UNIVERSITY OF MUMBAI

Bachelor of Engineering


Under

FACULTY OF TECHNOLOGY

(As per Semester Based Credit and Grading System)
Program Structure for B.E. Computer Engineering
Third Year (Computer)
(Semester V)
(REV 2012)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Teaching Scheme (Contact Hours)</th>
<th>Credits Assigned</th>
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<tr>
<td></td>
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<td>Theory</td>
<td>Pract</td>
</tr>
<tr>
<td>CPC501</td>
<td>Microprocessor</td>
<td>4</td>
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<tr>
<td>CPC502</td>
<td>Operating Systems</td>
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<tr>
<td>CPC503</td>
<td>Structured and Object Oriented Analysis and Design</td>
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<tr>
<td>CPC504</td>
<td>Computer Networks</td>
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<td>2</td>
</tr>
<tr>
<td>CPL501</td>
<td>Web Technologies Laboratory</td>
<td>-</td>
<td>4</td>
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<tr>
<td>CPL502</td>
<td>Business Communication and Ethics*</td>
<td>-</td>
<td>2</td>
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<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
<td><strong>12</strong></td>
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* 2 hours shown as Practicals to be taken class wise and 2 hours for tutorials to be taken as batch wise

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<tr>
<th>Course Code</th>
<th>Course Name</th>
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<td>Internal Assesment</td>
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<td>Test 1</td>
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<tr>
<td>CPC501</td>
<td>Microprocessor</td>
<td>20</td>
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<tr>
<td>CPC502</td>
<td>Operating Systems</td>
<td>20</td>
</tr>
<tr>
<td>CPC503</td>
<td>Structured and Object Oriented Analysis and Design</td>
<td>20</td>
</tr>
<tr>
<td>CPC504</td>
<td>Computer Networks</td>
<td>20</td>
</tr>
<tr>
<td>CPL501</td>
<td>Web Technologies Laboratory</td>
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<tr>
<td>CPL502</td>
<td>Business Communication and Ethics</td>
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<td><strong>Total</strong></td>
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</tbody>
</table>
Course Code: CPC501
Course/Subject Name: Microprocessor
Credits: 5

Objectives:
1. To understand basic architecture of 16 bit and 32 bit microprocessors.
2. To understand interfacing of 16 bit microprocessor with memory and peripheral chips involving system design.
3. To understand techniques for faster execution of instructions and improve speed of operation and performance of microprocessors.
4. To understand RISC and CISC based microprocessors.
5. To understand concept of multi core processors.

Outcomes: Learner will be able to…
1. Write programs to run on 8086 microprocessor based systems.
2. Design system using memory chips and peripheral chips for 16 bit 8086 microprocessor.
3. Understand and devise techniques for faster execution of instructions, improve speed of operations and enhance performance of microprocessors.
4. Distinguish between RISC and CISC processors.
5. Understand multi core processor and its advantages.

<table>
<thead>
<tr>
<th>Module</th>
<th>Detailed Contents</th>
<th>Hrs.</th>
</tr>
</thead>
</table>
| 01     | Intel 8086/8088 Architecture  
1.1 8086/8088 Microprocessor Architecture, Pin Configuration, Programming Model, Memory Segmentation, Study of 8284 Clock Generator, Operating Modes, Study of 8288 Bus Controller, Timing diagrams for Read and Write operations, Interrupts. | 10   |
| 02     | Instruction Set and Programming  
2.1 Instruction Set of 8086, Addressing Modes, Assembly Language Programming, Mixed Language Programming with C Language and Assembly Language. | 08   |
| 03     | System designing with 8086  
3.1 Memory Interfacing: SRAM, ROM and DRAM (using DRAM Controller-Intel 8203).  
3.2 Applications of the Peripheral Controllers namely 8255-PPI, 8253-PIT, 8259-PIC and 8237-DMAC. Interfacing of the above Peripheral Controllers with 8086 microprocessor.  
3.3 Introduction to 8087 Math Coprocessor and 8089 I/O Processor. | 12   |
| 04     | Intel 80386DX Processor  
4.1 Study of Block Diagram, Signal Interfaces, Bus Cycles, Programming Model, Operating Modes, Address Translation Mechanism in Protected Mode, Memory Management, Protection Mechanism. | 06   |
### Term Work:

