|--|----------|
| <b>1.</b> | <b>JAVA PROGRAMMING LANGUAGE</b>   | <b>6</b> |
|           | Types, value, variables, conversions – Names and packages, classes, fields, method, static initializes, constructors, interfaces, nesting – Arrays – Exception – Execution – Threads.  |          |
| <b>2.</b> | <b>JAVA VIRTUAL MACHINE (JVM) STRUCTURE</b>  | <b>6</b> |
|           | Data types – Runtime data base areas and frames – Objects – Floating point arithmetic – Exceptions – Instruction set summary – Class libraries.  |          |
| <b>3.</b> | <b>CLASS FILE FORMAT</b>   | <b>6</b> |
|           | Class and interfaces names, descriptors – Constant pool – Fields, methods, attributes – Constraints – Verification.  |          |
| <b>4.</b> | <b>RUNTIME ISSUES</b>  | <b>6</b> |
|           | Runtime constant pool – Virtual machine start up – Creation, loading, linking, initialization – Binding - Instruction set – Threads and locks.   |          |
| <b>5.</b> | <b>COMPILING FOR JVM</b>   | <b>6</b> |
|           | Constants, local variables, control constructs – Arithmetic – Runtime constant pool – Arguments, method, class instances – Arrays - Compiling switches – Exceptions – Synchronization. |          |

**L: 30 P: 30 Total: 60**

**Text Book**

1. Tim Lindholm and Frank Yellin, “The Java Virtual Machine Specification”, Second Edition, Addison Wesley, 1999.

**References**

1. Ken Arnold and James Gosling, “The Java Programming Language”, Addison Wesley, 1998.
2. Alferd V.Aho, Ravi Sethi, Jeffery D. Ullman, “Compilers – Principles, Techniques and Tools”, Addison Wesley, 1998.
3. Joshua Engel, “Programming for the Java Virtual Machine”, Addison Wesley, 1999.

**CS060            COMPONENT WARE ARCHITECTURES**

Prerequisite: CS237

<b>1.    INTRODUCTION</b>	<b>4</b>
Distributed applications – Two tier, three tier, n-tier architectures,	
<b>2.    COM / DCOM</b>	<b>8</b>
Architecture – Lookup strategies – Interfaces – Location transparency and registration.	
<b>3.    DATABASE ISSUES</b>	<b>8</b>
Transactions – Locks – Logging, undo, commitment, rollback - Active data objects (ADO) – Transaction Server (MTS).	
<b>4.    APPLICATION DEVELOPMENT</b>	<b>6</b>
Visual Studio – Active Template Library (ATL) – Component creating – Instancing, generating, registering, installing – building objects, interface – Data Access components – N tier application – Development.	
<b>5.    MISCELLANEOUS TOPICS</b>	<b>4</b>
Security – Clustering – Message Queuing (MSMQ).	

**L : 30 P : 30 Total : 60**

**Text Books**

1. R.Sessions “COM and DCOM”, John Wiley and Sons, 1998.
2. S. Power, “Development ASP components”, O’Reilly, 1999.

**References**

1. T.I. Thai, “Learning DCOM”, O’Reilly, 1999.
2. F.E. Redmond, “DCOM: Microsoft Distributed Component Object Model”, IDG Books Worldwide Inc., 1997.
3. D. Box, “Essential COM”, Addison Wesley, 1999.

**GE034 CREATIVITY, INNOVATION AND NEW PRODUCT DEVELOPMENT**

- 1. INTRODUCTION 8**  
The process of technological innovation – factors contributing to successful technological innovation – the need for creativity and innovation – creativity and problem solving – brain storming different techniques.
- 2. PROJECT SELECTION AND EVALUATION 8**  
Collection of ideas and purpose of project – Selection criteria – screening ideas for new products (evaluation techniques).
- 3. NEW PRODUCT DEVELOPMENT 7**  
Research and new product development – Patents – patent search – Patent laws – International code for patents – Intellectual property rights (IPR).
- 4. NEW PRODUCT PLANNING 7**  
Design of proto type – testing – quality standards – marketing research – introducing new products.

