University of Pune
TYBSc Computer Science Syllabus
to be implemented from 2010-11

Note:
• For every semester, each theory course will have 40 marks examination and 10 marks for internal examinations (total 50 marks).
• Every laboratory course will have 80 marks external examination and 20 marks internal examination (total 100 marks), which will be conducted at the end of academic year.

Theory courses

Semester-III
CS-331: Paper-I: Systems Programming and Operating System – I
CS-332: Paper-II: Theoretical Computer Science and Compiler Construction-I
CS-333: Paper-III: Computer Networks-I
CS-334: Paper-IV: Web Development and PHP programming-I
CS-335: Paper-V: Programming in Java-I
CS-336: Paper-VI: Object Oriented Software Engineering

Semester-IV
CS-341: Paper-I: Systems Programming and Operating System – II
CS-342: Paper-II: Theoretical Computer Science and Compiler Construction-II
CS-343: Paper-III: Computer Networks-II
CS-344: Paper-IV: Web Development and PHP programming-II
CS-345: Paper-V: Programming in Java-II
CS-346: Paper-VI: Business Applications

Laboratory Courses:
CS-347: Lab Course-I: System Programming and Operating System
CS-348: Lab Course-II: Programming in Java and PHP
CS-349: Lab Course-III: Project (Using Java or PHP)
University of Pune
Proposed Draft of
T.Y. B.Sc. COMPUTER SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2010-11

TITLE OF PAPER : Systems Programming and Operating System-I
Code No. : CS-331

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Semester-III

1. Introduction [4]
1.1. Types of program – System program and Application program.

1.2. Difference between system programming and application programming.

1.3. Elements of Programming environment - Editor, Preprocessor, Assembler, Compiler, Interpreter, Linker and Loader, Debugger, Device drivers, Operating System.

1.4. Simulation of simple computer smac0 (hypothetical computer) - Memory, Registers, Condition Codes, Instruction format, Instruction Set, smac0 programs.

2. Editors [2]
2.1 Definition, need/purpose of editor.

2.2 Types of editor

2.3 Structure of editor

3. Assembler [10]
3.1 Definition.

3.2 Features of assembly language, advantages

3.3 Statement format, types of statements – Imperative, Declarative, Assembler Directive.
3.4 Constants and Literals.
3.5 Design of assembler – Analysis Phase and Synthesis Phase.
3.6 Overview of assembling process
3.7 Pass Structure of Assembler – One pass, Two pass assembler.
3.8 Problems of 1-pass assembler - forward reference, efficiency, Table of Incomplete Instructions.
3.9 Design of 2-pass Assembler – Pass-I and Pass-II
3.10 Advanced assembler directives (LTORG, ORIGIN, EQU),
3.11 Data structure of 2-pass assembler.
3.12 Intermediate Code – Need, Forms-variant I and Variant II

4. Macros and Macro Processors

4.1 Definition
4.2 Macro definition and call
4.3 Macro expansion – positional and keyword parameters
4.4 Nested macro calls
4.5 Advanced macro facilities – alteration of flow of control during expansion, expansion time variable, conditional expansion, expansion time loops. (with examples)
4.6 Design of macro preprocessor – Design overview, data structure, processing of macro definition and macro expansion (Except algorithms)
Macro assembler – Comparison of macro preprocessor and macro assembler. Pass structure of macro assembler.

5. Compilers

5.1 Definition, Aspects of compilation
5.2 The structure of Compiler
   Phases of Compiler – Lexical Analysis, Syntax Analysis, Semantic Analysis, Intermediate Code generation, code optimization, code generation
5.3 Memory allocation – static and dynamic memory allocation, memory allocation in block structure languages, Array allocation and access.
5.4 Compilation of expression – Concepts of operand descriptors and register descriptors with example. Intermediate code for expressions – postfix notations, triples and quadruples, expression trees.

5.5 Code Optimization – Optimizing transformations - compile time evaluation, elimination of common sub expressions, dead code elimination, frequency reduction, strength reduction

6. Compiler Design options

6.1 Interpreter - Use of interpreter, definition, Comparison with compiler, Overview of interpretation, Pure and impure interpreter.

6.2 P-code compiler

7. Linker and Loader

7.1 Introduction

7.2 Concept of bindings, static and dynamic binding, translated, linked and load time addresses.

7.3 Relocation and linking concept – program relocation, performing relocation, public and external references, linking, binary program, object module.

Relocatability - nonrelocatable, relocatable, and self relocating programs (no algorithms).

Linking for Overlays.

Reference Books:

1. Systems Programming and Operating Systems by D.M.Dhamdhere

   (Second Revised Edition). [Chapters: 2, 3, 4, 5(5.1, 5.3, 5.4, 5.5), 6, 7]

2 System Software - An introduction to Systems Programming

   - Leland L. Beck (Pearson Education) [ Chapter: 1]


   (Second Edition) Pearson Education [Chapter: 5 (5.2)]
University of Pune

Proposed Draft of

T.Y. B.Sc. COMPUTER SYLLABUS

TO BE IMPLEMENTED FROM ACADEMIC YEAR 2010-11

TITLE OF PAPER : Systems Programming and Operating System-II

Code No. : CS-341

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Semester-IV

Total Lectures:48

1. Introduction

1.1 What Operating System Do – User View, System View, Defining OS
1.2 Computer System Organization
1.3 Computer System Architecture – Single processor system, Multiprocessor systems, Clustered Systems
1.4 Operating System Structure
1.5 Operating System Operations – Dual mode operation, Timer
1.6 Process Management
1.7 Memory Management
1.8 Storage Management – File system management, Mass storage management, Cashing, I/O systems
1.9 Protection and Security
1.10 Distributed Systems
1.11 Special Purpose System – Real time embedded systems, Multimedia systems, Handheld systems,
1.12 Computer Environment – Traditional computing, Client server computing, Peer to peer computing
1.13 Open Source Operating Systems – introduction, Linux only

2. System Structure  
2.1 Operating System Services  
2.2 User Operating-System Interface – Command interpreter, GUI  
2.3 System Calls  
2.4 Types of System Calls – Process control, File management, Device management, Information maintenance, Communication, Protection  
2.5 System Programs  
2.6 Operating System Structure – Simple structure, Layered approach, Micro kernels, Modules  
2.7 Virtual Machines – Introduction, Benefits  
2.8 System Boot

3. Process Management  
3.2 Process Scheduling – Scheduling queues, Schedulers, context switch  
3.3 Operations on Process – Process creation with program using fork(), Process termination  
3.4 Interprocess Communication – Shared memory system, Message passing systems.