The distribution of marks for term work shall be as follows:

- Laboratory work (experiments/practical & case studies):......... (15) Marks.
- Assignments………………………………………………………… (05) Marks.
- Attendance …………………………………………………………… (05) Marks

**TOTAL:** ................................................................. (25) Marks.

### Practical/Experiments:

1. Total eight experiments / practical must be performed out of which five practical must be performed on assemblers for 8086 and three experiments must be performed on interfacing of 8086 with peripheral chips like 8255 PPI, 8253 PIT, 8259 PIC and 8237 DMAC.

2. In addition to eight experiments/practical, two case studies are mandatory, one case study on RISC processor and second case study on CISC processor.

**Practical examination will be conducted based on the above syllabus.**

### Text Books:


### Reference Books:

1. 8086/8088 family: Design Programming and Interfacing: John Uffenbeck, PHI.
5. The SPARC Architecture Manual
6. Intel Manuals
Objectives:
1. To introduce students with basic concepts of Operating System, its functions and services.
2. To familiarize the students with various views and management policies adopted by O.S. as pertaining with processes, Deadlock, memory, File and I/O operations.
3. To brief the students about functionality of various OS like Unix, Linux and Windows XP as pertaining to resource management.
4. To provide the knowledge of basic concepts towards process synchronization and related issues.

Outcomes: Learner will be able to…
1. Appreciate the role of operating system as System software.
2. Compare the various algorithms and comment about performance of various algorithms used for management of memory, CPU scheduling, File handling and I/O operations.
3. Apply various concept related with Deadlock to solve problems related with Resources allocation, after checking system in Safe state or not.
4. To appreciate role of Process synchronization towards increasing throughput of system.
5. Describe the various Data Structures and algorithms used by Different Oss like Windows XP, Linux and Unix pertaining with Process, File, I/O management.
6. To control the behavior of OS by writing Shell scripts.

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<tr>
<th>Module</th>
<th>Detailed Contents</th>
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<tr>
<td>01</td>
<td>Introduction</td>
<td>04</td>
</tr>
<tr>
<td>2.1</td>
<td>Process concept,</td>
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<tr>
<td></td>
<td>operations on process</td>
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<tr>
<td>2.2</td>
<td>Synchronization:</td>
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<tr>
<td></td>
<td>Background, the critical section problem, Peterson’s Solution, Synchronization Hardware Semaphores, classic problems of Synchronization: The Producer Consumer Problem: Readers writers problem, Semaphores, Dinning Philosopher Problem</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Deadlock</td>
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<tr>
<td>3.1</td>
<td>Deadlock Problem, Deadlock Characterization, Deadlock Prevention. Deadlock avoidance Banker’s algorithm for single &amp; multiple resources, Deadlock recovery, Deadlock Detection.</td>
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<tr>
<th>04</th>
<th>Memory Management</th>
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<tbody>
<tr>
<td>4.1</td>
<td>Memory management strategies: background, swapping, contiguous memory allocation, paging, structure of page tables, segmentation</td>
</tr>
<tr>
<td>4.2</td>
<td>Virtual memory management: Demand paging, copy-on write, Page replacement, FIFO, Optimal, LRU, LRU Approximation, Counting Based, Allocation of frames, Thrashing</td>
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</table>

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<thead>
<tr>
<th>05</th>
<th>File Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>Files-System Structure, File System implementation, Directory implementation, Allocation Methods contiguous allocation, linked list allocation, indexed allocations, Free space management.</td>
</tr>
<tr>
<td>5.2</td>
<td>Secondary storage: structures: Disks Scheduling Algorithm: FCFS, SSTF, SCAN, CSCAN, LOOK, Disk Management</td>
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<tr>
<th>06</th>
<th>Input Output Management</th>
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<tbody>
<tr>
<td>6.1</td>
<td>Overview, I/O Hardware, Application I/O Interface</td>
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<tr>
<th>07</th>
<th>Case Study of UNIX</th>
</tr>
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<tbody>
<tr>
<td>7.1</td>
<td>History of UNIX, Overview of UNIX, UNIX File System, Data structures for process/memory management, Process states and State Transitions, Using the System (Booting and login), Process scheduling, Memory management, Shell programming</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>08</th>
<th>Case Study of Linux</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1</td>
<td>History, Design Principles, Kernel Modules, Process management, Scheduling, Memory management, File Systems, Input and Output, Inter process communication, Network structure, Security</td>
</tr>
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</table>

