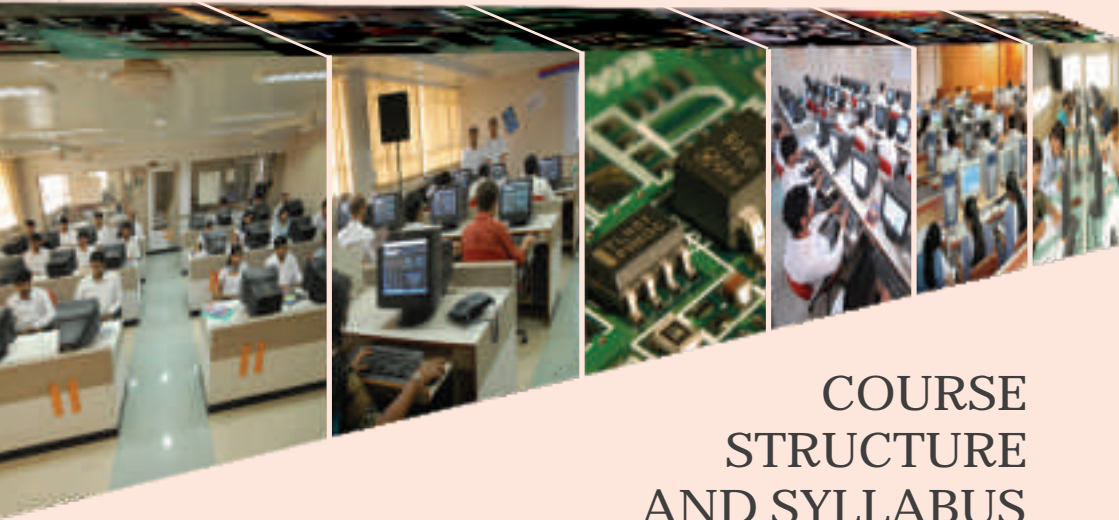




BHARATI VIDYAPEETH UNIVERSITY,  
Pune.

(Established under Section 3 of UGC ACT 1956)



COURSE  
STRUCTURE  
AND SYLLABUS

B. Tech. (COMPUTER) (Sem. V & VI)



# COURSE STRUCTURE & SYLLABUS

BHARATI VIDYAPEETH UNIVERSITY, PUNE

B. Tech. (COMPUTER) (Sem. V & VI)





Bharati Vidyapeeth University College of Engineering (BVUCOE) is the largest Engineering College in Maharashtra with an intake of 700 students in each academic year. Imparting quality technical education from Under Graduate to Doctorate Level, BVUCOE is probably the only Engineering College in India with an accreditation from both NAAC as well as NBA. The faculty at BVUCOE boasts of highly qualified academicians, a quality that is further emphasized by the fact that 15 of them are presently pursuing their Ph.D. degree.

BVUCOE has been ranked 29th amongst the Top 50 Technical Schools of India in survey conducted by DATAQUEST-IDC. We have enjoyed a ranking in this list for the last 4 years. Research is of utmost importance in all our programs. A total of 113 research papers were published in the academic year 2007-2008.

Currently we have 12 ongoing research projects. The infrastructure of BVUCOE is state-of-the-art with 62 classrooms, 59 laboratories and a well-stocked library that currently holds 27,130 titles. The college has an international presence with MoUs signed with the North Carolina A&T State University (Greensboro, USA), University of Venice (Italy), Actel Corporation (USA). Corporate interaction is also inculcated in our programs through our association with Oracle India Ltd., Infosys Ltd. and Tata Consultancy Services.

## SALIENT FEATURES

The field of engineering reflects the technological dynamism present in today's world. The department runs an under-graduate programme viz. B.Tech. (Comp) and a post-graduate programme viz. M.Tech. (Comp). The department has incorporated all the latest facilities for the benefit of the students. The department has 8 well-equipped laboratories, with three servers. The latest software and hardware equipments are provided to the students. The department has specialized laboratories in Digital Signal Processing, Multimedia Techniques, Linux and Software Engineering.

The Association of Computer & Information Technology Engineering Students (ACIES) organizes different events, guest lectures for the students. The syllabi of the department are revised regularly so as to match the needs of the industry. Apart from giving thorough technical knowledge using the state-of-art technology, the students are taught communication skills and are given experience in working in groups on live projects.

### MAJOR GROUPS/AREAS

Operating Systems, Multimedia, Image Processing, Computer Networks, Software Engineering, System Programming

### EXPERTISE IN RESEARCH AND CONSULTANCY

The department of Computer Engineering has received fund from AICTE for Modernization of Research Laboratory "Object Oriented Modeling and Design".

### ON GOING RESEARCH PROJECTS

Extended Log Structural File System For Linux Operating System, Platform Independent File Transfer, Block based Image Processing, Process Based Generic Modeling at Real Time Complex System with specific reference to Visual Modeling, DOUT – Distributed Opportunistic Unit Testing

### COMPLETED PROJECTS

Visual Modeling of Real Time System, NeTailor- A Network Patch Management Solution, Voice Message Transform, Artillery Command Post Execution Software, MAFCOG 1.0 Mathematical Formula Analysis and Generator, Object Oriented Learning Environment Using ASP, Real Time Complex System, Implementation of Sniffers.

### MAJOR EQUIPMENTS

Pentium -I 120/150 MHz - 25, Pentium - III 550 MHz - 10, Pentium -III 933 MHz - 68, Pentium -IV 2.46 GHz - 94, Pentium - IV 1.7 GHz - 10, Pentium - IV (IBM) 2.8 GHz - 100.

## SOFTWARES

Operating Systems	:	MS-DOS, Windows 95, Windows 98, SCO Xenix 2.1, Linux 7.0, Microsoft OS/2, SDK Ver 1.02, Sun Solaris 7.1
RDBMS	:	Oracle 8, Oracle 8i, Oracle 9i, SQL Ver 7.0 & 8.0
Developing Softwares	:	Visual Studio 6.0, Microsoft Office-2000, Turbo C ++ For DOS 4.5, Microsoft C 6.0, Microsoft Fortran, Turbo Pascal, Microsoft COBOL, Turbo C, Visual Studio MS.Net, Developer 2000, MS Project 2003
Web Designing Softwares	:	Adobe Photoshop, PageMaker, Corel Draw
Customized Softwares	:	Payroll, Stores/Purchase, Library/Libsys, Student, Exam Section, Admission

## LABORATORIES

Information Technology, Computer Graphics, Artificial Intelligence, Database Management System, Digital Signal Processing, Linux, Software Engineering, Microprocessor



## STRUCTURE & EXAMINATION PATTERN

### B. Tech. - Computer Engineering

Semester V									Total Duration : 32 Hrs/Week Total Marks : 750
Subject Code	Subject	Teaching Scheme (Hrs.)			Examination Scheme (Marks)				Total (Marks)
		L	T	P	Theory	Unit Test	TW & Pr	TW & Or	
K30301	System Programming	04	-	-	80	20	-	-	100
K30302	Theory of Computation	04	-	-	80	20	-	-	100
K30303	Computer Network And Communication	04	-	02	80	20	-	50	150
K30304	Computer Organization	04	-	02	80	20	50	-	150
K30305	Database Management System	04	-	02	80	20	50	-	150
K30306	Programming Laboratory -III	02	02	02	-	-	50	50	100
Total		22	02	08	400	100	150	100	750

Teaching Scheme			Examination Scheme				Total
Lectures	Practical	Tutorial	Theory	Test	T. W. & Pr	T. W. & Or.	
22	08	02	400	100	150	100	750

Semester VI									Total Duration : 32 Hrs/Week Total Marks : 750
Subject Code	Subject	Teaching Scheme (Hrs.)			Examination Scheme (Marks)				Total (Marks)
		L	T	P	Theory	Unit Test	TW & Pr	TW & Or	
K30307	Advanced Computer Architecture	04	-	-	80	20	-	-	100
K30308	Software Analysis And Design	04	-	-	80	20	-	-	100
K30309	Operating System	04	-	02	80	20	-	50	150
K30310	Microprocessor Based Systems	04	-	02	80	20	-	50	150
K30311	Advanced Computer Graphics	04	-	02	80	20	50	-	150
K30312	Programming Laboratory - IV	02	02	02	-	-	50	50	100
Total		22	02	08	400	100	100	150	750

Teaching Scheme			Examination Scheme				Total
Lectures	Practical	Tutorial	Theory	Test	T. W. & Pr	T. W. & Or.	
22	08	02	400	100	100	150	750



### Mode of the test

- In each semester for each subject three tests shall be conducted. The schedule for the same will be declared at the commencement of academic year in the academic calendar.
- Each test shall carry 20 marks.
- University examination pattern has given weightage of 20 marks for the tests.
- To calculate these marks following procedure is followed:
  - i) Out of the three tests conducted during the semester, the marks of only two tests in which the candidate has shown his/her best performance shall be considered, to decide the provisional marks in each subject.
  - ii) Average marks obtained in two tests in which students have performed well, shall be considered as provisional marks obtained by the student in the tests.
  - iii) If the candidate appears only for two tests conducted during the semester, he/ she will not be given benefit of the best performance in the tests.
  - iv) If the candidate appears only for one test conducted during the semester, to calculate the marks obtained in the tests it will be considered that the candidate has got 0 (zero) marks in other tests.
  - v) The provisional marks obtained by the candidate in class tests should reflect as proportional to theory marks. In cases of disparity of more than 15% it will be scaled down accordingly; These marks will be final marks obtained by the student. No scaling up is permitted.
  - vi) If the candidate is absent for theory examination or fails in theory examination his final marks for tests of that subject will not be declared. After the candidate clears the theory, the provisional marks will be finalized as above.
- Paper Pattern for Tests
  - i) All questions will be compulsory with weightage as following

Question 1	-	7 marks
Question 2	-	7 marks
Question 3	-	6 Marks
  - ii) There will not be any sub-questions.
- For granting the term it is mandatory to appear for all the three tests conducted in each semester.
- Roll numbers allotted to the students shall be the examination numbers for the tests.



## SEMESTER - V



## TEACHING SCHEME

Lectures : 04 Hrs/week

## EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

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### Unit-I

(04 Hours)

Introduction:

Definition, Components of system software. Evolution of system software. Language translators, Fundamentals of Language processing and language specification, Language Grammar.

### Unit-II

(10 Hours)

Assemblers and Macro Processor:

Structure of an assembler. Design of Two pass assembler, (Single Pass assembler-Table of incomplete instruction, backpatching. Cross-assembler. Macro instructions. Features of a macro facility. Design of two pass macro processor. Implementation of nested macros.

### Unit-III

(10 Hours)

Linkers and Loaders: Schemes:

Compile and Go, General loader scheme, absolute loader, Static and Dynamic Binding, Subroutine linkages, Relocating loaders. Direct linking loader. Dynamic linking loader, Overlay structure. Design of: Absolute loader, Direct linking loader. Implementation example - MSDOS linker.

### Unit-IV

(10 Hours)

Compilers and Interpreters:

Compiler phases (Introduction, with input/output for each phase must be dealt with), Concept of cross compiler (introductory part only). Features of machine dependent and independent compilers. Types of compilers with definitions only, Declarations, Binding attributes to names, In built data structures such as Arrays, Records, Sets, Strings, Expression Evaluation, statements of different types, Parameter passing (call by reference, value, name), Storage management, Recursion. Interpreter.

Unit-V

(04 Hours)

Software Tools:

Tools for program testing. Text editors - screen editor, line editor. Word processors. Debug monitors.

Unit-VI

(08 Hours)

Operating System:

Operating System components.

System Calls, O. S services:

File management, memory management, Device management, Process management.

System Calls, Process Scheduling:

Long term, Short term, Middle term scheduler

Interprocess Communication :

Direct communication. Indirect communication, buffering.

Text Books/ References

- D. M. Dhamdhere, "System Programming and Operating Systems", 2nd Ed., Tata Mcgrawhill
- John J. Donovan, "Systems Programming", McGraw Hill.

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks  
Duration : 03 Hours  
Unit Test : 20 Marks

Unit-I

(08 Hours)

Introduction:

Basic concepts – Set, Functions, Relations, symbol, alphabet, string/word, Language - Definition, difference between natural and formal languages, Basic machine - concept , design of basic machines. Finite state machine: Definition, Model, finite control, transition graphs, examples, Finite Automata (FA) - Definition of Deterministic Finite Automaton (DFA) and Non-Deterministic Finite Automaton (NFA), Two way FA, language acceptance by FA. Minimisation Of DFA states, Equivalence of NFA and DFA.

Unit-II

(08 Hours)

Moore and Mealy Machines:

Definition, models, interconversion, Equivalence of Mealy machine and Moore machine, Uses of both the machines.

Regular Expressions:

Definition of Regular Expression, identities, Regular set - Definition, NFA with epsilon moves, Conversion of NFA with epsilon move to NFA without epsilon move, Uses of Regular expression, Equivalence of Regular expression and FA. Regular sets - Properties, Pumping Lemma.

Unit-III

(08 Hours)

Grammars:

Fundamental concepts, Definition, production rules, derivation trees, ambiguous grammar, removal of ambiguity, Reduced form grammar-removal of unit productions, epsilon production, useless symbols, Chomsky hierarchy, Context Free Grammar (CFG) - definition, simplification of CFG, Context Free Language (CFL) - definition, inherently

ambiguous CFLs, Regular grammar - definition, left linear and right linear grammars, inter conversion between left linear and right linear grammar, Regular Grammars, Normal Forms, Chomsky Normal Form (CNF), Greibach Normal Form (GNF), Pumping Lemma.

#### Unit-IV

(08 Hours)

Pushdown Stack Memory Machine:

Formal definition, Pushdown Automata (PDA), Model, Transition Graph, Uses, Deterministic Push- down Automata (DPDA) - definition, Non-deterministic Pushdown Automata (NPDA), Equivalence of context free grammars and PDA, properties of context free languages.

#### Unit-V

(08 Hours)

Turing Machine:

Introduction, Definitions, model, comparison of Turing machine (TM), with FSM, PDM, and PM. Design of TM; combination TM, iterative TM, recursive TM, universal TM, Language Acceptability by TM, Recursive sets, partial recursive functions, recursively enumerable sets, Church's Turing hypothesis, multi stack turing machine, TM limitations, halting problem, incompleteness and undesirability, solvability, Semi solvability and insolvability.

#### Unit-VI

(08 Hours)

Applications:

Application of RE and FA, Lexical analyzer, Text editor, and searching using RE, Application of PDA - Expression conversion. Application of CFG - syntax analysis, language definition.

#### Text Books/References

- E.V. Krishnamurthy, "Theory of Computer Science", EWP Publication
- Hopcroft Ullman, "Introduction to Automata Theory, Languages & Computations, Narosa
- Daniel A. Cohen, "Introduction to Computer Theory", Wiley Publication
- John C. Martin, "Introduction to Language & Theory of Computation", McGraw Hill.

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI





## K30303: COMPUTER NETWORK AND COMMUNICATION

### TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

### EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

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### Unit-I

(08 Hours)

Introduction to Computer Networks:

Uses of Computer Networks, Types of Networks, Network Hardware, network software, network design issues, network design tools. ISO's OSI Reference Model & TCP/IP Reference model, Example Networks: Internet, X.25, Frame Relay, ATM, Ethernet, Wireless LANs, Network standardization, Switching, Buffering and Multicasting, MODEM, cable media.

### Unit-II

(08 Hours)

Data Link Layer:

Design issues, Services, framing, error and flow control, elementary data link protocols: Simplex stop & wait protocol, simplex protocol for noisy channel. Sliding window protocols: Using GO back-N ARQ, using selective repeat ARQ, HDLC. Protocol performance, protocol specification & verification. The Data Link Layer in the Internet & ATM.

Point-to-Point-Access (PPP):

Frame format, Transition states, PPP Stack: LCP, NCP

Network Hardware Components:

Connectors, Transceivers and Media Converters, Repeaters, NICs, Bridges and Switches.

### Unit-III

(08 Hours)

The Medium Access Control Sublayer:

Static and dynamic channel allocation, multiple access protocols: ALOHA, CSMA/CD, Collision-free protocols. Limited-contention Protocols, WDMA, wireless LAN protocols.

Ethernet: Cabling, encoding, MAC sub-layer protocol, Switched, fast and

Gigabit Ethernet, Logical link control, Wireless LANs and Digital Cellular Radio, Broadband Wireless, Virtual LANs, Bluetooth, Virtual Circuit.

Switching: Frame Relay and ATM, IEEE 802.3, 802.4, 802.5 standards, FDDI, fast Ethernet & satellite networks.

#### Unit-IV

(08 Hours)

Network Layer:

Design Issues, Packet switching, Connectionless and Connection-oriented Services, Virtual Circuits and Datagram Subnets, Router, Configuring Router Routing Algorithms, Internetworking, Firewalls.

#### Unit-V

(06 Hours)

Transport Layer:

The transport services, elements of transport protocols: Addressing establishing & releasing a connection, flow control and buffering, multiplexing and crash recovery, simple transport protocol, the Internet transport protocol TCP & UDP. Performance issues. Concept of socket and socket programming (TCP/IP, SPX/PX, WINSOCK).

#### Unit-VI

(08 Hours)

Application Layer:

Domain Name Systems (DNS), and DNS server, Electronic Mail Architecture and services, Message Formats, MIME, message transfer, SMTP, Mail Gateways, Relays, Configuration Mail Servers, DHCP, NetBios, File Transfer Protocol, General Model commands, TFTP.

World Wide Web:

Introduction, Architecture overview, static and dynamic web pages, WWW pages and browsing HTTP, LDAP, Browser Architecture, Caching in Web Browser remote login, Wireless web.

#### List of Practicals

- Implementation of data link layer protocols e.g stop & wait protocol sliding window protocol & pipelining protocols.
- Implementation of network layer functions e.g writing software for routing. Algorithms and flow control algorithm.
- TCP/IP socket programming.

- Windows socket programming.
- Writing TCP/IP application like TELNET, ping, FTP, remote execution.
- Network programming in UNIX.
- Programming in NOVELL NETWARE using IPX/SPX.
- Implementation of network security algorithm e.g data encryption standard and ciphers.
- Implementation of application layer e.g. E-mail.
- Configuration of any two of the following: Router, DNS, Proxy server, web server, mailserver.
- Data compression and decompression (RLE, Huffman's coding).
- Case study of existing networks, Study of network components and resources.
- Total ten assignments to be completed with 1,2,3,10<sup>th</sup> assignment compulsory.

#### Text Books/ References

- Tanenbaum A, "Computer Networks", 4<sup>th</sup> Edition, PHI
- Fourauzan B., "Data Communications and Networking", 3<sup>rd</sup> edition, Tata McGraw Hill
- Keshav S., "An Engineering Approach to Computer Networking", Perason Education, ISBN 981-235-986-9
- Comer D., "Computer Networks and Internet", 2140 Edition, featson Education, ISBN 81 -7808-086-9
- Gallo M., Hancock W., "Computer Communications and networking Technologies", Thomson Brooks/Cole

#### Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

Unit-I

(06 Hours)

Von Neumann architecture, basic computer organization, Basic CPU implementation, Characteristics, Instruction cycles. Interconnection structures. Bus interconnection and types. Addressing schemes. PDP - 11/IBM 360 systems.

Unit-II

(08 Hours)

Classification of various Data Types:

Scalar data types. Fixed point number, floating point numbers. Sign magnitude representation. Fixed point representation, Integer arithmetic (addition, subtraction, multiplication, division), 2's compliment multiplication, Booth's algorithms, hardware implementation. Division algorithm, Restoring and non-restoring. Floating point representation, IEEE standards. Floating point arithmetic (addition, subtraction, multiplication, division).

Unit-III

(10 Hours)

Central Processing Unit:

CPU Architecture and functions. Register organization, 80386 architecture as an example, Type of operands. Addressing modes, and formats. Instruction cycles. Instruction pipelining.

Unit-IV

(10 Hours)

Control Unit:

Operation, micro operation, hardware control, design methods and implementation Micro program control, Micro instruction Sequencing, Micro instruction execution, Control Unit design considerations. ALU & Sequencer.

## Unit-V

(10Hours)

### Memory Organisation :

Internal memory, Characteristics of memory systems, memory hierarchy, Main memory organization, chip packaging, error correction, cache memory, memory organization, mapping, replacement algorithms, Pentium cache organisation. Advanced DRAM Organisation, EDORAM, SDRAM, Cache DRAM, Rambus RAM Link DRAM, Performance Characteristics, Associative memories, Virtual memory implementation.

### Secondary Storage :

Magnetic Disk, Disk organisation and layout, Disk partitioning, RAID Optical memory USB memory, CDROM DMA controller.

## Unit-VI

(10Hours)

### Multiprocessor Configuration :

Closely coupled, Loosely coupled configuration. Problems of Bus contentions, Inter Processor communication. Buses, interconnection, system bus CPU and I/O bus operations, 8087,8089, using bus controller

### OS Support :

Component of OS, example of MS-DOS, its loading, DOS, BIOS, interrupts, TSR, Device driver for printer and keyboard.

### RISC Architecture:

Concept, example of 88510, 80860 RISC processor. Super scalar processor, overview, Power PC.

## List of Practicals

- Design and implementation of 4 bit multiplier.
- Design and implementation of 4 bit divider.
- Design of 4/8 bit CPU.
- Reading a boot record and displaying its contents.
- Use FAT to read a file And determine number of bad sectors. File under DOS. Use of file handlers.
- TSR in assembly for Alarm, Printing in background, screen saver.
- Floating point calculation using co-processor instruction.
- Write an assembly language program to implement COPY, TYPE etc., commands.

- Partitioning of Hard Disk and making a system partition.
- Study of VxDs and windows device drivers.
- Graphics printer device driver.

#### Text Books/ References

- William Stalling, “Computer Organization and Architecture”, PHI, fourth edition
- Hamacher and Zaky, “Computer Organization” MGH, Fourth edition

#### Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



TEACHING SCHEME

Lectures : 04Hrs/week

Practical : 02Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr. : 50 Marks

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Unit-I

(08 Hours)

Introduction to DBMS:

Basic concepts, Advantages of a DBMS over file-processing Systems, Data abstraction, Data Models and Data Independence, Components of a DBMS and overall structure of a DBMS, Life Cycle of a DBMS application. Database terminology, Role of database administrator.

Data Modeling:

Basic Concepts, Types of data models: E-R data model and Object- Oriented data model. Relational, Network and Hierarchical data models and their comparison. Entity, attributes, relationships, constraints, keys, E-R and EER diagrams: Components of E-R Model, conventions, converting E-R diagram into tables, EER Model components, converting EER diagram into tables, normalization.

Unit-II

(06 Hours)

Relational Model:

Basic concepts, Attributes and domains, Intention and extensions of a relation, concept of integrity and referential constraints, Relational Query Languages (Relational algebra and relational calculus). Concepts of View and triggers, Updation using views, indexes, nulls.

Relational Database Design:

Purpose of Normalization, Data Redundancy and Update Anomalies, Functional Dependencies, The Process of Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF.

Unit-III

(08 Hours)

SQL:

Structure of a SQL query, DDL and DML, SQL queries. Set Operations, predicates and Joins, Set Membership, Tuple variables. Set comparison.

Ordering of tuples, aggregate functions, and nested queries. Database modification using SQL, Dynamic and Embedded SQL and concept of stored procedures and Triggers. Characteristics and advantages, SQL Data Types and Literals, DDL, DML, SQL Operators, Tables: Creating, Modifying, Deleting, Views: Creating, Dropping, Updation using Views, Indexes, Nulls, JDBC, ODBC, Cursors.

#### Database Analysis and Design Techniques:

Information Systems Lifecycle, Application Lifecycle, Planning, System Definition, Requirement Analysis, Design, DBMS Selection, Application Design: Transaction and User-Interface Design, Prototyping, Implementation, Data Conversion and Loading, Testing, Data and Database Administration, Fact-Finding Techniques.

#### Unit-IV

(06 Hours)

##### Storage and File Systems:

Secondary Storage, RAID, File Organization, Indices, Static and Dynamic Hashing, B-trees and B & B\* Trees & examples.

##### Database Administration Issues:

Overview, Measures of query cost, Selection and join operations, Evaluation of Expressions, Introduction to Query Optimization, Estimation, Transformation of Relational Expressions, DBA role, indexes, data dictionary, Security, Backups, replication, SQL support for DBA. Commercial RDBMS selection.

#### Unit-V

(10 Hours)

##### Transaction Management:

Basic concept of a Transaction, Properties of Transactions, Database Architecture, Concept of Schedule, Serial Schedule, Serializability: Conflict and View, Cascaded Aborts, Recoverable and Non-recoverable Schedules, Concurrency Control: Need, Locking Methods, Deadlocks, Time stamping Methods, Optimistic Techniques, Multi-Version Concurrency Control, Different Crash Recovery methods such as Shadow-Paging and Log-Based Recovery: Deferred and Immediate, Checkpoints

##### Object-Oriented Databases:

Need of OODBMS, Storing Objects in Relational Database, Introduction to

OO Data Models, Persistent Programming Languages, Pointer Swizzling Techniques, Persistence, Object Management Group, Object Database Standard ODMG, differences between relational & object oriented database, inheritance.

## Unit-VI

(08 Hours)

### Database Architectures:

Centralized and Client-Server Architectures, Introduction to Distributed Database systems.

### New Applications:

Need for data analysis. Decision support systems, Data Warehouse, On-line Analytical Processing (OLAP), Data mining concepts, spatial and geographic databases, multimedia databases, data mart.

### Text Books/ References

- Silberschatz A., Korth H., Sudarshan S., "Database System Concepts", 4th Edition, McGraw Hill Publishers
- Rab P. Coronel C. "Database Systems Design, Implementation and Management", 5th Edition, Thomson Course Technology
- Date C. J., "An Introduction to Database Systems", 7th Edition, Pearson Education
- Elmasri R., Navathe S., "Fundamentals of Database Systems", 4th Edition, Pearson Education
- Ramkrishna R., Gehrke J., "Database Management Systems", 3rd Edition, McGraw-Hill
- Bipin Desai, "Introduction to Database Management Systems"
- Groff James R., Paul Weinberg, "LAN times guide to SQL"

### Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



## K30306: PROGRAMMING LAB III

### TEACHING SCHEME

Lectures : 02Hrs/week

Practical : 02Hrs/week

Tutorial : 02Hrs/week

### EXAMINATION SCHEME

T. W. & Pr. : 50 Marks

T. W. & Or. : 50 Marks

### Unit-I

(06 Hours)

Setting up Visual Basic:

Using the Application Wizard, The Visual Basic Environment & Help System. Customizing a Form, The Properties Window, Making a form Responsive.

### Unit-II

(06 Hours)

Building the User Interface:

ToolBox, Creating controls, The Name Property, Simple Event Procedures for command Buttons. Access Keys, Image Controls, Text Boxes, Labels, Message Box, Grid, Multimedia, Progress Bar, Status Bar, Display in Visual Basic, Data controls ADO, RDO.

### Unit-III

(08 Hours)

Programming in Visual Basic:

Variables, Data Types, Input Boxes, Calculator Program, Displaying Information on a Form, Controlling Program Flow: Loops, Conditional Statements, Built- In Functions, Building Projects.

### Unit-IV

(06 Hours)

Multithreaded Programming:

The Java Thread Model, the Main Thread, Creating a Thread, Creating Multiple Threads, Thread Priorities. Synchronization, Interthread Communication, Using Multithreading.

### Unit-V

(08 Hours)

I/O Applets:

I/O Basics, Reading Console Input, Writing Console Output, the

PrintWriter Class, Reading and Writing Files, Applet Fundamentals.

String Handling:

The String Constructors, String Operations, Character Extraction, String Comparison, Modifying a String, String Buffer.

### Unit-VI

(08 Hours)

The Collections Framework:

More Utility Classes, Networking, the Applet Class, Event Handling, Introduction of Abstract Window Toolkit (AWT). Introduction to Swing.

### List of Practicals

Concern Staff should Frame 2-3 Assignments on Each Unit.

### Text Books/ References

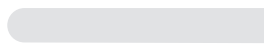
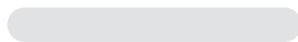
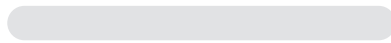
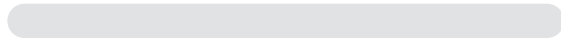
- Garry Cornel, “Visual Basic 6.0 “, Tata Mc Graw Hill
- Davaid Jung, Pierre Boutquin, “Visual Basic, Super Bible”, Techmedia Publications
- Steven Holzner, “Visual Basic Black Book”
- Helbert Schildt, “The Complete Reference Java 2”, Tata Mc Graw Hill Publication

### Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



## SEMESTER - VI





# K30307: ADVANCED COMPUTER ARCHITECTURE

## TEACHING SCHEME

Lectures : 04Hrs/week

## EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

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### Unit -I

(08 Hours)

Overview of Parallel Processing:

Introduction to Parallel Computing, Need for Parallel Computing, Parallelism in uniprocessor system, Evolution of parallel processor. Parallel Architectural classification schemes, Flynn's, Feng's classification, Performance of Parallel Processors. Amdahl Law, Distributed Processing and Quantitative Approach.

### Unit -II

(08 Hours)

Memory:

Processor & memory hierarchy, bus, cache & shared memory Introduction to super scalar architectures, Quantitative evaluation of performance gain using memory, cache miss/hits, Memory contention and arbitration techniques, Cache coherency and Bus snooping, Issues towards Cluster Computing.

### Unit-III

(08 Hours)

Pipeline Processing:

Introduction to Pipeline Processing, SIMD parallel processors, Arithmetic pipelines, Steady state analysis of pipeline, Pipelined instruction processing, interlocks, hazards, hazards detentions and resolution, memory systems used in pipelines, scheduling of dynamic pipelines. VLIW processor (Very long Instruction Word Processor).

### Unit-IV

(08 Hours)

Synchronous Parallel Processing:

Classification of parallel processors, SIMD Parallel algorithm, recurrence and matrix computations, Distributed array processor, Processor Arrays,

Multiprocessors, parallel programming languages, mapping and scheduling. RISC and CISC architectures: Basic concepts, types, comparison. eg. DEC Alpha, Power PC, Case study Ultra SPARC.

### Unit-V

(08 Hours)

#### Multiprocessor Architecture :

Loosely coupled multiprocessor, Tightly coupled multiprocessor, Inter PE communication networks, Time shared bus, PCI bus, Interconnection Network, Multiport Memory Model, Cross bar, Data Manipulator, Network Routing.

### Unit-VI

(10 Hours)

#### Parallel Software Issue:

- (a) Compiler technology for vector machine, Code optimization and Vectorization, Inter process communication mechanism and semaphore for multiprocessing.
- (b) Parallel algorithm for multiprocessors.
- (c) Operating system for parallel processor, Multiprocessor operating system.

#### Text Books/ References

- Peterson & Heresy, “Quantitative approach to computer Architecture”, Morgan Kaufman
- Quin, “Parallel Computing, Theory and Practices,” McGraw Hill
- Bhujde, “Parallel Computing,” New Age International
- Kai Hwang, “Advanced Computer Architecture”, McGraw Hill
- Englander, “Architecture of Computer Hardware & Software System,” Jon Willey & Sons
- Richard Y. Kain, “Advanced Computer Architecture”

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
Unit Test 3	Unit V & VI



## TEACHING SCHEME

Lectures : 04Hrs/week

## EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

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### Unit-I

(08 Hours)

Software & Software Engineering:

What is & Why Software Engg.? Product: evolving role of software, software -characteristics, components, applications, software crisis & myths, software engineering and software process, software development phases & software process models. Prototyping & RAD models, waterfall, incremental model, spiral model, 4GT model CASE tools and classifications.

### Unit-II

(08 Hours)

Planning & Management of Software Projects:

(Only basic concepts) People, problem & process, measures, metrics & indicators, metrics for software quality, scoping, software project estimation, make-buy decisions, software acquisition, software risks : identification, projection, assessment, monitoring, project scheduling & tracking tasks, work breakdown structures, timeline chart, project plan, CASE tools.

### Unit-III

(08 Hours)

Systems Engineering:

Computer based systems, system engineering hierarchy. Information Engineering: Information strategy, planning, enterprise modeling, data modeling, business area analysis, information flow modeling, product engineering: system analysis, feasibility study, economic and technical feasibility analysis, modeling system architecture diagrams. CASE tools. Design Fundamental: Software design and software design process, principles and concepts, abstraction, refinement and modularity, software architecture, control hierarchy, partitioning, data structure, information hiding, effective modular design, cohesion, coupling, design module, design document, CASE tools.

## Unit-IV

(08 Hours)

### Requirement Analysis:

Communication techniques, FAST, Quality deployment, analysis principles, modeling, partitioning, prototyping, specifications, SRS & SRS reviews analysis models : data modeling, functional modeling and information flow, Data flow diagrams, extensions to real-time systems, behavioral models, mechanics of structured analysis, ER diagrams, control modeling, data dictionary CASE tools.

## Unit-V

(08 Hours)

### Design Methods:

Architectural design & design process, transform & transaction flow, design steps. Interface design, procedural design, and graphical & tabular design notations. Software testing & Testing Strategies.

Software testing fundamentals, test case design, white-box, black-box testing, control structure testing, strategic approach to testing, strategic issues, unit testing, integrated testing. Validation testing, system testing, CASE tools.

## Unit-VI

(08 Hours)

### Object Oriented (OO) Software Engineering Planning:

OO Paradigms & Concepts, identifying elements of object model. Object oriented Analysis (OOA) and OOD: Conventional Vs OO, generic components of OO Analysis model, OOA process, object-relationship model, object-behavior model, Human Computer Interface (HCI) Components, Object design process, design patterns. CASE tools. Unified Modeling Language(UML) : Different Methods: Rumbaugh /Booch /Jacobsons, need for standardization. Diagramming in UML (Use Case, Class, Interaction, State diagrams) CASE tools Software Quality assurance: Software quality concepts. Software quality assurance (SQA) & approaches. Software Reliability, SQA plan, ISO 9000 and SEI standards for software. Software configuration management (SCM), base lines, scan process, version control, change control SCM audits CASE tools.

### Text Books/ References

- Roger Pressman, “Software Engineering”
- “A Practitioner's Approach”, 4th Ed., Tata McGraw Hill Publication Company
- Martin Fowler, “UML Distilled”, Addison Wesley
- Grady Booch, “OOA and design”, Addison Wesley
- Rumbaugh, “OO modeling, and Design”, PHI
- Pfleeger S. L., “Software Engineering”

### Syllabus for Unit Test

Unit Test 1	Unit I & II
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TEACHING SCHEME

Lectures : 04 Hrs/week  
Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks  
Duration : 03 Hours  
Unit Test : 20 Marks  
Or. : 20 Marks

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Unit-I

(06 Hours)

Introduction to Operating Systems:

Operating System concept & definition, Early Systems, Simple Batch Systems, Multi-programmed Batched Systems, Time Sharing Systems, Personal-Computer Systems, Parallel Systems, Distributed Systems, Real-Time Systems. Computer System Operation, Operating System Structures, General System Architecture, I/O Structure, Storage Structure, System Components, Operating System Services, System Calls, System Programmes, System Structures, Virtual Machines, System Design And Implementation, System generation.

Unit-II

(04 Hours)

Process & CPU Scheduling:

Process Concept, Interleaved I/O and CPU burst, Process States, Operating System Services for Process, Process Scheduling, Preemptive and Non-Preemptive Scheduling, FCFS, SJF, Round Robin, Priority Scheduling, Multi-level Queue Scheduling, Operation on a Process, Cooperating Process, Threads, Interprocess Communication.

Unit-III

(08 Hours)

Deadlocks:

Systems Model, Deadlock Characterization, Necessary Conditions, Methods of Handling Deadlocks, Deadlock Detection, Deadlock Prevention, Deadlock Avoidance, Safe State, Resource Allocation, Graph Algorithm, Bankers Algorithm, Recovery from Deadlock, Combined Approach.

Unit-IV

(10 Hours)

Memory Management:

Address Space, Swapping, Contiguous Allocation, Single Partition

Allocation, Multiple Partition allocation, Paging, Basic Method, Structure of Page Table, Protection, Segmentation, Paged Segmentation Hardware, Implementation of Segmentation Tables, Protection and sharing, Fragmentation, Internal and External Fragmentation.

#### Virtual Memory:

Demand Paging, Page- Replacement, Page- Replacement Algorithms: FIFO Algorithms, Optimal Algorithm, LRU Algorithm, Frame Allocation and Thrashing.

#### Unit-V

(08 Hours)

#### Multimedia Operating Systems Issues:

Quality of Service Concept, Guaranteed Services, Negotiations, Monitoring, Adaptation Translation. Resource Management: Admission, Reservation and Allocation. Linear arrival Process Model, Real-Time System Model, Guaranteed Scheduling for Processor and Disk, Multimedia File Systems, Buffer management for Continuous Media, Integrated Multimedia Device Management, Case Studies: quick Time, Windows, OS/2.

#### Unit VI

(08 Hours)

#### I/O Management and Disk Scheduling:

I/O Devices. Organization of the I/O Function; Operating System Design Issues; I/O Buffering; Disk Scheduling: RAID, Disk Cache, UNIX, Windows 2000 I/O.

#### File Management:

Overview; File Organization, File Directories, File Sharing, Record Blocking, Secondary Storage Management; UNIX File Management; Windows 2000 File System.

#### Case Studies:

UNIX: Internal Representation of files, System Calls for the File System, Implementation of Processes, Scheduling, Memory Management Policies. Windows NT; Layered.

#### Text Books/References

- Peterson, "Operating System Concepts"

- Nutt G., “Operating System a Modern Perspective”, 2<sup>nd</sup> Edition, Addison Wesley, 2000
- Siferschatz A., “Operating System Concepts”, 5<sup>th</sup> edition, Addison Wesley, 1997.
- Stallings W., “Operating System”, 2<sup>nd</sup> Edition, Prentice Hall, 1995
- Tanenbaum A., “Modern Operating System”, Prentice Hall, 1992
- Flynn I. and McHoes A., “Understanding Operating Systems”, 2<sup>nd</sup> Edition, PWS Publishing Company, 1997
- Dietel H., “An Introduction to Operating System”, Addison Wesley, 1990
- Peter Baer, Galvin, “Operating System Concepts”, 5th Edition, Abraham Silberschatz Bell Labs
- D. M. Dhamdhere, “Operating System A Concept based Approach”, Tata McGraw Hill Publication
- Milenkovic, “Operating System Concepts and Design”
- Maurice J. Bach, “Unix Operating System”, Prentice Hall of India
- Achyut S. Godbole, “Operating Systems”, Tata McGraw Hill Publication

Syllabus for Unit Test

Unit Test 1	Unit I & II
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TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Or. : 50 Marks

Unit-I

(06 Hours)

80386 architecture, functional diagram, support for pipelining, dynamic bus sizing, 80386 DX/SX differences. Programming model of 80386, register model, data types and addressing modes, Instruction set of 80386. Bus cycles with 16 and 32 bit data bus with timing, state diagrams, interrupt acknowledge, HOLD, HALT, RESET cycles.

Unit-II

(08 Hours)

80386 Addressing modes. Real, Protected, V86 modes. Protected mode programmer's model. Memory management through segmentation and paging. Support registers and caching in memory management.

Unit-III

(08 Hours)

Protection mechanism and privilege levels in protected and V86 modes. Privileged instructions, Protection mechanism in segmentation and paging procedure. Inter privilege level access mechanism gates. Multitasking support, task switching, task gates.

Unit-IV

(10 Hours)

Exceptions, Faults Traps, Interrupt, trap gates, protected, V86 mode. Co-processor interface. Interrupt handling, IVT, IDT, interrupt handling in real, 80387 mode interconnection, 16 and 32 bit memory interfacing, static and dynamic RAM, DRAM controller design cache memory, organization for Pentium family, 82496 cache controller, 82491 cache CPU chipset.

Unit-V

(08 Hours)

Pentium Family Architecture and features Pentium IV, Dual core, Core 2

Duo processors, I/O address space and I/O interfacing, PCI, SCSI bus controller, PC add-on card design considerations. Specifications of Laptops- Sony, Dell, Lenova, HP, Accer, etc.

### Unit-VI

(10Hours)

Micro controller MCS -31/51 family architecture and study. Register set. Register bank. Memory and I/O interfacing, SFR's interrupt structure, other features Design of micro-controller card.

### Text Books/References

- Tribel, "80386/486/Pentium Hardware and Software"
- Turley, "80386 Advanced Programmer's Manual"
- Microprocessor Data Manual Vol-II, Intel
- Intel MCS-51 Series Data Manual
- Intel 80386 Hardware Reference Manual

### Syllabus for Unit Test

Unit Test 1	Unit I & II
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TEACHING SCHEME

Lectures : 04 Hrs/week

Practical : 02 Hrs/week

EXAMINATION SCHEME

Theory : 80 Marks

Duration : 03 Hours

Unit Test : 20 Marks

T. W. & Pr : 50 Marks

Unit-I

(08 Hours)

Introduction to Computer Graphics:

Advantages and applications of computer graphics, types of graphics devices, Raster and random scan system, LCD, DVST, Flat panel system, display file structure, display file interpreter, graphics file format, BMP, TIFF, PCX, GIF.

Line and Circle generation: DDA and Bresenham's algorithms. Thick line segments, anti-aliasing of lines. Circle generation - DDA and Bresenham's algorithm, Comparison between algorithms, Character generation : Stroke principle, Starburst principle. Bit map method.

Unit-II

(08 Hours)

Polygons: types, representations, entering Polygons,

Polygon filling: Seed fill. Edge fill, scan conversion algorithm.

Scan Conversion: real time scan conversion, solid area scan conversion, run length encoding, cell encoding.

Segments: Concepts, segment table, segment creation, deletion, renaming. Image transformation.

Unit-III

(08 Hours)

3-D Geometry :

2D transformations primitives and concepts - Translation, rotation, rotation about an arbitrary points, scaling and shearing, 3D transformations, rotation about an arbitrary axis, 3D viewing transformations. Concept of parallel and perspective projections. Viewing parameters, 3D clipping. Mid-point subdivision algorithm.

Windowing and Clipping:

Viewing transformation, 2D clipping, Sutherland-Cohen, subdivision Line

Clipping algorithm. Midpoint subdivision algorithm. Generalized clipping, Cyrus-Beck algorithm. Interior and Exterior clipping. Polygon Clipping, Sutherland-Hodgeman algorithm.

#### Unit-IV

(08 Hours)

Hidden Surfaces and Lines:

Back-face removal algorithm, hidden line methods, Z buffer, Warnock and Painters algorithm. Floating Horizon. Light, Color and Shading : Diffused illumination, point source illumination, shading algorithm. Color models RGB, HVS, CYM etc., shading algorithm. Eliminating back spaces, transparency, reflection and shadows.

Curves and Fractals:

Curve generation. Interpolation, interpolating algorithms, interpolating polygons, B-Splines and corners, Bezier curves. Fractals, fractal surfaces and lines.

#### Unit-V

(08 Hours)

Interactive Graphics:

Graphics standards, Graphics hardware, CRT display and controller. Interlaced and Non interlaced display. Vector scan and Raster scan, Display adapter, VGA, SVGA, BIOS Video support, Graphics device drivers. Display buffers. Study of Graphics stations (practical aspects). Plotters, Digitizers, Scanners, Lightpen.

#### Unit-VI

(08 Hours)

Graphical User Interface:

Concepts of X-Windows: Client-server model, protocols, message passing (only GUI related concepts). Motif - widget, gadget, structure, (only GUI concepts). Concepts of MS Windows. Open GL and Animation.

Graphics Standard: Introduction to Graphics kernel System with Basic primitives.

Graphics Applications: Scientific & Engg. Applications, Business application. Application concept in Animation & Simulation. Graphics in Linux.

### List of Practicals

- Line/Circle drawing
- Polygon filling.
- 3-D transformations.
- Segmentation.
- Projections.
- Animation.
- Windowing and clipping algorithms.
- Polygon clipping algorithm.
- Hidden line and surfaces.
- Curves and fractals.
- Fractals.
- Study assignment on any GUI application
- Programming of display device drivers for various cards using windows environment.

Programs must be designed using device independent graphics principles. Any Nine from 1 to 11. Assignment number 12 is compulsory.

### Text Books/References

- Hearn and Baker, "Computer Graphics"
- David P. Rogers, "Procedural Elements for Computer Graphics", Mc-Graw Hill International
- Steven Harrington, "Computer Graphics A Programming Approach", McGraw Hill
- Foley, Vandam, Feiner, Hughes, "Computer Graphics
- "Principles and Practice", Addison Wesley
- Rao, Prasad, "Graphical user interface (GUI)"
- Charles Petzold, "Programming Windows 3.1", Microsoft Publication

Syllabus for Unit Test

Unit Test 1	Unit I & II
Unit Test 2	Unit III & IV
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TEACHING SCHEME

Lectures : 02 Hrs/week  
Practical : 02 Hrs/week  
Tutorial : 02 Hrs/week

EXAMINATION SCHEME

T. W. & Pr. : 50 Marks  
T. W. & Or : 50 Marks

Unit-I

(06 Hours)

Getting Started with Visual Basic .NET:

Introduction to Visual Basic .NET, MS. Net Project, MSIL, JIT, .NET framework class library.

Unit-II

(08 Hours)

Module and Variable:

Module and Name space, Variables, array and structure.

Control flow and Error Handlings:

Execution flow control. commands, functions & constants. Error Handling. Debugging .NET applications.

Unit-III

(10 Hours)

Introduction to Object Oriented Programming Class Fundamentals:

field, method, properties, constructors object lifetime, events, Inheritance in VB.NET., Interfaces, Attributes.

Unit-IV

(10 Hours)

Programming in .NET Framework .NET framework basic types:

Array, Lists and collection file, directories and streams.

Unit-V

(06 Hours)

Windows Forms Application:

Data Access in visual basic .NET, ADO.NET, Control windows forms controls

## Unit-VI

(10Hours)

Introduction to C# AND .NET:

Programming Fundamental and Language Basics.

### List of Practicals

- Term work should include minimum 12 experiments from the above Units.
- The programs can be developed with VB.NET software. With doing Proper installation. First Program should be how to install VB.NET software.

### Text Books/References

- Francesco Balena, “Programming in Microsoft Visual Basic .Net”, Microsoft Publication
- Billy Hollis Rockford Lhotka, “VB.NET Programming with the Public Beta”
- Steven Hotzner, “Visual Basic.NET Black Book”
- Matthew A. Telles, “C# Black Book”

### Syllabus for Unit Test.

Unit Test 1	Unit I & II
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## RULES REGARDING ATKT, CONTINUOUS ASSESSMENT AND AWARD OF CLASS

### A. T. K. T.

- A candidate who is granted term for B.Tech. Semester-I will be allowed to keep term for his/her B.Tech. Semester-II examination even if he/she appears and fails or does not appear at B.Tech. Semester-I examination.
- A candidate who is granted term for B. Tech. Semester - III will be allowed to keep term for his/her B.Tech. Semester-IV examination even if he/she appears and fails or does not appear at B.Tech. Semester-III examination.
- A candidate who is granted term for B.Tech. Semester-V will be allowed to keep term for his/her B.Tech. Semester-VI examination if he/she appear and fails or does not appear at B.Tech. Semester-V examination.
- A candidate who is granted term for B.Tech. Semester-VII will be allowed to keep term for his/her B.Tech. Semester-VIII examination if he/she appears and fails or does not appear at B.Tech. Semester-VII examination.
- A student shall be allowed to keep term for the B.Tech. Semester-III course if he/she has a backlog of not more than 3 Heads of passing out of total number of Heads of passing in theory examination at B.Tch. Semester-I & II taken together.
- A student shall be allowed to keep term for the B.Tech. Semester-V of respective course if he/she has no backlog of B.Tech Semester-I & II and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 heads of passing in termwork and practical examination or termwork and oral examination.
- A student shall be allowed to keep term for the B.Tech. Semester-VII course if he/she has no backlog of B.Tech. Semester-III & IV and he/she has a backlog of not more than 3 Heads of passing in theory examination and not more than 3 Heads of passing in termwork and practical examination or termwork and oral examination.

### CONTINUOUS ASSESSMENT

- In respect of Term work at B.Tech. Semester-I & II, B.Tech. Semester-III & IV and B.Tech. Semester-V & VI, target date shall be fixed for the completion of each job, project experiment or assignment as prescribed in the syllabus and the same shall be collected on the target date and assessed immediately at an affiliated college by at least one pair of the concerned teachers for the subject and the marks shall be submitted at the end of each term to the Principal of the college.

- Termwork and performance of Practical/Oral examination shall be assessed on the basis of the depth of understanding of the principles involved, correctness of results and not on ornamental or colorful presentation.
- For B.Tech. Semester-VII & VIII, termwork assessment will be done by external and internal examiners jointly during the examination schedule declared by the university. The record of continuous assessment shall be made available to the examiners during Term work and practical and Term work and oral examinations. Examiner shall use this record for overall assessment of the performance of the student. Every practical/termwork assignment shall be assessed on the scale of 20 marks and weightage of 20 marks shall be distributed as follows:

Sr. No.	Activity	Marks
1	Timely Submission	04
2	Presentation	06
3	Understanding	10

Marks obtained out of 20 for all assignments together will be converted on scale of marks assigned to term work of respective subject in the structure of the course.

### CLASS

- The class should be awarded to the student on the basis of aggregate marks obtained together in both the semesters of the respective year by him. The award of class shall be as follows.

A	Aggregate 66% or more marks	First Class with Distinction
B	Aggregate 60% or marks but less than 66%	First Class
C	Aggregate 55% or more marks but less than 60%	Higher Second Class
D	Aggregate 50% or more marks but less than 55%	Second Class
E	Aggregate 40% or more marks but less than 50%	Pass Class