**L : 30 P : 30**

**1. LABORATORY**

Creative design – Model Preparation – Testing – cost evaluation – Patent application

**References**

1. HARRY NYSTROM, “Creativity and Innovation”, John Wiley & Sons, 1979.
2. BRAIN TWISS, “Managing Technological Innovation”, Pitman Publishing Ltd., 1992.
3. HARRY B.WATTON, “New Product Planning”, Prentice-Hall Inc., 1992.
4. P.N.KHANDWALLA, “Fourth Eye (Excellence through Creativity), Wheeler Publishing, Allahabad, 1992.
5. I.P.R. Bulletins, TIFAC, New Delhi, 1997.

- |           |   |          |
|-----------|---|----------|
| <b>1.</b> | <b>SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS</b>  | <b>9</b> |
|           | Iterative method, Newton – Raphson method for single variable and for simultaneous equations with two variables. Solutions of linear system by Gaussian, Gauss-Jordan, Jacobi and Gauss – Seidel methods. Inverse of a matrix by Gauss – Jordan method. Eigen value of a matrix by power and Jacobi methods |          |
| <b>2.</b> | <b>INTERPOLATION</b>  | <b>9</b> |
|           | Newton’s divided difference formula, Lagrange’s and Hermite’s polynomials. Newton forward and backward difference formulae. Stirling’s and Bessel’s Central difference formulae.  |          |
| <b>3.</b> | <b>NUMERICAL DIFFERENTIATION AND INTEGRATION</b>  | <b>9</b> |
|           | Numerical differentiation with interpolation polynomials, Numerical integration by Trapezoidal and Simpson’s (both $1/3^{\text{rd}}$ and $3/8^{\text{th}}$ ) rules. Two and three point Gaussian quadrature formula. Double integrals using Trapezoidal and Simpson’s rules.                                |          |
| <b>4.</b> | <b>INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS</b>   | <b>9</b> |
|           | Single step Methods – Taylor Series, Euler and Modified Euler, Runge – Kutta method of order four for first second order differential equations. Multistep methods- Milne and Adam’s Bashforth predictor and corrector methods.   |          |
| <b>5.</b> | <b>BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS</b>  | <b>9</b> |
|           | Finite difference solution for the second order ordinary differential equations. Finite difference solution for one dimensional heat equation (both implicit and explicit), one dimensional wave equation and two dimensional laplace and poisson equations.  |          |

**L = 45   T = 15   Total = 60**

#### TEXT BOOKS

1. Sastry, S.S., Introduction of Numerical Analysis (Third Edition), Prentice Hall of India, New Delhi, 1998.
2. Gerald C.F., Wheatley P.O., Applied Numerical Analysis (Fifth Edition), Addison – Wesley, Singapore, 1998.

#### REFERENCES

1. Kandasamy, P., Thilakavthy, K. and Gunavathy, K. Numerical Methods, S.Chand and Co., New Delhi, 1999.
2. Grewal B.S., Grewal J.S., Numerical Methods in Engineering and science, Khanna Publishers, New Delhi, 1999.
3. Jain M.K., Iyengar S.R.K and Jain R.K., Numerical Methods for Engineering and Scientific Computation (Third Edition), New Age International (P) Ltd., New Delhi, 1995.
4. Narayanan S., Manickavachakam Pillai K. and Ramanaiah G., Advanced Mathematics for Engineering Students Vol.-III, S.Viswanathan Pvt. Ltd., Chennai, 1993.

## **GE037 INTELLECTUAL PROPERTY RIGHTS (IPR)**

### **UNIT I**

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property (i. Movable Property ii. Immovable Property and iii. Intellectual Property). 5

### **UNIT II**

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures. 10

### **UNIT III**

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT). 10

### **UNIT IV**

Indian Position Vs WTO and Strategies – Indian IPR legislations – commitments to WTO- Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition. 10

### **UNIT V**

Case Studies on – Patents (Basmati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition. 10

### **TEXT BOOK**

1. Subbaram N.R. “ Handbook of Indian Patent Law and Practice “, S. Viswanathan (Printers and Publishers) Pvt. Ltd., 1998.

### **REFERENCES**

1. Eli Whitney, United States Patent Number : 72X, Cotton Gin, March 14, 1794.
2. Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].
3. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000. [www.ipmatters.net/features/000707\_gibbs.html.