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<tr>
<th>09</th>
<th>Case study: Windows 7</th>
</tr>
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<tbody>
<tr>
<td>9.1</td>
<td>History, Design Principles, System components, environmental subsystems, File System, Networking, Programmer Interface</td>
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</tbody>
</table>

**Term Work:**

The distribution of marks for term work shall be as follows:

- Laboratory work (experiments+mini project): ............ (15)
- Assignments: ............................................... (05)
- Attendance .................................................. (05)

**TOTAL:** ................................................ (25)
Practical/Experiments:
Laboratory work shall consist of minimum 05 experiments and mini project, 2 assignments based on above theory syllabus.
The final certification and acceptance of term work ensures that satisfactory performance of laboratory work and minimum passing marks in term work.
Practical exam will be based on the above syllabus.

Text Books:

Reference Books:
3. Unix and Shell Programming by B. M. Harwani Oxford
5. Thomas Rebecca : Yates A user guide to the Unix system.

Syllabus for Practical:
Suggested topics for experiment but not limited to:
1. Exploring basic commands for handling File system under Unix/Linux using shell scripts.
   ( creating groups , chown , chmod , directory name, tty , diff, umask )
2. Pattern matching utilities like awk, grep , nroff , troff , sort etc.
3. Exploring the boot process of Unix/Linux and implementing practical on it (for ex. MBR, passing different parameter to kernel, do different activity while booting and power-off ).
4. Basic Process management algorithms ( Any from FCFS , SJF , SRTN, RR , multilevel Queue scheduling )
5. Process synchronization algorithms like producer consumer problem , dining philosopher problem
6. Implementing Various page replacement policies: FIFO, Optimal, LRU, LFU
7. Implementation of Disk scheduling algorithms like FCFS,SSTF,SCAN ,CSCAN,LOOK.
8. Implementing Various file allocation methods : Index Allocation , Contiguous allocation.
9. Simulating Paging and Segmentation
10. Implementation of System calls like printing a file, display file using Unix/Linux internals.
11. Study booting process of Windows XP, Linux , and Unix.
Outcomes: Learner will be able to…
1. Understand and apply techniques to get the system requirements and present it in standard format.
2. Apply key modeling concepts to both the traditional structured approach and the object-oriented approach.
3. Construct the candidate system following design methodology.

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<tr>
<th>Module</th>
<th>Detailed Contents</th>
<th>Hrs.</th>
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<tbody>
<tr>
<td>01 Introduction</td>
<td>1. System overview, Types of Systems, 1.2 Key Differences Between Structured and Object-Oriented Analysis and Design, 1.3 Role of the System Analyst, 1.4 Systems Development Life Cycle</td>
<td>06</td>
</tr>
<tr>
<td>02 System Analysis</td>
<td>2.1 Business process Reengineering and the Zachman Framework, System Requirement, Stakeholders, Techniques for information gathering, Validating the requirements.</td>
<td>06</td>
</tr>
<tr>
<td>03 Feasibility Analysis</td>
<td>3.1 Feasibility Analysis, Tests for feasibility, Cost-Benefit Analysis, Feasibility analysis of candidate system, 3.2 The system Proposal.</td>
<td>06</td>
</tr>
<tr>
<td>05 System Design</td>
<td>5.1 Moving To Design, 5.2 The traditional Approach to design, 5.3 The Object-Oriented Approach to design: Use Case Realization, 5.4 Designing Database, Designing the User Interface, Designing System Interfaces, Controls and security</td>
<td>12</td>
</tr>
<tr>
<td>06 Application Architecture</td>
<td>6.1 IT Architecture, Application Architecture Strategies, Modeling Application Architecture for Information System, 6.2 Deployment using UML diagrams, Component and deployment diagram for various architectures.</td>
<td>06</td>
</tr>
</tbody>
</table>
**List of Assignment:**