4. Multithreaded Programming  
4.1 Overview  
4.2 Multithreading Models  
4.3 Thread Libraries – Pthreads

5. Process Scheduling  
5.1 Basic Concept – CPU-I/O burst cycle, CPU scheduler, Preemptive scheduling, Dispatcher  
5.2 Scheduling Criteria  
5.3 Scheduling Algorithms – FCFS, SJF, Priority scheduling, Round-robin scheduling, Multiple queue scheduling, Multilevel feedback queue scheduling
5.4 Thread Scheduling

6. Process Synchronization

6.1 Background
6.2 Critical Section Problem
6.3 Synchronization Hardware
6.4 Semaphores: Usage, Implementation

7. Deadlocks

7.1 System model
7.2 Deadlock Characterization – Necessary conditions, Resource allocation graph
7.3 Deadlock Prevention
7.4 Deadlock Avoidance - Safe state, Resource allocation graph algorithm, Banker’s Algorithm
7.5 Deadlock Detection
7.6 Recovery from Deadlock – Process termination, Resource preemption

8. Memory Management

8.1 Background – Basic hardware, Address binding, Logical versus physical address space, Dynamic loading, Dynamic linking and shared libraries
8.2 Swapping
8.3 Contiguous Memory Allocation – Memory mapping and protection, Memory allocation, Fragmentation
8.4 Paging – Basic Method, Hardware support, Protection, Shared Pages
8.5 Segmentation – Basic concept, Hardware
8.6 Virtual Memory Management – Background, Demand paging, Performance of demand paging, Page replacement – FIFO, OPT, LRU, Second chance page replacement
9. File System

9.1 File concept
9.2 Access Methods – Sequential, Direct, Other access methods
9.3 Directory and Disk Structure – Storage structure, Directory overview, Single level directory,
   Two level directory, Tree structure directory, Acyclic graph directory, General graph
directory
9.4 Allocation Methods – Contiguous allocation, Linked allocation, Indexed allocation
9.5 Free Space Management – Bit vector, Linked list, Grouping, Counting, Space maps

Reference books:

2) Operating Systems : Principles and Design – Pabitra Pal Choudhary (PHI Learning
   Private Limited)

**Note:** Case study specified in reference book may be taken for the detail study of syllabus, but
not recommended to ask in University examination.
University of Pune
Proposed Draft of
T.Y. B.Sc. COMPUTER SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2010-11

TITLE OF PAPER: Theoretical Computer Science (TCS)
Code No. : CS-332

AIM
To have a introductory knowledge of automata, formal language theory and computability.

OBJECTIVES
• To have an understanding of finite state and pushdown automata.
• To have a knowledge of regular languages and context free languages.
• To know the relation between regular language, context free language and corresponding recognizers.
• To study the Turing machine and classes of problems.

1. Preliminaries [3 Lectures]
   1.1 Symbol, Alphabet, String, Prefix & Suffix of Strings, Sets, Operations on sets, Finite & infinite sets Formal Language
   1.2 Relation, Equivalence Relation, (reflexive, transitive and symmetric closures)
   1.3 Principle of Induction

2. Finite Automata [12 Lectures]
   2.1 Deterministic finite Automaton – Definition, DFA as language recognizer, DFA as a pattern recognizer
   2.2 Nondeterministic finite automaton – Definition and Example
2.3 NFA with ε-transitions  Definition and Example
2.4 NFA TO DFA : Method (From Book 4) & NFA with ε- to DFA  & Examples
2.5 Finite automaton with output – Mealy and Moore machine, Example
2.6 Minimization of DFA, Algorithm & Problem using Table Method

3. Regular languages  [5 Lectures]
3.1 Regular Expressions (RE) : Definition & Example
3.2 Regular Expressions Identities
3.3 Equivalence of FA and RE (RE To FA)
3.4 Pumping lemma for regular languages and applications
3.5 Closure properties of regular Languages
(Union, concatenation, Intersection and Kleene closure)

4. Context Free Grammar & Languages  [12 Lectures]
4.1 Chomsky Hierarchy
4.2 CFG : Definition & examples, Derivation, LMD, RMD, Reduction, Parse Tree
4.3 Ambiguous Grammar : Concept & Examples
4.4 Simplification of CFG :
   4.4.1 Removing Useless Symbols,
   4.4.2 Removing unit productions
   4.4.3 Removing ε productions & Nullable symbols
4.5 Normal Forms :
4.5.1 Chomsky Normal Form (CNF) Method & Problem

4.5.2 Greibach Normal form (GNF) Method & Problem

4.6 Regular Grammar : Definition, Equivalence of FA & Regular Grammar
   4.6.1 Construction of regular grammar equivalent to a given DFA
   4.6.2 Construction of a FA from the given right linear grammar

4.7 Closure Properties of CFL’s(Union, concatenation and Kleene closure) Method and examples

5. Push Down Automaton [6 Lectures]
   5.1 Definition of PDA and examples
   5.2 Construction of PDA using empty stack and final State method : Examples using stack method
       Equivalence between acceptance by final state And Empty stack method & examples
   5.3 Definition DPDA & NPDA, their correlation and Example of NPDA
   5.4 CFG (in GNF) to PDA : Method and examples

6. Turing Machine [10 Lectures]
   6.1 The Turing Machine Model and Definition of TM
   6.2 Language accepted by TM
   6.3 Design of Turing Machines
   6.4 Nondeterministic Turing Machine
   6.5 Problems on language recognizers
   6.6 Recursive Languages
6.6.1. Recursive and Recursively enumerable Languages.