## **GE038 INDIAN CONSTITUTION AND SOCIETY**

### **UNIT I**

Historical Background – Constituent Assembly of India – Philosophical foundations of the Indian Constitution – Preamble – Fundamental Rights – Directive Principles of State Policy – Fundamental Duties – Citizenship – Constitutional Remedies for citizens. 9

### **UNIT II**

Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review. 9

### **UNIT III**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts. 9

### **UNIT IV**

Indian Federal System – Center – State Relations – President’s Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India. 9

### **UNIT V**

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India; Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women, Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections. 9

### **TEXT BOOKS**

1. Durga Das Basu, “ Introduction to the Constitution of India “, Prentice Hall of India, New Delhi.
2. R.C.Agarwal, “ (1997) Indian Political System “, S.Chand and Company, New Delhi.
3. Maciver and Page, “ Society: An Introduction Analysis “, Mac Milan India Ltd., New Delhi.
4. K.L.Sharma, “ (1997) Social Stratification in India: Issues and Themes “, Jawaharlal Nehru University, New Delhi.

### **REFERENCES**

1. Sharma, Brij Kishore, “ Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
2. U.R.Gahai, “ (1998) Indian Political System “, New Academic Publishing House, Jalaendhar.
3. R.N. Sharma, “ Indian Social Problems “, Media Promoters and Publishers Pvt. Ltd.
4. Yogendra Singh, “ (1997) Social Stratification and Change in India “, Manohar, New Delhi.





**CS 040          DIGITAL SPEECH AND IMAGE PROCESSING**

**Prerequisite: CS 331**

**UNIT I**

**9**

Speech processing model – Speech analysis – Estimation frequency – Spectrum of speech using DFT – Linear predictive Analysis.

**UNIT II**

**9**

Speech synthesizer – Linear predictive synthesizer – Different methods of speech recognition and speech encoding.

**UNIT III**

**9**

Image Transforms – image enhancement – Restoration.

**UNIT IV**

**9**

Compression Models – Lossy compression – Image Segmentation – Boundary detection – Detection of Discontinuities – Thresholding Boundary representation – Description – Introduction to Classifiers – Introduction to Colour image processing.

**UNIT V**

**9**

Morphology – Automated Image Analysis – Semantic Networks – Production (expert system)

**L=45    T=15          Total: 60**

**TEXT BOOK**

1. Gonzalez r. and woods B.E., “Digital Image Processing”, Addison Wesley, 1993.

**REFERENCES:**

1. Maner Sid-Ahmed A., “Image Processing”, McGraw Hill International Edition, 1995.
2. Rabiner, “Speech Recognition”, Prentice Hall, 1993.
3. Rabiner and Schaeffer, “ Digital Processing of Speech Signals”, Prentice hall, 1995.
4. Anil Jain K. “Fundamentals of Digital Image Processing”, PHI, 1999.
5. Gonzales, Rafael and Windzp, “Digital Image Processing”, Addison-Wesley.



## **CS 048      ROBOTICS**

### **UNIT I**

**9**

The scope of industrial Robotics – Definition of an Industrial Robot – Need for Industrial Robots – Applications – Fundamentals of Robot Technology – Automation and Robotics – Robot Anatomy – Work Volume – Precision of movement End effectors – Sensors.

### **UNIT II**

**9**

Robot Programming – Methods – Interlocks textual languages – Characteristics of Robot level languages, characteristics of task level languages.

### **UNIT III**

**9**

Puma Robot Arm Control – Computed Torque Technique – Near minimum time control – Variable structure control – Non-linear decoupled feedback control – Reserved motion control – Adaptive control.

### **UNIT IV**

**9**

Robot Cell Design and control – Remote center Compliance – Safety in Robotics.

### **UNIT V**

**9**

Advanced Robotics, Advanced Robotics in Space – Specific features of Space Robotics systems - Long term technical developments – Advanced Robotics in underwater operations – Robotics Technology of the future – Future applications.

**Total: 45**

### **TEXT BOOK:**

1. Barry Leatham Jones, “Elements of Industrial Robotics” Pitman Publishing, 1987.

### **REFERENCE:**

1. Mikell P. Groover, Mitchell Weiss, Roger N.Nagel, Nicholas G. Odrey, “Industrial Robotics Technology, Programming And Applications”, McGraw Hill Book Company, 1986.
2. Fu K.S., Gonzalez R.C and Lee C.S.G., “Robotics – Control, Sensing, Vision and Applications”, McGraw Hill International Editions, 1987.
3. Bernard Hodges and Paul Hallam, “Industrial Robotics”, British Library Cataloging in Publication, 1990.



## **CS 055      RESOURCE MANAGEMENT TECHNIQUES**

### **UNIT I**

**9**

Principle Components of Decision problem – Operations Research (or) Modeling – Phases of (or) study – LP formation and graphical solution – Resource Allocation Problem – The simplex method sensitivity Analysis – Revised Simplex method.

### **UNIT II**

**9**

Definition of Dual problem – Primal – Dual relationships – Dual simplex method – post optimality analysis – Transportation and Assignment models – Transshipment model – Network minimization – Shortest Route problems – Maximal Flow Problems.

### **UNIT III**

**9**

Cutting plane algorithm, Branch and Bound method, Multistage (dynamic) programming – Solution of LP by dynamic programming.

### **UNIT IV**

**9**

Introduction – Discrete and continuous systems – Discrete Event Simulation – Monte Carlo Simulation – Random Number Generation – Investment Decision Through Simulation – Mathematical Modeling - Advantages of Simulation and modeling.

### **UNIT V**

**9**

Network diagram representation – Critical path method – Time Charts and Resource leveling – PERT CPM – Development of computerized packages for project management.

**Total: 45**

### **TEXT BOOK**

1. Taha H.A., “Operations Research – An Introduction” Macmillan Publishing Company, New York Third Edition, 1982.

### **REFERENCES:**

1. Kapoor V.K., “Quantitative Techniques, System Analysis and Data Processing”, Sultan Chand & Sons Publications, New Delhi, 1998.
2. Billey E. Gillet, “Introduction to Operations – A Computer Oriented Algorithmic Approach”, Tata McGraw Hill, New Delhi, 1979.

**CS 057      TCP / IP – DESIGN AND IMPLEMENTATION**  
**Prerequisite: CS339**

<b>UNIT I</b>	<b>9</b>
Internetworking Issues – routing – Internet Addressing – Address Resolution Protocol (ARP) – Reverse Address Resolution protocol (RARP) - Packet format – Routing.	
<b>UNIT II</b>	<b>9</b>
Fragmentation and Reassembly – Error Processing – Ipv6 – UDP – Basic Concepts – TCP Data Structures.	
<b>UNIT III</b>	<b>9</b>
Finite State machine implementation – output Processing – Timer Management – Flow Control – Urgent Data Processing.	
<b>UNIT IV</b>	<b>9</b>
Core Gateway system – Autonomous systems and Considerations – Interior gateway Protocols, Transparent Gateways, DNS.	
<b>UNIT V</b>	<b>9</b>
Sockets – RPC mechanisms – Telnet – Mail Systems.	

**Total: 45**

**TEXT BOOK**

1. Comer D.E., “Internetworking with TCP / IP – Vol.1”, 3<sup>rd</sup> Edition, Prentice Hall of India, 1997.
2. Comer D.E & Stevens D.L., “Internetworking with TCP / IP – Vol.2”, 2<sup>nd</sup> Edition, Prentice Hall of India, 1997.
3. Comer D.E., “Computer Networks and Internet”, Prentice Hall of India, 1999

**REFERENCE:**

1. Comer D.E & Stevens D.L., “Internetworking with TCP / IP – Vol.3”, Prentice Hall of India, 1997.
2. Stevens W.R., “TCP/IP Illustrated – Vol.1, 2 & 3”, Addison Wesley, 1999.

**CS 062      C# AND .NET FRAME WORK**

**UNIT I**

**9**

Introduction to .NET frame work-.NET objects- ASP .NET- .NET web services – Windows Forms

**UNIT II**

**9**

Introduction to C#, Understanding C# in .NET, overview of C#, Literals, Variables, Data types.

**UNIT III**

**9**

Operators, Expressions, Branching and looping operations- Methods, Arrays, Strings.

**UNIT IV**

**9**

Structures and Enumerations – Classes and Objects - Inheritance and Polymorphism, Multiple Inheritance.

**UNIT V**

**9**

Operator overloading, Events, console I/O operations and Exception.

**L=45 P=15 TOTAL : 60**

**TEXT BOOKS**

1. E. Balagurusamy, “ Programming in C#”, Tata McGraw Hill, 2002
2. David S. Platt, “ Introducing Microsoft .NET Microsoft Press”, Saarc Edition, 2001

**REFERENCES**

1. Microsoft, “C# Language specifications”, Microsoft Press, 2001



## HS053 COMMUNICATION SKILLS FOR ENGINEERS

**UNIT 1:** **L P**  
**8 14**

ORAL COMMUNICATION – Practical use of language in simulated real – life situations through role playing – social skills – interaction with employers, peers and subordinates – Group dynamics – Listening techniques – Phonological aspects of language use – pronunciation, stress and intonation.

Introducing oneself and others, narrating events – Making telephonic conversation – Making requests, Asking questions, Making recommendations using modal verbs, Expressing causal relations with suitable discourse markers, Giving instructions using imperatives, Expressing purposes and functions, obligation and preferences, Accepting offers and Counseling, Interpreting advertisements, Describing processes using sequential expressions.

**UNIT 2:** **L P**  
**6 6**

Presenting one's ideas at meetings and conferences, Making extempore talks, Public speaking, Body language, Strategic competence, Use of audio – visual aids and multimedia presentations.

**UNIT 3:** **L P**  
**8 0**

Technical Writing – the structure of organised writing – paragraph writing, coherence, cohesion (use of Discourse Markers) and punctuation, Use of titles, nonverbal devices – Layout – Revision strategies – Reading techniques.

Letter Writing: - Personal/Informal letters: Letters to family members and friends Business / Formal letters: Letters thanking the recipients, announcing functions, extending invitations, congratulating associates on important occasions, letters of application (Resumes), apology and complaint, letters to the editor.

**UNIT 4:** **L P**  
**8 0**

Report Writing: - persuasive, explanatory, argumentative and informative, Writing agenda, minutes, memos, project proposals and checklists.

**UNIT 5** **L P**  
**10 0**

Grammar - study of grammatical items in contexts. Nouns, pronouns, adjectives, comparative adjectives, adverbs, gerund, prepositions, voice, tenses, 'if clauses, direct and indirect speech (reporting verbs), concord Vocabulary – Synonyms, antonyms, homonyms, homophones, hyponyms, affixes, reference words, phrasal verbs and prepositional phrases.

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Total 60 hrs. **L: 40 P: 20**  
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### Text Books:

1. Doff, Adrian and Jones, Christopher, Language in Use: Classroom Book (Intermediate level). Cambridge: CUP. 1994 (2 audio cassettes).
2. Dr.V.Chellammal, Learning to Communicate – a resource book for Engineers and Technologists. Coimbatore: Kamakhya Publications 2002 (1 audio cassette)

## References:

1. Sung, Abraham. 330 more Model Letters for all occasions Malaysia-Minerva Publications. 2002.
2. Bentley, T.J. Report Writing in Business: The Effective Communication of Information. New Delhi: Viva Books Pvt.Ltd., 2001.
3. Vivanilam, J.V. More Effective Communication: A Manual for Professionals. New Delhi: Response Books. 2000
4. Michael, V.P.Communication and Research for Management. Mumbai: Himalaya Publishing House 2001.
5. Nauheim, Ferd. How to Write Business Letters. New Delhi; Crest Publishing House 2000.
6. Mohan, Krishna, Meera Banerji. Developing Communication Skills. New Delhi: Macmillan 1991.
7. Denny, Richard. Communicate to Win. New Delhi: Kogan Page 2002.

**CS063**

**QUANTUM COMPUTING**

**3 0 0 100**

### **1. INTRODUCTION**

Quantum bits – Quantum Computation – Quantum Algorithms – The Postulates of quantum mechanics

### **2. QUANTUM CIRCUITS**

Quantum algorithms – Single Qubit Operations – Controlled Operations – Measurement – Universal quantum gates – Summary of the quantum circuit model of Computation – Simulation of quantum systems.

### **3. Quantum Fourier Transform**

Quantum Fourier Transform – Phase estimation – order finding and factoring – General applications of the quantum fourier transform.

### **4. Quantum Search Algorithms**

Quantum Search Algorithm – Quantum search as quantum simulation – Quantum counting – Speeding up the solution of NP complete problems – Quantum search of an structured database – Optimality of the search algorithm – Black box algorithm limits.

### **5. Physical Realization**

Guiding principles – Conditions for Quantum Computation – Harmonic Oscillator Quantum Computer – Optical Photon Quantum Computer – Optical Cavity Quantum electrodynamics – Ion Traps – Nuclear magnetic resonance – Other implementation schemes.

**Total = 45**

**TEXTBOOK**

1. Michael A Nielsoen and Isaac L Chuang, 'Quantum Computation and Quantum Information', Cambridge University Press, UK, (Indian Reprint), 2002.

## **CS061            MAINFRAME COMPUTING**

<b>1.</b>	<b>MVS CONCEPTS</b>	<b>7</b>
	MVS overview – System Initialization – Storage Management – Job Management – Managing work – Data Management – I/O Processing – Termination and Recovery.	
<b>2.</b>	<b>TSO/ISPF</b>	<b>3</b>
	TSO Commands – General syntax of JCL statements.	
<b>3.</b>	<b>JCL</b>	<b>7</b>
	Explanation of job statements – Explanation of EXEC statements – Explanation of DD statements – Additional parameters on JOB, EXEC, DD statements – Additional parameters on JOB, EXEC, DD statements – Classification – Instream and catalog procedures – Utilities – Abend codes.	
<b>4.</b>	<b>VSAM</b>	<b>7</b>
	VSAM data set organization structure – IDCAMS comments – JCL for VSAM – Buffering – Alternative index – Repro – Backup and Recovery – Export and Import.	
<b>5.</b>	<b>COBOL/370</b>	<b>7</b>
	Structured programming constructs – Fundamentals of COBOL – Data definition – Conditional statements – Perform statements – Compiler option – Table definition – COBOL call and parameter passing – File Handling.	
<b>6.</b>	<b>DB2</b>	<b>7</b>
	RDBMS Concepts – Structural Query Language – Normalization – DB2 Architecture – DB2 objects – Locks – Program preparation – Cursors – Null indicators – Optimier – Utilities.	
<b>7.</b>	<b>CICS</b>	<b>7</b>
	CICS Introduction – Terminal control – Application House keeping – Exec, interface block – Supplied transactions – CESN, CESH, CEMT, CEDF – NMDS – BMS – Abend Codes – File control – Program control – TSQ – TDQ – Pseudo conversation – Recovery and rollback.	

**Total : 45**

### **References**

1. Doug lowe, "MVS", Mike Murach Associates; 1994.
2. Chander Rande, "JCL", McGraw-Hill, 1994.
3. Gary D. Brown & S.A.M. Smith, "MVS/VSAM for the Application Programmer", John Wiley & Sons, 1993.
4. M.K. Roy & D. Ghosh Dastidar, "COBOL Programming", John Wiley & Sons, 1996.
5. Stern & Stern, "Structured COBOL Programming", John Wiley & Sons, 1996.
6. Mullens, "DB2 – Developer's Guide", Same Publishing, 1997.
7. C.J. Data, "DB2"

8. Yukihsa Kageyama, "CICS Handbook".
9. Doug Lowe, "CICS Programmer's Desk Reference", Mike Murach & Associates, 1992.

Below is the list of Punjab University elective subjects for BA examinations. Also, no candidate shall take up Space Science except with A Course of Mathematics or Geography and that no candidate shall take up B Course of Mathematics unless he has taken up A Course of Mathematics. All those candidates who have passed B.A. with General Mathematics need only to qualify B -Course of Mathematics (Paper I & II) as an additional subject for eligibility of admission to M.Sc. Mathematics or for appearing in M.Sc. Mathematics Examination as an external/private candidates. Also that "Mathematics Gen It will guide you about subjects selection for exam, list of subjects, format of exam and syllabus. Bachelor of arts (ba). Bachelor of Arts (BA) Part-I. Subject. Marks. 1. English (Compulsory) - I. The BSc students will select three elective subjects from the list of elective subjects given at the end of this page. BA & BSc. English paper and Islamic studies/Pak-studies are compulsory subjects. The paper of Islamic Studies/Pak-studies will be a combined paper of 100 marks. Islamiyat portion has 60 marks. Pak-studies portion has 40 marks. Each elective subject has two papers (paper-I and paper-II). Paper-I is attempted in part-I and Paper-II is attempted in part-II of the Bachelor program. ELECTIVE SUBJECTS.