Assignments can be based on following topics

1. Feasibility analysis
2. Design patterns.

**Term Work:**

The distribution of marks for term work shall be as follows:

- Laboratory work: .................................................. (10) Marks.
- Mini Project presentation:...........................................(10) Marks.
- Attendance ......................................................... (05) Marks

**TOTAL:** ............................................................... (25) Marks.

Oral exam will be based on the above syllabus and tLaboratory work.

**Suggested Practical List:**

1. Develop Requirement specification document of the selected / alloted project.
2. Develop DFD model (level-0, level-1 DFD and Data dictionary) of the selected / alloted project.
3. Develop UML Use case model for the selected / alloted project.
4. Develop sequence diagram selected / alloted project.
5. Develop Class diagram selected / alloted project.
6. Develop prototype of your project selected / alloted project.
7. Draw system architecture diagram selected / alloted project.

**Text Books:**

1. System Analysis & Design by Satzinger, Jackson and Burd, Cengage Learning, 2007
3. System Analysis and Design by Alan Dennis, Barbara H. Wixom, Roberta M. Roth, Wiley India 4th edition

**Reference Books:**


<table>
<thead>
<tr>
<th>Course Code</th>
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<th>Credits</th>
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<tbody>
<tr>
<td>CPC504</td>
<td>Computer Networks</td>
<td>4+1</td>
</tr>
</tbody>
</table>

**Objectives:**
1. To provide students with an overview of the concepts and fundamentals of data communication and computer networks
2. To familiarize with the basic taxonomy and terminology of computer networking area.
3. To experience the designing and managing of communication protocols while getting a good exposure to the TCP/IP protocol suite.

**Outcomes:**

**After completion of this course learner will be able to:**
1. Conceptualize all the OSI Layers
2. Use appropriate network tools to build network topologies
3. Install and configure an open source tool NS2
4. Test simple protocols in a laboratory scenario

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<th>Module</th>
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<th>Hrs.</th>
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<tbody>
<tr>
<td>01</td>
<td>Introduction</td>
<td>06</td>
</tr>
<tr>
<td>1.1</td>
<td>History and development of computer network, network application, network software and hardware components, topology, protocol hierarchies, design issues for the layers, connection oriented and connectionless services, reference models: layer details of OSI, TCP/IP models. Communication between layers.</td>
<td></td>
</tr>
<tr>
<td>02</td>
<td>Physical Layer</td>
<td>06</td>
</tr>
<tr>
<td>2.1</td>
<td>Guided Transmission Media: Twisted pair, Coaxial, Fiber optics.</td>
<td></td>
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<tr>
<td>2.2</td>
<td>Unguided media (Wireless Transmission): Radio Waves, Bluetooth, Infrared, Virtual LAN.</td>
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</tr>
<tr>
<td>03</td>
<td>Data Link Layer</td>
<td>09</td>
</tr>
<tr>
<td>3.1</td>
<td>DDL Design Issues, Functionalities of DLL, Flow control algorithms - Sliding Window, Error Detection &amp; Correction techniques, SDLC, PPP, Framing.</td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td>MAC Layer</td>
<td></td>
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<tr>
<td></td>
<td>Aloha protocols, Control Access Protocol, Carrier Sense Multiple Access(CSMA), Ethernet, Local Area Networks - Ethernet, Token ring, FDDI.</td>
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</tr>
<tr>
<td>04</td>
<td>Network layer</td>
<td>08</td>
</tr>
<tr>
<td>4.1</td>
<td>Communication Primitives: Unicast, Multicast, Broadcast. IP Addressing, Subnetting, IPv4, IPv6, Routing algorithms : Link state routing, Distance Vector Routing, ARP, RARP, ICMP, Routing protocols - RIP, OSPF, BGP, IGRP, Congestion control algorithms: Open Loop congestion control, Closed Loop congestion control.</td>
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<tr>
<td>05</td>
<td>Transport Layer</td>
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<tr>
<td>5.1</td>
<td>The Transport Service: Transport service primitives, Berkeley Sockets, Connection management, UDP, TCP, Socket Programming (TCP &amp; UDP), Socket Programming examples, TCP Flow control, TCP Congestion Control, Multiplexing.</td>
<td>08</td>
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</table>