6.6.2. Difference between recursive and recursively enumerable language.

6.7 Types of Turing Machines (Iterated, Composite and Universal)

6.8 Turing Machine Limitations

6.9 Decision Problem, Undecidable Problem, Halting Problem of TM

6.10 Introduction to LBA (Basic Model) & CSG. (Without Problems)

References:

1. Introduction to Automata theory, Languages and computation
   John E. Hopcroft and Jeffrey Ullman – Narosa Publishing House

2. Introduction to Automata theory, Languages and computation
   John Hopcroft, Rajeev Motwani and Jeffrey Ullman – Third edition Pearson Education

3. Introduction to Computer Theory

4. Principles of Compiler Design (Refer 2.4)
   Alfred V. Aho and Jeffrey Ullman – Narosa Publishing House

5. Theory of Computer Science (Automata, Language & Computation)

6. Introduction to Languages and The Theory of Computation
   John C. Martin TMH, Second Edition
University of Pune  
Proposed Draft of  
T.Y. B.Sc. COMPUTER SYLLABUS  
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2010-11  
TITLE OF PAPER : COMPILER CONSTRUCTION  
Code No. : CS-342  

Semester-IV       Total Lectures:48

Aim : To understand the various phases of a compiler and to develop skills in designing a compiler

Objective :  
• To understand, design and implement a lexical analyzer.
• To understand, design and implement a parser.
• To understand, design code generation schemes

1. Introduction [2 Lectures]  
Translator-Compiler, Interpreter definition,
Phase of compiler
Introduction to one pass & Multipass compilers, cross compiler, Bootstrapping

2. Lexical Analysis [6 Lectures]  
Review of Finite automata as a lexical analyzer,
Applications of Regular Expressions and Finite Automata( lexical analyzer, searching using RE), Input buffering, Recognition of tokens
LEX: A Lexical analyzer generator (Simple Lex Program)
Error handling.

3. Parser

Definition

**Top-Down Parser**

Top-Down Parsing with Backtracking: Method & Problems

Drawbacks of Top-Down parsing with backtracking

Elimination of Left Recursion(direct & indirect)

Recursive Descent Parsing : Definition

Need for Left Factoring & examples

Implementation of Recursive Descent Parser

Using Recursive Procedures

Predictive [LL(1)] Parser(Definition, Model)

Implementation of Predictive Parser[LL(1)]

FIRST & FOLLOW

Construction of LL(1) Parsing Table

Parsing of a String using LL(1) Table

**Bottom-Up Parsers**

Operator Precedence Parser

Basic Concepts

Operator Precedence Relations form Associativity & Precedence

Operator Precedence Grammar
Algorithm for LEADING & TRAILING (with ex.)

Algorithm for Operator Precedence Parsing (with ex.)

Precendence Functions

Shift Reduce Parser

Reduction

Handle

Handle Pruning

Stack Implementation of Shift Reduce

Parser (with examples)

LR Parser

Model

Types [SLR(1), Canonical LR, LALR]

Method & examples.

YACC (from Book 3)

4. Syntax directed Translation (SDT) [12 Lectures]

4.1 Syntax Directed Definitions (SDD)

4.1.1 Inherited & Synthesized Attributes

4.1.2 Evaluating an SDD at the nodes of a Parse Tree, Example

4.2 Evaluation Orders for SDD’s

4.2.1 Dependency Graph

4.2.2 Ordering the Evaluation of Attributes
4.2.3 S-Attributed Definition
4.2.4 L-Attributed Definition
4.2.3 Semantic Rules With Controlled Side Effects

4.3 Application of SDT

4.3.1 Construction of syntax trees,
4.3.2 The Structure of a Type

4.4 SDT Schemes

4.4.1 Postfix Translation Scheme
4.4.2 Parser Stack Implementation of Postfix SDT’s

5. Code Generation & Optimization

5.1 Variants of Syntax Tree
5.1.1. DAG for Expression
5.1.2 The Value-number method for constructing DAG’s
5.2 Issues in design of code generator
5.3 Definition of basic block, flow graphs
5.4 Directed acyclic graph (DAG) representation of basic block
5.5 Loop Optimization (D dominators and its properties)

(Prerequisites for 5.5 Optimization from Syspro & OS Course)

References :-

1) Compilers: Principles, Techniques, and Tools

Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman
2) Principles of Compiler Design By:
   Alfred V. Aho, Jeffrey D. Ullman (Narosa Publication House)

3) LEX & YACC (O’reilly Publication)
### University of Pune

**Proposed Draft of**

**T.Y. B.Sc. COMPUTER SYLLABUS**

**TO BE IMPLEMENTED FROM ACADEMIC YEAR 2010-11**

**TITLE OF PAPER :** Computer Networks-I

**Code No. :** CS-333

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#### Semester-III

<table>
<thead>
<tr>
<th>Ch. No</th>
<th>Topic</th>
<th>Total Lectures</th>
<th>Reference Books</th>
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<tbody>
<tr>
<td>1</td>
<td><strong>Introduction to Computer Networks</strong> <em>(Lectures: 7)</em></td>
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<td>Computer Networks</td>
<td><strong>goals and applications</strong></td>
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<tr>
<td></td>
<td>Network Hardware</td>
<td><strong>broadcast and point-to-point, topologies – star, bus, mesh, ring etc.</strong></td>
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<tr>
<td></td>
<td>Network Types</td>
<td>LAN, MAN, WAN, Wireless Networks, Home Networks, Internetworks, Protocols and Standards – <em>Definition of Protocol, Defacto and Dejure standard</em> <em>Peer –to-peer and Server – based LAN</em></td>
<td>3</td>
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<tr>
<td></td>
<td>Network Software</td>
<td>Protocol Hierarchies - <em>layers, protocols, peers, interfaces</em></td>
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</table>
### Network Architecture

- Protocol stack
- Design issues of the layers – addressing, error control, flow control, multiplexing and de-multiplexing, routing
- Connection-oriented and connectionless service
- Service Primitives – *listen, connect, receive, send, disconnect and Berkley Socket*
- The relationships of services to protocol

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<th>2</th>
<th>Network Models</th>
<th>(Lectures: 5)</th>
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<tr>
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<td>OSI Reference Model</td>
<td>Functionality of each layer</td>
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<td>TCP/IP Reference Model</td>
<td>Introduction to IP, TCP, and UDP</td>
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<td>TCP/IP Protocol Suite</td>
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<td>Comparison of OSI and TCP/IP model</td>
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<td>Addressing</td>
<td>Physical, Logical and Port addresses</td>
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<tr>
<th>3</th>
<th>The Physical Layer</th>
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<tbody>
<tr>
<td></td>
<td>Basic Concepts</td>
<td>Signals, Types – Analog and Digital Signals, Bit rate, bit length, baseband transmission</td>
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<td>Transmission Impairments – <em>attenuation, distortion and noise</em></td>
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<td>Data Rate Limits – <em>Nyquist’s bit rate formula for noiseless channel and Shannon’s law</em></td>
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<td><em>(Enough problems should be covered on every topic.)</em></td>
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<td>Performance of the Network</td>
<td>Bandwidth, Throughput, Latency(Delay), Bandwidth –Delay Product, Jitter</td>
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<td>(Enough problems should be covered on every topic.)</td>
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<td>Line Coding</td>
<td>Characteristics, Line Coding Schemes – Unipolar, NRZ, RZ, Manchester and Differential Manchester</td>
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<td>Transmission Modes</td>
<td>Parallel Transmission Serial Transmission – Asynchronous and Synchronous</td>
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<td>Multiplexing</td>
<td>FDM and TDM</td>
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<td>Switching</td>
<td>Circuit Switching, Message Switching and Packet Switching</td>
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<tr>
<td>ISDN</td>
<td>Services, Evolution, Architecture</td>
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<p>| 4 | The Data Link Layer (Lectures:12) | |
| --- | | |
| 4 | Design Issues | Services to Network Layer, Flow Control, Error Control | 1 | |
| 4 | Framing | Character Count, Byte Stuffing, Bit Stuffing and Physical Layer Coding Violations | 2 | TAN Ch3 |
| 4 | Error Control | Hamming Code and CRC (Enough problems should be covered) | 2 | TAN Ch3. |</p>
<table>
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<tr>
<th><strong>on every topic.)</strong></th>
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<tbody>
<tr>
<td>Elementary Data Link Layer Protocols</td>
<td>Utopia, A Simplex Stop-And-Wait, A Simplex protocol for noisy channel</td>
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<tr>
<td>Data Link Layer Protocols</td>
<td>HDLC – frame format, all frame types PPP – Use, Frame Format, Use of PPP in the Internet</td>
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### 5 The Medium Access Sublayer  (Lectures: 7)

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<tr>
<td>Random Access Protocols</td>
<td>ALOHA – pure and slotted CSMA – 1-persistent, p-persistent and non-persistent CSMA/CD CSMA/CA</td>
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<td>Controlled Access</td>
<td>Reservation, Polling and Token Passing</td>
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<tr>
<td>Channelization</td>
<td>FDMA, TDMA and CDMA-Analogy, Idea, Chips, Data Representation, Encoding and Decoding, Signal Level, Sequence Generation (Enough problems should be covered on every topic.)</td>
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### 6 Wired LANS  (Lectures: 7)

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<th><strong>on every topic.)</strong></th>
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<td>IEEE Standards</td>
<td>Data Link Layer, Physical Layer</td>
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<tr>
<td>Standard Ethernet</td>
<td>MAC Sublayer – Frame Format, Frame Length, Addressing, Access Method Physical Layer – Encoding and Decoding, 10Base5, 10Base2, 10Base-</td>
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<td><em>T, 10Base-F,</em></td>
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<td>Changes In The Standard</td>
<td><em>Bridged Ethernet, Switched Ethernet, Full Duplex Ethernet</em></td>
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<td>Fast Ethernet</td>
<td><em>Goals, MAC Sublayer, Topology, Implementation</em></td>
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<td>Ten-Gigabit Ethernet</td>
<td><em>goals, MAC Sublayer, Physical Layer</em></td>
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University of Pune  
Proposed Draft of  
T.Y. B.Sc. COMPUTER SYLLABUS  
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2010-11

TITLE OF PAPER : Computer Networks-II

Code No. : CS-334

==================================================================

Semester-IV  

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<th>Course</th>
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<td><strong>Wireless LAN</strong></td>
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<td>IEEE 802.11</td>
<td>Architecture – <em>Basic Service Set</em>, <em>Extended Service Set</em></td>
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<td>Bluetooth</td>
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<td><strong>The Network Layer</strong></td>
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<td>Design Issues</td>
<td>Store-and-forward packet switching, Services Provided to the Transport Layer, Implementation of Connectionless Service, Implementation of Connection Oriented Service, Comparison of Virtual Circuit and Datagram</td>
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<tr>
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<td>Logical Addressing</td>
<td>IPV4 Addresses – Address Space, Notations, Classful Addressing, Subnetting, Super netting, Classless Addressing, Network Address Translation(NAT)</td>
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<tr>
<th>Topic</th>
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<th>Chapter</th>
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<td>Datagram Format, Fragmentation, Checksum, Options</td>
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<td>Routing</td>
<td>Properties of routing algorithm, Comparison of Adaptive and Non-Adaptive Routing Algorithms</td>
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<td>Congestion Control</td>
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<td>TAN. Ch. 5</td>
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<tr>
<td><strong>3 Address Mapping (Lectures: 04)</strong></td>
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<td>Address Resolution Protocol (ARP)</td>
<td>Cache Memory, Packet Format, Encapsulation, Operation, Four Different Cases, Proxy ARP, RARP</td>
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<td>Process-to-Process Delivery</td>
<td>Client Server Paradigm, Multiplexing and Demultiplexing, Connectionless Vs Connection-Oriented Service, Reliable Vs Unreliable</td>
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<td>User Datagram Protocol (UDP)</td>
<td>Datagram Format, Checksum, UDP operations, Use of UDP</td>
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<td>The Application Layer  (Lectures:07)</td>
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<td>Domain Name System (DNS)</td>
<td>Name Space, Domain Name Space, Distribution of Name Space, DNS in the Internet, Name – Address Resolution</td>
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<td>E-MAIL</td>
<td>Architecture, User Agent, Message Transfer Agent-SMTP, Message Access Agent-POP, IMAP, Web Based Mail</td>
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<td>File Transfer Protocol (FTP)</td>
<td>Communication over control connection, Communication over Data Connection, Anonymous FTP</td>
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<td>HTTP</td>
<td>HTTP Transaction, Persistent and Non-persistent Connection, Proxy Server</td>
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<td>Internetworking Devices  (Lectures:5)</td>
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<td>Physical Layer Devices</td>
<td>Repeaters, Hubs</td>
<td>FORO. Ch. 15</td>
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<td>Data Link Layer Devices</td>
<td>Bridges – <em>Transparent and Source Routing Bridges, Bridges Connecting Different LANs</em></td>
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<td>FORO. Ch. 15</td>
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<td>Network Layer Devices</td>
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<td><strong>Gateways</strong></td>
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<td><strong>Virtual LANs</strong></td>
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<td>Switches,</td>
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<td>Advantages</td>
<td>Principles (Problems should be</td>
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**Communication Security**
- Firewalls

**Web Security**
- Threats, Secure Naming, DNS Spoofing – *DNS Spoofing, Secure DNS, Self Certifying names*

**Mobile Mode Security**
- Java Applet Security, ActiveX, JavaScript, Viruses

**Social Issues**
- Privacy, Anonymous Remailers, Freedom of Speech, Steganography

---

**Reference Books:**

1) *Computer Networks* by Andrew Tanenbaum, Pearson Education.
2) *Data Communication and Networking* by Behrouz Forouzan, TATA McGraw Hill.

Guidelines For Examination:

1) Frame and Packet formats should no be asked.
2) Problems should be asked atleast for 10 marks.
University of Pune

Proposed Draft of

T.Y. B.Sc. COMPUTER SYLLABUS

TO BE IMPLEMENTED FROM ACADEMIC YEAR 2010-11

TITLE OF PAPER : Web Development and PHP programming-I

Code No. : CS-334

==================================================================

Semester-III

1. Introduction to web techniques
   HTTP basics, Introduction to Web server and Web browser
   Introduction to PHP
   What does PHP do?
   Lexical structure
   Language basics
   Book 1 chapter 2

2. Function and String
   Defining and calling a function
   Default parameters
   Variable parameters, Missing parameters
   Variable function, Anonymous function
   Types of strings in PHP
   Printing functions
   Encoding and escaping

Total Lectures: 48
Comparing strings
Manipulating and searching strings
Regular expressions

Book 1 chapter 3 and 4

3. **Arrays**
   - Indexed Vs Associative arrays
   - Identifying elements of an array
   - Storing data in arrays
   - Multidimensional arrays
   - Extracting multiple values
   - Converting between arrays and variables
   - Traversing arrays
   - Sorting
   - Action on entire arrays
   - Using arrays

        Book 1 chapter 5

4. **Introduction to Object Oriented Programming**
   - Classes
   - Objects
   - Introspection
   - Serialization
   - Inheritance
   - Interfaces
   - Encapsulation

        Book 1, 2 chapter 12

5. **Files and directories**

        6
Working with files and directories

- Opening and Closing, Getting information about file, Read/write to file,
- Splitting name and path from file, Rename and delete files

Reading and writing characters in file
Reading entire file
Random access to file data
Getting information on file
Ownership and permissions

   Book 2 chapter 7

6. Web Techniques

   Variables
   - Server information
   - Processing forms
   - Setting response headers
   - Maintaining state
   - SSL

   Book 1 chapter 7

References

1. Programming PHP
   Rasmus Lerdorf and Kevin Tatroe
   O'Reilly publication

2. Beginning PHP 5
   Wrox publication

3. PHP web services
   Wrox publication

4. AJAX Black Book
   Kogent solution
5. Mastering PHP  
   BPB Publication
6. PHP cookbook  
   O'Reilly publication
7. Learning PHP and MYSQL  
   O'Reilly publication
8. PHP and MYSQL  
   O'Reilly publication
9. PHP for Beginners  
   SPD publication
10. www.php.net.in
11. www.W3schools.com
12. www.wrox.com
University of Pune

Proposed Draft of

T.Y. B.Sc. COMPUTER SYLLABUS

TO BE IMPLEMENTED FROM ACADEMIC YEAR 2010-11

TITLE OF PAPER : Web Development and PHP programming-II

Code No. : CS-344

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Sem IV

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<tr>
<td>1. Databases</td>
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<tr>
<td>Using PHP to access a database</td>
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<tr>
<td>Relational databases and SQL</td>
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<td>PEAR DB basics</td>
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<td>Advanced database techniques</td>
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<td>Sample application (Mini project)</td>
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Book 1 chapter 9

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<td>2. Generating Graphics</td>
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<tr>
<td>Basics of computer graphics</td>
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<tr>
<td>Working with Raster images</td>
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<td>Using text in images</td>
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Book 2 chapter 16

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<td>3. XML</td>
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<tr>
<td>What is XML?</td>
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<tr>
<td>XML document Structure</td>
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<tr>
<td>PHP and XML</td>
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Total Lectures:48
XML parser
The document object model
The simple XML extension
Changing a value with simple XML

Book 2 chapter 8

4. **Handling email with php** 8
   Email background
   Internet mail protocol
   Structure of an email message
   Sending email with php
   Email id validation and verification

   Book 2 chapter 15

5. **Web services** 8
   Web services concepts
   WSDL
   Introduction to
   SOAP XML-RPC
   Creating web services
   Calling web services

   Book 3 chapter 3

6. **Ajax** 8
   Understanding java scripts for AJAX
   AJAX web application model
   AJAX –PHP framework
   Performing AJAX validation
   Handling XML data using php and AJAX
   Connecting database using php and AJAX
References

6. Programming PHP  
   Rasmus Lerdorf and Kevin Tatroë  
   O'Reilly publication

7. Beginning PHP 5  
   Wrox publication

8. PHP web services  
   Wrox publication

9. AJAX Black Book  
   Kogent solution

10. Mastering PHP  
    BPB Publication

6. PHP cookbook  
   O'Reilly publication

7. Learning PHP and MYSQL  
   O'Reilly publication

8. PHP and MYSQL  
   O'Reilly publication

9. PHP for Beginners  
   SPD publication

10. www.php.net.in

11. www.W3schools.com

12. www.wrox.com
University of Pune
Proposed Draft of
T.Y. B.Sc. COMPUTER SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2010-11

TITLE OF PAPER : Programming in Java-I
Code No. : CS-335

Semester-III Total Lectures:48

1. An Introduction to Java
   • A Short History of Java
   • Features of Java
   • Comparison of Java and C++
   • Java Tools And Editors(Appletviewer, Jar, Jdb)
   • Java Environment.

2. An Overview of Java
   • Types of Comments.
   • Built In Data Types.
   • Variables and Constants(Final Keyword Related to variables)
   • Operators
   • Memory Allocation Using new Operator.
   • Output using println() method
   • Control Statements.
   • Arrays, static and dynamic
   • Simple Java Program.

3. Objects and Classes
   • Defining Your Own Classes and Use of ‘this’ Keyword.
   • Using Predefined Classes
   • Object the cosmic class
   • Constructor and Overloading Constructors
• Method Parameters
• Static Fields and Methods
• Access Specifiers (public, protected, private, friendly(defualt))
• Creating Accesses and using Packages
• Wrapper Classes
• Garbage Collection(finalize() Method)

4. Inheritance (5)
• Inheritance Basics (extends Keyword) and Types of Inheritance
  Superclass, and Subclass and use of Super Keyword
• Method Overriding and Use of final keyword related to method and class
• Use of Abstract class

5. Interfaces and Inner Classes (4)
• Defining and Implementing Interfaces
• Object Cloning
• Inner Classes

6. Exception Handling (5)
• Dealing Errors
• Catching exception and exception handling
• Creating user defined exception.
• Using assertion

7. Strings, Streams and Files. (8)
• String class and StringBuffer Class
• Stream classes
  Byte Stream classes
  Character Stream Classes
• Using the File class
• Creation of files
• Reading/Writing characters and bytes
• Handling primitive data types
8. User Interface Components with AWT and Swing (11)
   - What AWT? What is Swing? Difference between AWT and Swing.
   - The MVC Architecture and Swing
   - Layout Manager and Layouts, The JComponent class
   - Components - Buttons and Labels (JButton, JLabel), Checkboxes and Radio Buttons (JCheckBox and JRadioButton), Lists and Combo Boxes (JList and JComboBox) along with the JScrollPane Class, Menus – Jmenu and the JPopupMenu Class, JMenuItem and JCheckBoxMenuItem, Scrollbars and Sliders(JScrollBar and JSlider), Dialogs (Message, confirmation, input (like file selection) and options(like color chooser))
   - Event Handling: Event sources, Listeners, Adapters, Anonymous class

9. Applet Programming (3)
   - Applet Life Cycle.
   - Applet HTML Tags.
   - Passing parameters to Applet
   - Repaint() and Update() method
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Proposed Draft of
T.Y. B.Sc. COMPUTER SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2010-11

TITLE OF PAPER : Programming in Java-II
Code No. : CS-345

===================================================================

Semester-IV

1. Graphics Programming Using Swing
   - Working with 2D Basic Shapes
   - Using Color
   - Using Font
   - Displaying Images

2. Multithreading
   - What are threads
   - Running and starting thread
   - Running multiple threads
   - The Runnable interface
   - Thread priorities
   - Synchronization and interthread communication

3. Database Programming
   - The design of jdbc, jdbc configuration
   - Types of drivers
   - Executing sql statements, query execution
   - Scrollable and updatable result sets, rowset
   - Metadata, transactions

4. Collections

===================================================================

Total Lectures: 48

1. Graphics Programming Using Swing: 4
2. Multithreading: 6
3. Database Programming: 10
4. Collections: 6
• Collections, Introduction to the Collection framework (Interfaces, Implementation and algorithms), Interfaces, collection classes: Set, List, Queue and Map
• Set: HashSet, TreeSet, and LinkedHashSet
• Interfaces such as Lists, Set, Vectors, LinkedList, Comparator, Iterator, hashtable.

5. Servlet (10)
• Introduction to Servlet (HTTP Servlet)
• Life Cycle of servlet
• Handling get and post request (HTTP)
• Data handling using servlet
• Creating and cookies
• Session tracking using HTTP servlet

6. JSP (5)
• Getting Familiar with JSP Server
• First JSP
• Adding Dynamic contents via expressions
• Scriptlets, Mixing Scriptlets and HTML
• Directives, Declaration, Tags and Session

7. Networking (5)
• The java.net package
• Connection oriented transmission – Stream Socket Class
• Creating a Socket to a remote host on a port (creating TCP client and server)
• Simple Socket Program Example.

8. JavaBeans Components (2)
• Why beans?
• The bean-writing process
• Using beans to build an application
Reference Books:

1) Complete reference Java by Herbert Schildt (5th edition)
2) Java 2 programming black books, Steven Horlzner
3) Programming with Java, A primer, Forth edition, By E. Balagurusamy
4) Java servlet Programming by Jason Hunter, O’Reilly
University of Pune
Proposed Draft of
T.Y. B.Sc. COMPUTER SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2010-11

TITLE OF PAPER : Object Oriented Software Engineering
Code No. : CS-336

Semester-III
Total Lectures:48

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<th>Name of the Chapter / Topic</th>
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<td>1</td>
<td>Object Oriented Concepts and Principles</td>
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<td>- 1.1.2 Object</td>
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<td>- 1.1.2 Classes and Instance</td>
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<td>- 1.2.1 Introduction</td>
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<td>- 1.2.2 Function/Data Methods (With Visibility)</td>
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<td>- 1.2.4 Object Oriented Construction</td>
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<td>1.3 Identifying the Elements of an Object Model</td>
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<td>Basic Structural Modeling</td>
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<td>Use Cases and Use Case Diagram with stereo types (Minimum three examples should be covered)</td>
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<td>Understanding Requirements</td>
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<td>6.4</td>
<td>Use Case Model From Inception to Elaboration</td>
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<td>7</td>
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<td>7.1</td>
<td>The Booch Method, The Coad and Yourdon Method and Jacobson Method and Raumbaugh Method</td>
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<td>The Generic Components of the OO Design Model</td>
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<td>Concurrency and Sub System Allocation</td>
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<td>Task Management Component</td>
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8.1 Component
8.2 Components Diagram
   (Minimum two examples should be covered)
8.3 Deployment Diagram
   (Minimum two examples should be covered)
8.4 Collaboration Diagram
   (Minimum two examples should be covered)

9 Object Oriented Testing

9.1 Object Oriented Testing Strategies
9.2 Test Case Design for Object Oriented Software
9.3 Inter Class Test Case Design

References:

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<td>1</td>
<td>Grady Booch, James Rambaugh</td>
<td>The Unified Modeling Language User/Reference Guide</td>
<td>Pearson Education INC</td>
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<td>Ivar Jacobson</td>
<td>Object Oriented Software Engineering</td>
<td>Pearson Education INC</td>
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<td>Craig Larman</td>
<td>Applying UML and Patterns</td>
<td>Pearson Education INC</td>
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<td>McGraw Hill</td>
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University of Pune
Proposed Draft of
T.Y. B.Sc. COMPUTER SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2010-11

TITLE OF PAPER : Business Applications
Code No. : CS-346

Semester-IV

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<th>Name of the Chapter / Topic</th>
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<td>Sales and Distribution Management System</td>
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<td>1.1 Sales Budgeting-Market Segments/Customer/Product</td>
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<td>Human Resource Management System</td>
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<td>2.3 Employee Appraisal – Performance Efficiency</td>
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<td>2.4 Employee Training</td>
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<td>2.5 Leave Accounting and Payroll</td>
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<td>2.6 Case Study on Human Resource Management</td>
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<td>3.</td>
<td>Manufacturing / Production Planning Control System</td>
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<td>3.1</td>
<td>Capacity Requirements Planning for Equipment, MRP-I</td>
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<td>3.2</td>
<td>Manpower and Time, Material Resource Planning, MRP-II</td>
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<td>3.3</td>
<td>Production Planning – Work Order Management- EOQ</td>
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<td>3.4</td>
<td>Material Procurement –Indenting, Purchasing, Vendor Analysis, BOM, Supplier Bill Passing and Receipt of Material</td>
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<td>3.5</td>
<td>Case Study on Manufacturing/ Production Planning and Control</td>
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</tbody>
</table>

| 4.1 | Saving Bank Account Processing – Opening, Cancellation, Transfer, Transaction (Deposit, Withdrawal), Cheque Book issue process of Saving A/c’s |
| 4.2 | ATM Application |
| 4.3 | E-Banking |
| 4.4 | Biometric Devices and its scope in Applications |
| 4.5 | Case Study on Banking |

| 5.1 | Enterprises Resource Planning-Evaluation, Scope, Package ERP Solution Vs Custom Development Features of ERP, Different Modules of ERP, Selection of ERP Software |
| 5.2 | Supply Chain Management (SCM) |
| 5.3 | Customer Relationship Management (CRM): CRM covers Marketing, Sales and Service functions of a Company, CRM Process, Customer Acquisition / Development, Retention, Call Centre / Knowledge Centre, KPO’s, BPO’s |
| 5.4 | International Business Management-Basic Concept, Market Potential opportunities, Competitive Advantage |
| 5.5 | TQM – Total Quality Management, Six Sigma |

*Demonstration of all above mentioned real life applications be arranged for the students*
References:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Author</th>
<th>Title</th>
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<tbody>
<tr>
<td>1.</td>
<td>Mayer</td>
<td>Production and Operation Management</td>
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<td>2.</td>
<td>K. Aswathapa</td>
<td>Human Resource and Personal Management</td>
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<td>3.</td>
<td>M. M Shaikh</td>
<td>Enterprise Resource Planning and Business Process</td>
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<tr>
<td>4.</td>
<td>Dr. Milind Oka</td>
<td>Business Applications</td>
</tr>
</tbody>
</table>
Proposed Syllabus for TY BSC COMPUTER SCIENCE PRACTICAL

Title : CS - 347 (32109) System Programming and Operating System

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Assignments: Semester-I

1. Line Editor
   - command line argument
   - singly linked list
   - display, append, help, insert, delete, search, save, copy, move, quit.

2. Assembler
   - literals
   - declarative
   - literal table
   - 2pass      START , ORIGIN , LTORG
   Set A - regular with littab/pooltab
   Set B-    intermediate code generation
     Target code generation
   Errors-   invalid stmt mnemonics
     Invalid symbol
     Invalid literal space
     Symbol used but not defined
     Defined but not used
     Duplicate declaration

3. SMACO Simulator

4. Macro Preprocessor
   - multiple macro should be supported, multiple calls to same macro
   - no nested macro

5. DFA Driver
   - input     start state(5 states)
   - use adjacency list and implement
   - take string as input and check whether string is validated or not
- error state should be rejected

6. Triples/quadruples generation

**Assignments: Semester-II**

1. Shell Simulation
   - with redirection commands and using fork do
     count, list, search, type line, set, show
   - system command should not used / for all built in programs child
     program should be created

2. CPU Scheduling
   - priority(both), SJF(both), RR

3. Deadlock Detection and avoidance
   - Bankers algorithm

4. Paging/segmentation
   - MFU, LRU, FIFO, second chance, optimal

5. Pthread Library
   - implementation of link allocation methods

6. Semaphores

**Lab-I Slip format**

2 Programs (40+40)

10 marks oral (External Examiner)

10 marks Journal (Internal Examiner)
Assignments: Semester-I

Programming in Java

1. Java Basics
   Java tools, javac, java, javap, javadoc, jdb.
   Creating objects, using new, static keyword, final.
   Setting the classpath, constructors.

2. Packages & Arrays of Objects
   Console I/O.
   Scanner.
   BufferedReader.
   Wrapper classes.

3. Inheritance & Interfaces
   Reflection using class’s class.

4. Exception Handling
   User define exceptions & use of keywords.

5. File Handling.

6. GUI Designing / AWT

7. Event Handling.

8. Applet
   Creation of an applet.
   Runtime parameter passing.

Programming in PHP

1. String Manipulation
   Implement user functions parallel to built-in functions (minimum four).

2. Assignment on Arrays
Develop an application using built-in functions viz. sorting, iterator, set, stack and searching.

3. Inheritance
Examining classes and objects using inheritance

4. Operations on Text file
Operations on files using built-in file handling functions.

5. Reading Directory file
Directory handling using built-in functions

6. Form validation (with sticky form)
Self processing and sticky form applications

Assignments: Semester-I

Programming in Advanced Java

1. Multithreading & Graphics
   Creating & starting threads (using both Runnable & Thread class).
   Multiple Threads
   Synchronization (Race Condition)
   Simple Games & Animation

2. Database Programming Using JDBC
   ResultSet MetaData
   Database MetaData

3. Collection
   LinkList, Hashtable, TreeSet, Iterator.
   Algorithms (Sort, Binary Search).

4. Servlets
   Servlet Config
   Servlet returning HTML response
   Servlet & JDBC
   Servlets which redirects to another URL
   I/P from HTML using GET/POST
Cookies & HttpSession class (Shopping, counting number of visits)
Applet/Serlvet Communication
5. JSP
   HTML with Scriptlets
   JSP tags (page, include)
   Implicit JSP Objects (request, response, session, out)
6. Networking
   Simple Client Server
   Server Handling Multiple Clients using Multiple Threading

**Programming in Advanced Java**
1. Assignment on sessions / cookies
   Develop program using session and cookies.
2. Database connectivity and database manipulation
   Develop sample application for database operations (no documentation).
3. Creating and reading image files
4. Sending an e-mail
   Offline email handling (using LAN)
5. Java script application using AJAX
   Simple application using AJAX with JAVA script and XML
6. Database access using AJAX
   Database connectivity and manipulation using AJAX

**Lab-II Slip format**
2 Programs – Java (sem I) and Web technology (sem II)
   Or Java (sem II) and Web technology (sem I)    (40+40)
10 marks oral (External Examiner)
10 marks Journal (Internal Examiner)
Title: CS – 349 (32111) Project (Using Java or PHP)

A Project of 100 marks. The marks will be converted to grade.

Grading will be as follows:

<table>
<thead>
<tr>
<th>Marks</th>
<th>Grade</th>
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<tbody>
<tr>
<td>Below 40</td>
<td>D (Indicates FAIL)</td>
</tr>
<tr>
<td>40 - 49</td>
<td>C</td>
</tr>
<tr>
<td>50 - 59</td>
<td>C+</td>
</tr>
<tr>
<td>60 – 69</td>
<td>B</td>
</tr>
<tr>
<td>70 - 79</td>
<td>B+</td>
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<tr>
<td>80 - 89</td>
<td>A</td>
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<tr>
<td>90 – 100</td>
<td>A+</td>
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### University of Pune

**Equivalence of Old Courses with New Courses**

**TYBSc Computer Science (To be implemented from 2010-11)**

<table>
<thead>
<tr>
<th>Old Course</th>
<th>New Course</th>
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<tbody>
<tr>
<td>Systems Programming &amp; Operation Systems</td>
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</tr>
<tr>
<td>Theoretical Computer Science &amp; Compiler Construction</td>
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</tr>
<tr>
<td>Computer Networks and Network Administration</td>
<td>Computer Networks-I &amp; II</td>
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<tr>
<td>Server Databases &amp; Application Development</td>
<td>Web Development and PHP programming</td>
</tr>
<tr>
<td>Programming in Java &amp; Advanced Java</td>
<td>Programming in Java-I &amp; II</td>
</tr>
<tr>
<td>Software Engineering</td>
<td>Object Oriented Software Engineering &amp; Business Applications</td>
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