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<tr>
<th>06</th>
<th>Application Layer</th>
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<tbody>
<tr>
<td>6.1</td>
<td>DNS, HTTP, E-mail, SMTP, Telnet, FTP, Security-PGP-SSH.</td>
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<tr>
<th>07</th>
<th>Network Management</th>
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<tbody>
<tr>
<td>7.1</td>
<td>SNMP Concept, Management Components, SMI, MIB, SNMP Format, Messages.</td>
</tr>
</tbody>
</table>

**Term Work:**

Term work shall consist of minimum **12** experiments.  
Journal must include at least 2 assignments.  
The final certification and acceptance of term work ensures that satisfactory performance of laboratory work and minimum passing marks in term work.  
The distribution of marks for term work shall be as follows:

- **Experiments:** .......................................................... (15) Marks.
- **Assignments:** ............................................................ (05) Marks.
- **Attendance** ............................................................... (05) Marks

TOTAL: ................................................................. (25) Marks.

**Practical exam will be based on the above syllabus.**

**Suggested Practicals:**

1. Study of LAN Topology.
2. Study of various Network devices.
4. Installation & Configuration of NS2 in Linux environment.
5. Basic wired & wireless topology in NS2.
8. Write a program to implement find out class of a given IP address, subnet mask & first & last IP address of that block.
9. Write a program to build client-server model on different computers.
11. Datalink Layer: Error Detection and correction, Flow Control, Framing
12. Network Layer: IP Addressing, Routing
Text Books:

Reference Books:
5. An Engineering Approach To Computer Networking: Atm Networks, The Internet ...By Keshav
Objectives:
1. To inculcate in students professional and ethical attitude, effective communication skills, teamwork, skills, multidisciplinary approach and an ability to understand engineer’s social responsibilities.
2. To provide students with an academic environment where they will be aware of the excellence, leadership and lifelong learning needed for a successful professional career.
3. To inculcate professional ethics and codes of professional practice
4. To prepare students for successful careers that meets the global Industrial and Corporate requirement’ provide an environment for students to work on Multidisciplinary projects as part of different teams to enhance their team building capabilities like leadership, motivation, teamwork etc.

Outcomes: A learner will be able to …..
1. communicate effectively in both verbal and written form and demonstrate knowledge of professional and ethical responsibilities
2. Participate and succeed in Campus placements and competitive examinations like GATE, CET.
4. Have education necessary for understanding the impact of engineering solutions on Society and demonstrate awareness of contemporary issues.

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<td>Report Writing</td>
<td>08</td>
</tr>
<tr>
<td></td>
<td>1.1 Objectives of report writing</td>
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<tr>
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<td>1.2 Language and Style in a report</td>
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<td>1.3 Types of reports</td>
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<td>1.4 Formats of reports: Memo, letter, project and survey based</td>
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<tr>
<td>02</td>
<td>Technical Proposals</td>
<td>02</td>
</tr>
<tr>
<td></td>
<td>2.1 Objective of technical proposals</td>
<td></td>
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<tr>
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<td>2.2 Parts of proposal</td>
<td></td>
</tr>
<tr>
<td>03</td>
<td>Introduction to Interpersonal Skills</td>
<td>08</td>
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<tr>
<td></td>
<td>3.1 Emotional Intelligence</td>
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<td>3.2 Leadership</td>
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<td>3.3 Team Building</td>
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<td>3.4 Assertiveness</td>
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<td>3.5 Conflict Resolution</td>
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<td>3.6 Negotiation Skills</td>
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<td>3.7 Motivation</td>
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<td>3.8 Time Management</td>
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<tr>
<td>04</td>
<td>Meetings and Documentation</td>
<td>02</td>
</tr>
<tr>
<td></td>
<td>4.1 Strategies for conducting effective meetings</td>
<td></td>
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<td></td>
<td>4.2 Notice</td>
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</tbody>
</table>
### List of Assignment:

1. Report Writing (Synopsis or the first draft of the Report)
2. Technical Proposal (Group activity, document of the proposal)
3. Interpersonal Skills (Group activity and Role play)
4. Interpersonal Skills (Documentation in the form of soft copy or hard copy)
5. Meetings and Documentation (Notice, Agenda, Minutes of Mock Meetings)
6. Corporate ethics and etiquettes (Case study, Role play)
7. Cover Letter and Resume
8. Printout of the PowerPoint presentation

### Term Work:

Term work shall consist of all assignments from the list. The distribution of marks for term work shall be as follows:

- Assignments: .................................................. (20) Marks.
- Project Report Presentation........................................... (15) Marks.
- Group Discussion.................................................... (10) Marks.
- Attendance ...........................................................(05) Marks

**TOTAL: .......................................................... (50) Marks.**

The final certification and acceptance of term work ensures the satisfactory performance of work assigned and minimum passing in the term work.
References:

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<tr>
<th>Module</th>
<th>Detailed Contents</th>
<th>Lab Sessions</th>
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</table>
| 01     | **Title:** Create HTML Forms. Use of various HTML Tag on Web Forms.  
*Concept:* Designing of effective web site, Introduction of different Web Technologies: HTML, and Different HTML Tag.  
*Objective:* objective of this module is to provide students an overview of the concepts Web Technologies, and HTML.  
*Scope:* Designing static client side web page using various HTML tags.  
*Technology:* HTML | 01 |
| 02     | **Title:** Use of CSS on HTML Form.  
*Concept:* Cascaded Style Sheets  
*Objective:* In this module student will learn, defining a CSS and unstaring its purpose different syntax and types of CSS.  
*Scope:* Creating web pages and use CSS to control the layout pages.  
*Technology:* HTML with Cascade Style Sheet | 01 |
| 03     | **Title:** Use of Java Script functions on Web Forms and Use of Dynamic HTML Page.  
*Concept:* Scripting Languages, Dynamic web pages  
*Objective:* in this lab student will learn how to define client side scripting and understand its advantages and disadvantages. Embedding JavaScript code into HTML document using script tag, and will understand dynamic HTML.  
*Scope:* Create animation using JavaScript.  
*Technology:* HTML with JavaScript | 02 |
| 04     | **Title:** Creation of Web page with the help of Quanta Plus /Aptana /Kompozer.  
*Concept:* Web development Environment  
*Objective:* This module students will learn how will introduce editors for development of web pages.  
*Scope:* Development of web pages using any web tool.  
*Technology:* Quanta Plus /Aptana /Kompozer | 03 |
Title: Write an XML file marksheet.xml representing your semester mark sheet.
Concept: Extensible Mark up Language (XML)

Objective: is to learn about basics of XML and how it can be used to store information away from the mechanism of processing or formatting of such data. Will also learn how to build simple XML files and be able to manipulate and refer to them.
Scope: is to creating an XML file in that it must include basic syntax of an XML doc and DTD for the same.

Title: server side scripting. Use HTML form to accept the two numbers N1 and N2 and using PHP program display only prime numbers in between N1 and N2.
Concept: Server side scripting, introduction to PHP

Objective: this lab gives a basic introduction of to PHP and dynamic programming on the server side.
Scope: creating a server side script using PHP, decisions, looping
Technology: PHP, HTML

Term work Assessment:
Term work will consist of small assignments testing all the technologies included in syllabus and a Mini project solving an appropriate problem using the above technology

The distribution of marks for term work shall be as follows:
- Assignments: ............................................... (20) Marks.
- Project Report Presentation........................................ (15) Marks.
- Group Discussion.................................................. (10) Marks.
- Attendance ......................................................(05) Marks
TOTAL: .............................................................. (50) Marks.

End Semester Examination:
Oral examination is to be conducted by pair of internal and external examiners based on the mini projects undertaken by student groups.

Text Books: