

P.V.G.'s College of Science, Pune 9

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Syllabus of F.Y. B.Sc. (Computer Science)

Academic Year 2013-14

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University of Pune

Three Year Degree Course in
B. Sc. Computer Science

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1) Title of the Course : B. Sc. Computer Science

F.Y.B.Sc. Computer Science Syllabus
(To be implemented from Academic Year 2013-14)

2) Preamble:

B. Sc. Computer Science is a systematically designed three year course that prepares the student for a career in Software Industry. The syllabus of computer Science subject along with that of the three allied subjects (Mathematics, Electronics and Statistics) forms the required basics for pursuing higher studies in Computer Science. The Syllabus also develops requisite professional skills and problem solving abilities for pursuing a career in Software Industry.

3) Introduction:

At **first year of under-graduation** basic foundation of two important skills required for software development is laid. A course in programming and a course in database fundamentals forms the preliminary skill set for solving computational problems. Simultaneously two practical courses are designed to supplement the theoretical training. The second practical course also includes a preliminary preparation for website designing in the form of HTML programming.

Alongwith Computer Science two theory and one practical course each in Statistics, Mathematics and Electronics help in building a strong foundation.

At **second year under-graduation**: The programming skills are further strengthened by a course in Data structures and Object oriented programming. The advanced topics in Databases and preliminary software engineering form the second course. Two practical courses alongside help in hands-on training. Students also undertake a mini project using software engineering principles to solve a real world problem. Simultaneously two theory and one practical course each in Mathematics and Electronics help in strengthening problem solving abilities.

At **third year under-graduation**: Six theory papers in each semester and practical courses cover the entire spectrum of topics necessary to build knowledge base and requisite skill set. Third practical course also includes project work which gives students hands on experience in solving a real world problem.

Objectives:

- To develop problem solving abilities using a computer
- To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
- To imbibe quality software development practices. To create awareness about process and product standards
- To train students in professional skills related to Software Industry.
- To prepare necessary knowledge base for research and development in Computer Science
- To help students build-up a successful career in Computer Science

4) Eligibility:

Higher Secondary School Certificate (10+2) Science stream or its equivalent Examination as per the University of Pune eligibility norms.

Note: Admissions will be given as per the selection procedure / policies adopted by the respective college, in accordance with conditions laid down by the University of Pune. Reservation and relaxation will be as per the Government rules.

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5 A) Examination Pattern:

First Year B. Sc. Computer Science

Subject : Computer Science

Pattern of Examination: Annual

Theory courses (CS-101): Annual

(CS-102): Annual

Practical Course (CS-103): Annual

(CS-104): Annual

Paper/ Course No.	Title	Total Number of lectures/practicals per Term	Standard of passing		
			Internal marks out of 20	External marks out of 80	Total marks out of 100
Computer Science Paper I (CS-101)	Problem Solving Using Computers and 'C' Programmin g	Three lectures/Week (Total 80 lectures)	08	32	40 *
Computer Science Paper II CS-102)	File Organizatio n and Fundament al of Databases	Three lectures/Week (Total 80 lectures)	08	32	40 *
Computer Science Practical Paper I (CS-103)	Computer Science Practical Paper I	25 Practical slots of 4 lectures each	08	32	40 *
Computer Science Practical Paper II (CS-104)	Computer Science Practical Paper II	25 Practical slots of 4 lectures each	08	32	40 *

* Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Notes:

1. Total marks: Theory (100 + 100) = 200 marks
2. Total marks per year 200 (Theory) + 100 marks (practical)+ Grade(practical) = 300 marks +Grade
3. Internal marks for theory papers given on the basis of internal assessment tests and for practicals on continuous assessment of lab work.
4. In case of Computer Science Practical Paper II, marks out of 100 will be converted to grades

Marks	Grade
75 and above	O

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65 and above	A
55 and above	B
50 and above	C
45 and above	D
40 and above	E
Below 40 (indicates Failure)	F

Theory examination will be of three hours duration for each theory course. There shall be 5 questions each carrying equal marks. The pattern of question papers shall be:

Question 1	8 sub-questions, each of 2 marks; answerable in 2 -3 lines and based on entire syllabus
Question 2, 3 ,4 and 5	4 out of 5/6– short answer type questions; answerable in 8 – 10 lines ; mix of theory and problems

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each term. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain). There shall be 20 questions.
Practical: Continuous assessment of Lab work and mini project.

Practical Examination: Practical examination shall be conducted by the respective college at the end of the academic year. Practical examination will be of 3 hours duration for each practical course. Certified journal is compulsory to appear for practical examination. There shall be two expert and two examiners per batch for the practical examination.

Second Year B. Sc. Computer Science

No	Paper	Title: Semester I	Title: Semester II
1	Computer Science Paper I	CS-211:Data Structures using 'C'	CS-221:Object Oriented Concepts using C++
2	Computer Science Paper II	CS-212: Relational Database Management System	CS-222:Software Engineering
3	Computer Science Paper III	CS-223:Data structures Practicals and C++ Practicals	
4	Computer Science Paper IV	CS-224:Database Practicals & Mini Project using Software Engineering techniques	

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5	Mathematics Paper I	MT-211:Mathematics Paper I-Sem I	MT-221:Mathematics Paper I-Sem II
6	Mathematics Paper II	MT-212:Mathematics Paper II-Sem I	MT-222:Mathematics Paper II-Sem II
7	Mathematics Paper III	MT-223:Practical Course in Mathematics	
8	Electronics Paper I	EL-211:Electronics Paper I-Sem I	EL-221:Electronics Paper I-Sem II
9	Electronics Paper II	EL-212:Electronics Paper II-Sem I	EL-222:Electronics Paper II-Sem II
10	Electronics Paper III	EL-223:Practical Course in Electronics	
11	English	EN-211:Technical English-Sem I	EN-221:Technical English – Sem II

Pattern of examination: Semester

Theory courses (Sem I: CS-211 and CS212): Semester
 (Sem II: CS-221 and CS-222): Semester
 Practical Course (CS-223 and CS-224): Annual

Paper/ Course No.	Title	Total Number of lectures/practicals Per Semester	Standard of passing		
			Internal marks out of 10 (theory) Out of 20 (practicals)	External marks out of 40 (theory) Out of 80 (practicals)	Total passing marks out of 50 (theory) and out of 100 (practicals)
Theory Paper I (CS- 211)	Data Structures using 'C'	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Theory Paper II (CS 212)	Relational Database Management System	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Theory Paper I (CS 221)	Object Oriented Concepts using C++	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Theory Paper II (CS 222)	Software Engineering	Four lectures/Week (Total 48 per Semester)	04	16	20 *

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		Semester)			
Practical paper I (CS 223) (First & Second Semester)	Data structures Practicals and C++ Practicals	Practicals of 4 lectures each 25 practicals / year)	08	32	40 **
Practical paper II (CS 223) (First & Second Semester)	Database Practicals & Mini Project using Software Engineeri ng technique s	Practicals of 4 lectures each 25 practicals / year)	08	32	40 **

* Subject to compulsory passing in external examination and getting minimum 20 marks out of 50

** Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Notes:

1. Total marks: Theory for each semester (50 + 50) = 100 marks
2. Total marks per year 200 (Theory) + 100 marks (practicals)+Grade(practical) = 300 marks+Grade
3. Internal marks for theory papers given on the basis of Continuous internal assessment

Theory examination will be of two hours duration for each theory course. There shall be 4 questions carrying equal marks. The pattern of question papers shall be:

Question 1	10 questions, each of 1 marks	10 marks
Question 2 3	Sub-questions carrying 5 marks (2 out of 3)	10 marks each
Question 4	Sub-questions carrying marks depending on their complexity with options	10 marks

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each Semester. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain) There shall be 20 questions.

Practicals: Continuous assessment of practical performance

Practical Examination: Practical examination shall be conducted at the respective college at the end of the academic year. Practical examination will be of 3 hours duration. Certified journal is compulsory to appear for practical examination. There shall be one expert and two examiners per batch for the practical examination. One of the examiners will be external.

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Third Year B. Sc. Electronic Science

No	Paper	Title: Semester I	Title: Semester II
1	Computer Science Paper I	CS-331: System Programming	CS-341: Operating System
2	Computer Science Paper II	CS-332: Theoretical Computer Science	CS-342: Compiler Construction
3	Computer Science Paper III	CS-333: Computer Networks-I	CS-343: Computer Networks-II
4	Computer Science Paper IV	CS-334: Internet Programming- I	CS-344: Internet Programming- II
5	Computer Science Paper V	CS-335: Programming in Java-I	CS-345: Programming in Java-II
6	Computer Science Paper VI	CS-336: Object Oriented Software Engineering	CS-346: Computer Graphics
7	Computer Science Paper VII	CS-347: Practicals Based on CS-331 and CS341 – Sem I & Sem II	
8	Computer Science Paper VIII	CS-348: Practicals Based on CS-335 and CS-344 – Sem I & Sem II and Computer Graphics using Java	
9	Computer Science Paper IX	CS-349: Practicals Based on CS-334 and CS-344 – Sem I & Sem II and Project	

Subject : Computer Science

Pattern of examination: Semester

Theory courses:

(Sem III: CS-331-CS-336): Semester (Sem IV: CS-341-CS-346): Semester

Practical Course:

(CS-347-CS-349): Annual

Theory Papers					
Paper/Course No.	Title	Total Number of lectures Per Semester	Standard of passing		
			Internal marks out of 10 (theory) Out of 20 (practicals)	External marks out of 40 (theory) Out of 80 (practicals)	Total passing marks out of 50 (theory) and out of 100 (practicals)
SEM III					
CS-331	System Programming	48	4	16	20*

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CS-332	Theoretical Computer Science	48	4	16	20*
CS-333	Computer Networks-I	48	4	16	20*
CS-334	Internet Programming- I	48	4	16	20*
CS-335	Programming in Java-I	48	4	16	20*
CS-336	Object Oriented Software Engineering	48	4	16	20*
SEM IV					
CS-341	Operating System	48	4	16	20*
CS-342	Compiler Construction	48	4	16	20*
CS-343	Computer Networks-II	48	4	16	20*
CS-344	Internet Programming- I	48	4	16	20*
CS-345	Programming in Java-I	48	4	16	20*
CS-346	Computer Graphics	48	4	16	20*
Practical Papers					
CS 347 (Semester III & IV)	Practicals Based on CS-331 and CS-341 – Sem I & Sem II	25 practicals/year	08	32	40 **
CS 348 (Semester III & IV)	CS-348:Practicals Based on CS-335 and Cs-344 – Sem I & Sem II and Computer Graphics using Java	25 practicals/year	08	32	40 **

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CS 349 (Semester III & IV)	CS-349:Practicals Based on CS-334 and CS-344 – Sem I & Sem II and Project	25 practicals/ year	08	32	40 **
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* Subject to compulsory passing in external examination and getting minimum 20 marks out of 50

** Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Notes:

1. Total marks: Theory for each semester (50 × 6) = 300 marks
2. Total marks per year 600 (Theory) + 300 marks (practicals) = 900 marks
3. Internal marks for theory papers given on the basis of continuous internal assessment

Theory examination will be of two hours duration for each theory course. There shall be 4 questions carrying equal marks. The pattern of question papers shall be:

Question 1	10 questions, each of 1 marks	10 marks
Question 2 and 3	Sub-questions carrying 5 marks (2 out of 3)	10 marks each
Question 4	Sub-questions carrying marks depending on their complexity with options	10 marks

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each Semester. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain) There shall be 20 questions.

Practicals: one internal assessment test + practical journals + attendance + activity.

Practical Examination: Practical examination shall be conducted at the respective college at the end of the academic year. Practical examination will be of 3 hours duration. Certified journal is compulsory to appear for practical examination. There shall be one expert and two examiners per batch for the practical examination. One of the examiners will be external.

5 B) Standard of Passing:

- i. In order to pass in the first year theory examination, the candidate has to obtain 40 marks out of 100 in each course. (Minimum 32 marks out of 80 must be obtained in the University Theory Examination.)
- ii. In order to pass in the Second Year and Third Year theory examination, the candidate has to obtain 20 marks out of 50 in each course of each semester.

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(Minimum 16 marks out of 40 must be obtained in the University Theory Examination.)

- iii. In order to pass in practical examination, the candidate has to obtain 40 marks out of 100 in each course. (Minimum 32 marks out of 80 must be obtained in the University Examination.)

5 C) ATKT Rules:

While going from F.Y.B.Sc. to S.Y.B.Sc. at least 8 courses (out of total 13) should be passed; however all F.Y.B.Sc. courses should be passed while going to T.Y.B.Sc. While going from S.Y.B.Sc. to T.Y.B.Sc., at least 12 courses (out of 22) should be passed (Practical Course at S.Y.B.Sc. will be equivalent to 2 courses).

5 D) Award of Class:

The class will be awarded to the student on the aggregate marks obtained during the second and third year in the principal subject only. The award of the class shall be as follows:

1	Aggregate 70% and above	First Class with Distinction
2	Aggregate 60% and more but less than 70%	First Class
3	Aggregate 55% and more but less than 60%	Higher Second Class
4	Aggregate 50% and more but less than 55%	Second Class
5	Aggregate 40% and more but less than 50%	Pass Class
6	Below 40%	Fail

5 E) External Students: There shall be no external students.

5 F) Setting question papers:

F.Y.B.Sc.: For theory papers I and II annual question papers shall be set by the University of Pune and assessment done at the respective colleges. Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject. For Practical Papers, the Question paper slips will be provided by the University of Pune and assessment done at the respective colleges.

S.Y.B.Sc. and T.Y.B.Sc.: For theory papers I and II for each semester and also for the annual practical examination question papers set by the University of Pune. Centralized assessment for theory papers done as per the University instructions. Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject. For Practical Papers: Papers shall be set by the University of Pune and assessment done by the internal examiner and external examiner appointed by University of Pune.

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5G) Verification and Revaluation Rules:

As per university Statues and rules for verification and revaluation of marks in stipulated time after declaration of the semester examination result.

6) Course Structure:

Duration: The duration of B.Sc. Computer Science Degree Program shall be three years.

a) All are Compulsory Papers:

F.Y.B.Sc. : 2 Theory + 2 Practical (Annual)

S .Y.B.Sc.: 2 Theory per semester + 2 Practical (Annual)

T.Y.B.Sc.: 6 Theory per semester + 3 Practical (Annual)

b) Question Papers :

F.Y.B.Sc.Theory paper:

University Examination – 80 marks (at the end of 2nd term)

Internal Examination – 20 marks

S.Y / T.Y. - B.Sc.Theory paper:

University Examination – 40 marks (at the end of each term)

Internal Examination – 10 marks

F.Y. / S.Y / T.Y. - B.Sc.Practical Paper:

University Examination – 80 marks (at the end of 2nd term)

Internal Examination – 20 marks

c) **Medium of Instruction:** The medium of instruction for the course shall be English.

7) Equivalence of Previous Syllabus:

Old Course (2008 Pattern)	New Course (2013 Pattern)
Paper I: Introduction to Computers and 'C' Programming	CS-101:Problem Solving Using Computers and 'C' Programming
Paper II: File Organization and Fundamental of Databases	CS 102:File Organization and Fundamental of Databases
Paper III: Computer Science Practical paper I	CS-103: Computer Science Practical paper I
Paper IV: Computer Science Practical paper II	CS-104: Computer Science Practical paper II

8) **University Terms:** Dates for commencement and conclusion for the first and second terms will be declared by the University authorities. Terms can be kept by only duly admitted students. The term shall be granted only on minimum 75 percent attendance at theory and practical course and satisfactory performance during the term.

9) **Qualification of Teachers:**M.Sc. Computer Science/M.C.A. or equivalent master degree in science with class/grades and NET/SET as per prevailing University/Government /UGC rules.

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10) Detail Syllabus with Recommended Books:

Title : Problem Solving Using Computers and 'C' Programming

Objective :-

- i) To develop Problem Solving abilities using computers
- ii) To teach basic principles of programming
- iii) To develop skills for writing programs using 'C'

Syllabus

Chapter 1 Problem Solving using Computers	[8]
1.1 Problem-Solving	
1.2 Writing Simple Algorithms	
1.3 Algorithms	
1.4 Flowcharts	
Chapter 2 Programming Languages as Tools	[3]
2.1 Machine language	R6(1.5,1.6)
2.2 Assembly language	
2.3 High level languages	
2.4 Compilers and Interpreters	
Chapter 3 Introduction to C	[2]
3.1 History	R3(2-1), R6(1.1)
3.2 Structure of a C program	R3(2-2), R6(1.8)
3.3 Functions as building blocks	R3(4-1,4-2)
3.4 Application Areas	
3.5 C Program development life cycle	R6(1.10)
3.6 Sample programs	
Chapter 4 C Tokens	[12]
4.1 Keywords	R6 (Ch 2, 3)
4.2 Identifiers	
4.3 Variables	
4.4 Constants – character, integer, float, string, escape sequences	
4.5 Data types – built-in and user defined	
4.6 Operators and Expressions Operator types (arithmetic, relational, logical, assignment, bitwise, conditional , other operators) , precedence and associativity rules.	
4.7 Simple programs using printf and scanf	
Chapter 5 Input and Output	[3]
5.1 Character input and output	R6(4.2 - 4.5)
5.2 String input and output	
5.3 Formatted input and output	
Chapter 6 Control Structures	[10]
6.1 Decision making structures If, if-else, switch	R3(5-2, 5-3), R6(5.2 - 5.8)
6.2 Loop Control structures While, do-while, for	R6 (Ch 8)
6.3 Nested structures	
6.4 break and continue	

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Chapter 7 Functions in C		[8]
7.1 What is a function	R3(4-2, 4-4)	
7.2 Advantages of Functions		
7.3 Standard library functions	R3(5-4)	
7.4 User defined functions :Declaration, definition, function call, parameter passing (by value), return keyword,	R6 (Ch 9)	
7.5 Scope of variables, storage classes		
7.6 Recursion	R3 (6-9)	
Chapter 8 Arrays		[8]
8.1 Array declaration, initialization	R6(Ch 7)	
8.2 Types – one, two and multidimensional	"	
8.3 Passing arrays to functions	R3(8-3), R6(9.17)	
Chapter 9 Pointers		[6]
9.1 Pointer declaration, initialization	R6(11.1 - 11.14)	
9.2 Dereferencing pointers		
9.3 Pointer arithmetic		
9.4 Pointer to pointer		
9.5 Arrays and pointers		
9.6 Functions and pointers – passing pointers to functions, function returning pointers		
9.7 Dynamic memory allocation	R6(13.1-13.6)	
Chapter 10 Strings		[6]
10.1 Declaration and initialization, format specifiers	R6(Ch 8)	
10.2 Standard library functions		
10.3 Strings and pointers		
10.4 Array of strings		
10.5 Command Line Arguments	R3(Appendix I1-I2)	
Chapter 11 Structures and Unions		[6]
11.1 Creating structures	R6(Ch 10)	
11.2 Accessing structure members (dot Operator)		
11.3 Structure initialization		
11.4 Array of structures		
11.5 Passing structures to functions		
11.6 Nested structures		
11.7 Pointers and structures		
11.8 Unions		
11.9 Difference between structures and unions		
Chapter 12 File Handling		[6]
12.1 Streams	R3(7-1, 7-2)	
12.2 Types of Files		
12.3 Operations on files	R6(12.1- 12.4), 12.6, 12.7	
12.4 Random access to files		
Chapter 13 C Preprocessor		[2]

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- 13.1 Format of Preprocessor directive R6(14.1 - 14.3)
- 13.2 File Inclusion directive
- 13.3 Macro substitution, nested macro, argumented macro

References

1. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, ISBN:9788120305960, PHI Learning
2. How to Solve it by Computer, R.G. Dromey, ISBN:9788131705629, Pearson Education
3. A Structured Programming Approach Using C, Behrouz A. Forouzan, Richard F. Gilberg ISBN:9788131500941, Cengage Learning India
4. Using The GNU Compiler Collection, Richard M. Stallman;The GCC Developer Community Pothi.com
5. Using the Gnu Compiler Collection, Richard M. Stallman, Gcc Developer community ISBN:9781441412768,Createspace
6. Programming in ANSI C, E. Balaguruswamy, ISBN:9781259004612, Tata Mc-Graw Hill Publishing Co.Ltd.-New Delhi

Computer Science: Paper – II : File Organization and Fundamental of Databases

Title : File Organization and Fundamental of Databases

Objective :-

- i) To understand data processing using computers
- ii) To teach basic organization of data using files
- iii) To understand creations, manipulation and querying of data in databases

Syllabus

Chapter 1 File Organization R3
[6]

- 1.1 Introduction
- 1.2 Physical / logical files
- 1.3 Types of file organization (heap,sorted, indexed,hashed)
- 1.4 Choosing a file organization

Chapter 2 Introduction of DBMS R1(Ch 1) [6]

- 2.1 Overview
- 2.2 File system Vs DBMS
- 2.3 Describing & storing data (Data models (relational,hierarchical, network))
- 2.4 Levels of abstraction
- 2.5 Data independence
- 2.6 Structure of DBMS
- 2.7 Users of DBMS
- 2.8 Advantages of DBMS

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**Chapter 3 Conceptual Design (E-R model) R1(Ch 2), R3, R4
[15]**

- 3.1 Overview of DB design
- 3.2 ER data model (entities , attributes, entity sets, relations, relationship sets)
- 3.3 Additional constraints (Key constraints, Mapping constraints, Strong & Weak entities, aggregation / generalization)
- 3.4 Conceptual design using ER modelling (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER)
- 3.5 Case studies

**Chapter 4 Relational data model R1(Ch 3)
[6]**

- 4.1 Structure of Relational Databases (concepts of a table, a row, a relation, a Tuple and a key in a relational database)
- 4.2 Conversion of ER to Relational model
- 4.3 Integrity constraints (primary key, referential integrity, unique constraint, Null constraint, Check constraint)

**Chapter 5 Relational algebra R1(Ch 3)
[7]**

- 5.1 Preliminaries
- 5.2 Relational algebra (selection, projection, set operations, renaming joins, division)

**Chapter 6 SQL R1(Ch 4)
[20]**

- 6.1 Introduction
- 6.2 Basic structure
- 6.3 Set operations
- 6.4 Aggregate functions
- 6.5 Null values
- 6.6 Nested Subqueries
- 6.7 Modifications to Database
- 6.8 DDL commands with examples
- 6.9 SQL mechanisms for joining relations (inner joins, outer joins and their types)
- 6.10 Examples on SQL (case studies)

**7 Relational Database Design R1(ch 7)
[20]**

- 7.1 Pitfalls in Relational-Database Design (undesirable properties of a RDB design like repetition, inability to represent certain information),
- 7.2 Functional dependencies (Basic concepts, F+, Closure of an Attribute set, Concept of a Super Key and a primary key

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- (Algorithm to derive a Primary Key for a relation)
- 7.3 Concept of Decomposition
 - 7.4 Desirable Properties of Decomposition (Lossless join & Dependency preservation)
 - 7.5 Concept of Normalization
 - 7.6 Normal forms (only definitions) 1NF, 2NF, 3NF, BCNF
 - 7.7 Examples on Normalization

References

1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S. Sudarshan, ISBN:9780071289597, Tata McGraw-Hill Education
2. Database Management Systems ,Raghu Ramakrishnan,ISBN:9780071254342, Mcgraw-hill higher Education
3. Database Management Systems,Raghu Ramakrishnan and Johannes Gehrke, McGraw-Hill Science/Engineering/Math; 3 edition, ISBN: 9780072465631
4. Database Systems, Shamkant B. Navathe, Ramez Elmasri, ISBN:9780132144988, PEARSON HIGHER EDUCATION
5. Beginning Databases with PostgreSQL: From Novice to Professional, Richard Stones, Neil Matthew, ISBN:9781590594780, Apress
6. PostgreSQL, Korry Douglas, ISBN:9780672327568, Sams
7. Practical PostgreSQL (B/CD),John Worsley, Joshua Drake, ISBN:9788173663925 Shroff/O'reilly
8. Practical Postgresql , By Joshua D. Drake, John C Worsley (**O'Reilly publications**)
9. "An introduction to Database systems", Bipin C Desai, Galgotia Publications

Important to Note: It is absolutely necessary and essential that all the practicals for Paper III and Paper IV be conducted on Open Source Operating System like Linux. All the practicals related to C needs to be conducted using GCC compiler.

Paper III – Computer Science Practical Paper I
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Title : Basic 'C' Programming and Database Handling practicals

Objective :-

- i) Design and implement a 'C' programs for simple problems
- ii) Understand appropriate use of data types and array structures
- iii) Understand use of appropriate control structures

Syllabus

1. Initial 3 practical slots (12 lectures) should be used for teaching basic operating systems commands and use of editors

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2. Last 2 slots (8 lectures) are to be used for revision
3. Remaining 80 lectures are to be utilised for the following 20 Assignments

Computer Science : Paper III : Basic 'C' Programming and Database Handling practicals#		
No	Topic	Lectures
1	Assignment to demonstrate use of data types, simple operators (expressions)	4
2	Assignment to demonstrate decision making statements (if and if-else, nested structures)	4
3	Assignment to demonstrate decision making statements (switch case)	4
4	Assignment to demonstrate use of simple loops	4
5	Assignment to demonstrate use of nested loops	4
6	Assignment to demonstrate menu driven programs.	4
7	Assignment to demonstrate writing C programs in modular way (use of user defined functions)	4
8	Assignment to demonstrate recursive functions.	4
9	Assignment to demonstrate use of arrays (1-d arrays) and functions	4
10	Assignment to demonstrate use of multidimensional array(2-d arrays) and functions	4
11	Assignment to create simple tables , with only the primary key constraint (as a table level constraint & as a field level constraint) (include all data types)	4
12	Assignment to create more than one table, with referential integrity constraint, PK constraint.	4
13	Assignment to create one or more tables with following constraints, in addition to the first two constraints (PK & FK) a. Check constraint b. Unique constraint c. Not null constraint	4
14	Assignment to drop a table from the database, to alter the schema of a table in the Database.	4
15	Assignment to insert / update / delete records using tables created in previous Assignments. (use simple forms of insert / update / delete statements)	4

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16	Assignment to query the tables using simple form of select statement Select <field-list> from table [where <condition> order by <field list>] Select <field-list, aggregate functions > from table [where <condition> group by <> having <> order by <>]	4
17	Assignment to query table, using set operations (union, intersect)	4
18	Assignments to query tables using nested queries	4
19	Assignment to query tables , using nested queries (use of 'Except', exists, not exists clauses	4
20	Assignment related to small case studies (Each case study will involve creating tables with specified constraints, inserting records to it & writing queries for extracting records from these tables)	4

Paper IV – Computer Science Practical Paper II#

Title : HTML5 programming and Advanced 'C' Programming practicals

Objective :-

- i) Understanding basic HTML designing
- ii) Writing C programs using complex data structures such as pointers, structures etc.

Syllabus

1. Initial 3 practical slots (8 lectures) should be used for teaching basic internet usage including use of browsers

2. Last 2 slots (8 lectures) are to be used for revision

3. Remaining 80 lectures are to be utilised for the following 20 Assignments

Computer Science : Paper IV : HTML 5 programming and Advanced 'C' Programming practicals		
No	Topic	Lectures
1	Creating simple HTML pages (use of different tags for changing fonts, foreground and background colors etc.))	4
2	HTML programming (use of lists, tables)	4
3	HTML programming using frames	4
4	HTML programming using hyperlinks	4
5	HTML programming (Creation of forms)	4

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6	HTML programming – Case Study 1	4
7	HTML programming – Case Study 1	4
8	HTML programming – Case Study 1	4
9	Assignment to demonstrate use of pointers	4
10	Assignment to demonstrate concept of strings (string & pointers)	4
11	Assignment to demonstrate array of strings.	4
12	Assignment to demonstrate use of bitwise operators.	4
13	Assignment to demonstrate structures (using array and functions)	4
14	Assignment to demonstrate structures and unions	4
15	Assignment to demonstrate command line arguments and preprocessor directives	4
16	Assignment to demonstrate file handling (text files)	4
17	Assignment to demonstrate file handling (binary files and random access to files)	4
18	C Programming – Case study 1	4
19	C Programming – Case study 2	4
20	C programming – Case Study 3	4

[#]The Lab Hand Book will define in detail the contents and provide guidelines for each practical Assignment.

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UNIVERSITY OF PUNE, PUNE.

Syllabus for F.Y.B.Sc(Computer Science)

Subject: MATHEMATICS

(With effect from June 2013)

Introduction:

University of Pune has decided to change the syllabi of various faculties from June,2013. Taking into consideration the rapid changes in science and technology and new approaches in different areas of mathematics and related subjects Board of studies in Mathematics with concern of teachers of Mathematics from different colleges affiliated to University of Pune has prepared the syllabus of F.Y.B.Sc. (Computer Science) Mathematics. To develop the syllabus the U.G.C. Model curriculum is followed.

Aims:

- i) Give the students a sufficient knowledge of fundamental principles ,methods and a clear perception of innumerable power of mathematical ideas and tools and know how to use them by modeling ,solving and interpreting.
- ii) Reflecting the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science.
- iii) Enhancing students' overall development and to equip them with mathematical modeling abilities, problem solving skills , creative talent and power of communication necessary for various kinds of employment.
- iv) Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

Objectives:

- (i) A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology and recognize basic geometrical figures and graphical displays ,state important facts resulting from their studies.
- (ii) A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.
- (iii) A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical Sciences.
- (iv) A student be able to apply their skills and knowledge ,that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.
- (v) A student should be made aware of history of mathematics and hence of its past, present and future role as part of our culture.

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Eligibility: 12th science with mathematics or equivalent examination.

Structure of the course:

Sr.No.	Paper	Theory	Oral	Internal	Total
1	MTC 101 (Discrete Mathematics)	80 Marks	-	20 Marks	100 Marks
2	MTC 102 (Algebra and Calculus)	80 Marks	-	20 Marks	100 Marks
3	MTC 103 (Mathematics Practicals)	72 Marks	08 Marks	20 Marks	100 Marks

All 3 above courses are compulsory.

Medium of Instruction: English

Examination:

A) Pattern of examination: Annual.

B) Standard of passing : 40 Marks out of 100 marks for each papers.

But for MT 101 and MT 102 for passing a student should obtain minimum 32 marks out of 80 in the theory examination and overall total marks for theory and internal should be minimum 40.

C)Pattern of question papers: For MTC 101 and MTC 102

Q1. Attempt any 08 out of 10 questions each of 02 marks. [16 Marks]
(05 questions from each term)

Q2. Attempt any 04 out of 06 questions each of 04 marks. [16 Marks].
(Based on term I)

Q.3. Attempt any 02 out of 03 questions each of 08 marks. [16 Marks].
(Based on term I)

Q4. Attempt any 04 out of 06 questions each of 04 marks. [16 Marks].
(Based on term II)

Q.5. Attempt any 02 out of 03 questions each of 08 marks. [16 Marks].
(Based on term II)

The pattern of question paper for MTC 103 is given in the detailed syllabus.

D) External Students: Not allowed.

E)Verification/Revaluation: Allowed for MTC 101,MTC 102.

Equivalence of Previous syllabus along with new syllabus:

Sr.No	New Courses	Old Courses
1	MTC 101 (Discrete Mathematics)	Paper I (Discrete Mathematics)
2	MTC 102 (Algebra and Calculus)	Paper II (Algebra and Calculus)
3	MTC 103 (Mathematics Practicals)	Paper III (Mathematics Practicals)

Qualifications for Teacher

M.Sc. Mathematics (with NET /SET as per existing rules)

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Course Catalog for B. Sc. (Computer Science) Program

Details of Syllabus

MTC 101: Discrete Mathematics

First Term

- Unit 1: Logic** **07 Lectures**
- 1.1 Revision : Propositional Logic, Propositional Equivalences.
 - 1.2 Predicates and Quantifiers : Predicate, n -Place Predicate or n -ary Predicate, Quantification and Quantifiers, Universal Quantifier, Existential Quantifier, Quantifiers with restricted domains, Logical Equivalences involving Quantifiers.
 - 1.3 Rules of Inference : Argument in propositional Logic, Validity Argument(Direct and Indirect methods) Rules of Inference for Propositional Logic, Building Arguments.
- Unit 2 : Lattices and Boolean Algebra** **10 Lectures**
- 2.1 Poset, Hasse diagram.
 - 2.2 Lattices, Complemented lattice, Bounded lattice and Distributive lattice.
 - 2.3 Boolean Functions : Introduction, Boolean variable, Boolean Function of degree n , Boolean identities, Definition of Boolean Algebra.
 - 2.4 Representation of Boolean Functions : Minterm, Maxterm Disjunctive normal form, Conjunctive normal Form.
- Unit 3 : Counting Principles** **10 Lectures**
- 3.1 Cardinality of Set : Cardinality of a finite set.
 - 3.2 Basics of Counting : The Product Rule, The Sum Rule, The Inclusion-Exclusion Principle.
 - 3.3 The Pigeonhole Principle: Statement, The Generalized Pigeonhole Principle, Its Applications.
 - 3.4 Generalized Permutations and Combinations : Permutation and Combination with Repetitions, Permutations with Indistinguishable Objects, Distributing objects into boxes : Distinguishable objects and distinguishable boxes, Indistinguishable objects and distinguishable boxes, Distinguishable objects and Indistinguishable boxes, Indistinguishable objects and Indistinguishable boxes
- Unit 4 : Recurrence Relations** **9 Lectures**
- 4.1 Recurrence Relations : Introduction, Formation.
 - 4.2 Linear Recurrence Relations with constant coefficients.
 - 4.3 Homogeneous Solutions.
 - 4.4 Particular Solutions.
 - 4.5 Total Solutions.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Second Term

Unit 5 : Graphs	06 Lectures
5.1 Definition, Elementary terminologies and results, Graphs as Models.	
5.2 Special types of graphs.	
5.3 Isomorphism.	
5.4 Adjacency and Incidence Matrix of a Graph.	
Unit 6 : Operations on Graphs	04 Lectures
6.1 Subgraphs, induced subgraphs, Vertex deletion, Edge deletion.	
6.2 Complement of a graph and self-complementary graphs.	
6.3 Union, Intersection and Product of graphs.	
6.4 Fusion of vertices.	
Unit 7 : Connected Graphs	09 Lectures
7.1 Walk, Trail, Path, Cycle : Definitions and elementary properties.	
7.2 Connected Graphs : definition and properties.	
7.3 Distance between two vertices, eccentricity, center, radius and diameter of a graph.	
7.4 Isthmus, Cutvertex : Definition and properties.	
7.5 Cutset, edge-connectivity, vertex connectivity.	
7.6 Weighted Graph and Dijkstra's Algorithm.	
Unit 8 : Eulerian and Hamiltonian Graphs	05 Lectures
8.1 Seven Bridge Problem, Eulerian Graph : Definition and Examples, Necessary and Sufficient condition.	
8.2 Fleury's Algorithm.	
8.3 Hamiltonian Graphs : Definition and Examples, Necessary Condition.	
8.4 Introduction of Chinese Postman Problem and Travelling Salesman Problem.	
Unit 9 : Trees	06 Lectures
9.1 Definition, Properties of trees.	
9.2 Center of a tree.	
9.3 Binary Tree : Definition and properties.	
9.4 Tree Traversal : Ordered rooted Tree, Preorder traversal, inorder traversal and postorder traversal, Prefix Notation.	
9.5 Spanning Tree : Definition, Properties, Shortest Spanning Tree, Kruskal's Algorithm.	

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Unit 10 : Directed Graphs 06 Lectures

- 10.1 Definition, Examples Elementary Terminologies and properties.
- 10.2 Special Types of Digraphs.
- 10.3 Connectedness of digraphs.
- 10.4 Network and Flows : definition and examples.

Text Book: Text book of Discrete Mathematics, Prepared by B.O.S. in Mathematics, University of Pune, Pune.(2013).

Reference Books:

- 1) Kenneth Rosen, Discrete Mathematics and It's Applications (Tata McGraw Hill)
- 2) C. L. Liu ,Elements of Discrete Mathematics, (Tata McGraw Hill)
- 3) John Clark and Derek Holton, A First Look at Graph Theory (Allied Publishers)
- 4) Narsingh Deo, Graph Theory with Applications to Computer Science and Engineering, (Prentice Hall).

MTC 102: Algebra and Calculus

First Term: (Algebra)

Unit 1: Relations and functions 11 Lectures

- 1.1 Ordered pairs, Cartesian product of Sets.
- 1.2 Relations, types of relations, equivalence relations. Partial orderings.
- 1.3 Equivalence Class, properties and partition of a set.
- 1.4 Transitive closure and Warshall's Algorithm.
- 1.5 Digraphs of relations, matrix representation and composition of relations.
- 1.6 Definition of function as relation, types of functions (one-one, onto and bijective)

Unit 2: Binary Operations and Groups. 9 Lectures

- 2.1 Definition of binary operation, examples, properties of binary operations.
- 2.2 Definition of Monoid, semigroup, examples.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

2.3 Definition of group and examples, finite and infinite groups, permutation groups, subgroups, Cyclic groups.

Unit 3: Divisibility in Integers

16 Lectures

- 3.1 Well ordering principle
- 3.2 First and second Principle of Mathematical Induction, Examples
- 3.3 Division Algorithm (without proof)
- 3.4 Divisibility and its properties, prime numbers.
- 3.5 Definition G.C.D and L.C.M., Expressing G.C.D. of two integers as a linear combination of the two integers.
- 3.6 Euclidean Algorithm (Without proof).
- 3.7 Relatively prime integers, Euclid's Lemma and its generalization.
- 3.8 Congruence relations and its properties, Residue Classes: Definition, Examples, addition and multiplication modulo n and composition tables
- 3.9 Euler's and Fermat's Theorems. (Without proof). Examples

Second Term: (Calculus)

Unit 4: Continuity and Differentiability

12 Lectures

- 4.1 Continuity and Properties of continuous functions defined on $[a, b]$ (Without proof) and examples.
- 4.2 Differentiability
- 4.3 Theorem – Differentiability implies continuity but not conversely. Left hand derivative and Right hand derivative.
- 4.4 Intermediate value theorem (without proof).
- 4.5 Rolle's theorem (with proof and geometric interpretation)
- 4.6 Lagrange's Mean Value Theorem (with proof and geometric interpretation)
- 4.7 Cauchy's Mean Value Theorem (with proof), Verification and Application.

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4.8 L' Hospital's Rule (without proof)

Unit 5: Successive Differentiation **05 Lectures**

5.1 The n^{th} derivatives of standard functions.

5.2 Leibnitz's Theorem (with proof).

Unit 6: Taylor's and Maclaurin's Theorems **05 Lectures**

6.1 Taylor's and Maclaurin's Theorems with Lagrange's and Cauchy's form of remainders (without proof).

6.2 Taylor's and Maclaurin's Series.

Unit 7 : Matrices and System of Linear Equations **14 Lectures**

7.1 Revision: Elementary operations on matrices.

7.2 Echelon form of matrix

7.3 System of linear equations: Gauss Elimination Method, Gauss –Jordan Elimination Method, L.U. Decomposition Method

7.4 Rank of matrix, Row rank, Column rank

Text Book: Text book of Algebra and Calculus, Prepared by B.O.S. in Mathematics, University of Pune, Pune.(2013).

Reference Books:

- 1) Discrete Mathematics Structure – Bernard Kolman, Robert Busby, Sharon Cutler Ross, Nadeem-ur-Rehman, Pearson Education, 5th Edition
- 2) Elements of Discrete Mathematics – C.L.Liu (Tata McGraw Hill)
- 3) Calculus and Analytical Geometry- Thomas Finny
- 4) J.B. Fraleigh, A. First Course in Abstract Algebra, Third Ed., Narosa, New Delhi, 1990
- 5) H. Anton and C. Rorres, Elementary Linear Algebra with Applications, Seventh Ed., Wiley, (1994).

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Course Catalog for B. Sc. (Computer Science) Program

MTC 103: Mathematics Practicals

(Practicals based on the applications of articles in MTC 101 and MTC 102)

List of Practicals:

TERM I

1. Logic
2. Lattices
3. Boolean Algebra .
4. Counting Principles.
5. Recurrence Relations
6. Miscellaneous.
7. Relations and functions.
8. Binary Operations
9. Groups
10. Divisibility in Integers I
11. Divisibility in Integers II.
12. Miscellaneous.

TERM II

13. Graphs and Operations on Graphs.
14. Connected Graphs.
15. Eulerian and Hamiltonian Graphs.
16. Trees
17. Directed Graphs.
18. Miscellaneous.
19. Continuity and Differentiability.
20. Mean value theorems and L'Hospital rule.
21. Successive Differentiation.
22. Taylor's and Maclaurin's Theorems.
23. Matrices and System of Linear Equations.
24. Miscellaneous.

Modalities For Conducting The Practical and The Practical Examination

- 1) There will be one 3 hour practical session for each batch of 15 students per week.
- 2) A question bank consisting of 100 problems in all for the whole year, distributed in four Sections: 50 questions for each term (25 questions on MT 101 and 25 on MT 102) will be the course work for this paper. Question Bank will be prepared by the individual subject teacher and the problems included should be changed every year, based on the list of practicals given above. The question bank of each year should be preserved by the subject teachers, which can be reviewed by the L.I.C. members visiting college.

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3) The College will conduct the Practical Examination at least 15 days before the commencement of the Main Theory Examination. The practical examination will consist of written examination of 72 marks and oral examination of 08 marks.

4) There will be no external examiner; the practical exam will be of the duration of 3 hours.

5) The subject teacher will set a question paper based on pattern as follows:

- Q1. (a) Any 1 out of 2 worth 8 marks on MTC101 (first term).
(b) Any 1 out of 2 worth 8 marks on MTC 102(First term).
- Q2*: Any 5 out of 7 each of 4 marks on MTC 101.
- Q3*: Any 5 out of 7 each of 4 marks on MTC 102.
- Q4. (a) Any 1 out of 2 of 10 marks on MTC 101(second term).
(b) Any 1 out of 2 worth 10 marks on MTC 102(second term).

(*In Q2 and Q3, there will be 3 questions from first term and 4 questions from the second term or vice-versa.)

6) Each student will maintain a journal to be provided by the college.

7) The internal 20 marks will be given on the basis of journal prepared by student and the cumulative performance of student at practicals.

8) It is recommended that concept may be illustrated using computer software and graphing calculators wherever possible.

8) The subject teachers must include computer practicals based on use of free mathematical software's like Scilab, Maxima, mu-pad, etc. for solving problems in the miscellaneous practical mentioned above.

10) **Special Instruction:** Before starting each practical necessary introduction, basic definitions, intuitive inspiring ideas and prerequisites must be discussed.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

University of Pune

Three Year B. Sc. Degree Course in Computer Science

Subject : Electronics

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

1) Title of the Course :

F.Y.B.Sc.Electronics of Computer Science

(To be implemented from Academic Year 2013-14)

2) Preamble:

The systematic and planned curricula for first year and second year electronics shall motivate and encourage the students for pursuing higher studies in Electronics and computer and for becoming an enterpreneur.

3) Introduction:

At **first year of under-graduation**: The basic topics related to the fundamentals of electronics are covered. Since electronics is an inherent part of technological advancements, the practical course is intended to achieve the basic skills required for circuit building and testing.

At **second year under-graduation**: The level of the theory and practical courses shall be one step ahead of the first year B.Sc. Courses based on content of first year shall be introduced. Analog and digital circuit design concepts will be introduced at this stage.

Objectives:

- To provide in depth knowledge of scientific and technological aspects of electronics
- To familiarize with current and recent technological developments
- To enrich knowledge through programs such as industrial visits, hobby projects, market survey, projects etc.
- To train students in skills related to electronics industry and market.
- To create foundation for research and development in Electronics
- To develop analytical abilities towards real world problems
- To help students build-up a progressive and successful career in Electronics

4) Eligibility:

1 First Year B.Sc.:

Higher Secondary School Certificate (10+2) Science stream or its equivalent Examination as per the University of Pune eligibility norms.

2 Second Year B.Sc.:

Keeping terms of First Year of B.Sc. Computer Science, with electronics as one of the subjects. Other students if they fulfill the conditions approved by the equivalence committee of Faculty of Science of the University of Pune are also eligible.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Note: Admissions will be given as per the selection procedure / policies adopted by the respective college, in accordance with conditions laid down by the University of Pune. Reservation and relaxation will be as per the Government rules.

5 A) Examination Pattern:

First Year B.Sc. Computer Science Subject : Electronics

Pattern of Examination: Annual

Theory courses (ELC-101 and ELC-102) : Annual

Practical Course (ELC-103) : Annual

Paper/ Course No.	Title	Total Number of lectures/practicals per Term	Standard of passing		
			Internal marks out of 20	External marks out of 80	Total marks out of 100
Theory Paper I (ELC-101) (First term)	Principles of Analog Electronics	Three lectures/Week (Total 36 lectures per term)	08	32	40 *
Theory Paper I (ELC-101) (Second term)	Principles of Analog Electronics	Three lectures/Week (Total 36 lectures per term)			
Theory Paper II (ELC-102) (First term)	Principles of Digital Electronics	Three lectures/Week (Total 36 lectures per term)	08	32	40 *
Theory Paper II (ELC-102) (Second term)	Principles of Digital Electronics	Three lectures/Week (Total 36 lectures per term)			
Practical Paper III (ELC-103) (First & Second Term)	Practical	10 Practicals of 4 lectures in each term (20 practicals / year)	08	32	40 *

* Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Notes:

- Total marks: Theory (100 + 100) = 200 marks
- Total marks per year 200 (Theory) + 100 marks (practicals) = 300 marks
- Internal marks for theory papers given on the basis of internal assessment tests and for practicals on internal assessment tests + journals + attendance + study visit reports/ market survey/hobby projects etc.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Theory examination will be of three hours duration for each theory course. There shall be 5 questions each carrying equal marks. The pattern of question papers shall be:

Question 1	8 sub-questions, each of 2 marks; answerable in 2 -3 lines and based on entire syllabus
Question 2 and 3 and 4	4 out of 6– short answer type questions, each of 4 marks; answerable in 8 – 10 lines
Question 5	2 out of 3 – long answer type questions; 8 marks each; answerable in analytical fashion or circuit/logic diagrams

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each term. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain). There shall be 20 questions.

For practicals: one internal assessment test + marks for journals + attendance + hobby project - tour report etc.

Practical Examination: Practical examination shall be conducted by the respective college at the end of the academic year. Practical examination will be of 6 hours duration (2-Sessions). Certified journal is compulsory to appear for practical examination. There shall be two expert and two examiners per batch for the practical examination.

Second Year B.Sc. Computer Science

Subject : Electronics

Pattern of examination: Semester

Theory courses (Sem I: ELC 211 and ELC 212): Semester

(Sem II: ELC 221 and ELC 222): Semester

Practical Course (ELC 223): Annual

Paper/ Course No.	Title	Total Number of lectures/practicals Per Semester	Standard of passing		
			Internal marks out of 10 (theory) Out of 20 (practicals)	External marks out of 40 (theory) Out of 80 (practicals)	Total passing marks out of 50 (theory) and out of 100 (practicals)
Theory Paper I (ELC 211)	Paper I	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Theory Paper II (ELC 212)	Paper II	Four lectures/Week	04	16	20 *

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

		(Total 48 per Semester)			
Theory Paper I (ELC 221)	Paper I	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Theory Paper II (ELC 222)	Paper II	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Practical paper III (ELC 223) (First & Second Semester)	Paper III	12 Practicals of 4 lectures in each Semester (24 practicals / year)	08	32	40 **

* Subject to compulsory passing in external examination and getting minimum 20 marks out of 50

** Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Notes:

1. Total marks: Theory for each semester (50 + 50) = 100 marks
2. Total marks per year 200 (Theory) + 100 marks (practicals) = 300 marks
3. Internal marks for theory papers given on the basis of internal assessment tests and for practicals on internal assessment tests + journals + attendance + study visit reports/ market survey/hobby projects etc.

Theory examination will be of two hours duration for each theory course. There shall be 4 questions each carrying marks as per the table. The pattern of question papers shall be:

Question 1	10 sub-questions, each of 1 marks	10 marks
Question 2 and 3	2 out of 3 sub-questions, each of 5 marks; short answer type questions; answerable in 8 – 10 lines	10 marks each
Question 4	2 out of 3 sub-questions, each of 5 marks; long answer type questions (12-16 lines), problems, circuit/logic diagrams and designs	10 marks

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each Semester. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain) There shall be 20 questions. For practicals: one internal assessment test + marks for journals + attendance + visit report.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Practical Examination: Practical examination shall be conducted at the respective college at the end of the academic year. Practical examination will be of 6 hours (2-Sessions) duration. Certified journal is compulsory to appear for practical examination. There shall be one expert and two examiners per batch for the practical examination. One of the examiners will be external.

5 B) Standard of Passing:

- i. In order to pass in the first year theory examination, the candidate has to obtain 40 marks out of 100 in each course. (Minimum 32 marks out of 80 must be obtained in the University Theory Examination.)
- ii. In order to pass in the Second Year and Third Year theory examination, the candidate has to obtain 20 marks out of 50 in each course of each semester. (Minimum 16 marks out of 40 must be obtained in the University Theory Examination.)
- iii. In order to pass in practical examination, the candidate has to obtain 40 marks out of 100 in each course. (Minimum 32 marks out of 80 must be obtained in the University Examination.)

5 C) ATKT Rules:

While going from F.Y.B.Sc. to S.Y.B.Sc. at least 8 courses (out of total 12) should be passed; however all F.Y.B.Sc. courses should be passed while going to T.Y.B.Sc.

5 D) External Students: There shall be no external students.

5 E) Setting Question papers:

F.Y.B.Sc.: For theory papers I and II annual question papers shall be set by the University of Pune and assessment done at the respective colleges. Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject. For Practical Paper III papers shall be set by the University of Pune and assessment done at the respective colleges.

S.Y.B.Sc.: For theory papers I and II for each semester and also for the annual practical examination question papers set by the University of Pune. Centralized assessment for theory papers done as per the University instructions. Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject. For Practical Paper III papers shall be set by the University of Pune and assessment done by the internal examiner and external examiner appointed by University of Pune.

5 F) Verification and Revaluation Rules:

As per university Statutes and rules for verification and revaluation of marks in stipulated time after declaration of the semester examination result.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

6) Course Structure:

Duration: The duration of B.Sc. (Computer Science) Degree Program shall be three years. Electronics is offered at first and second year.

a) **Compulsory Papers** : All Theory and Practical Papers

b) **Optional Papers** : Nil

c) **Question Papers** :

F.Y.B.Sc.

Theory paper: University Examination – 80 marks (at the end of 2nd term)

Internal Examination – 20 marks

Practical Paper: University Examination – 80 marks (at the end of 2nd term)

Internal Examination – 20 marks

S.Y.B.Sc.

Theory paper: University Examination – 40 marks (at the end of each semester)

Internal Examination – 10 marks

Practical Paper: University Examination – 80 marks (at the end of 2nd semester)

Internal Examination – 20 marks

d) **Medium of Instruction:** The medium of instruction for the course shall be English.

7) Equivalence of Previous Syllabus:

Old Course (2008 Pattern)	New Course (2013 Pattern)
Paper I: Electronic Devices, circuits and computer peripherals	ELC-101: Principles of Analog Electronics
Paper II: Fundamentals of Digital Electronics	ELC-102: Principles of Digital Electronics
Paper III: Practical	ELC-103: Practical

8) **University Terms:** Dates for commencement and conclusion for the first and second terms will be declared by the University authorities. Terms can be kept by only duly admitted students. The term shall be granted only on minimum 75 percent attendance at theory and practical course and satisfactory performance during the term.

9) **Qualification of Teachers:** M.Sc. Electronic Science or equivalent master degree in science with class/grades and NET/SET as per prevailing University /Government /UGC rules.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

10) Detail Syllabus with Recommended Books:

Electronics Subject of F.Y. B.Sc.Computer Science

Paper I

ELC-101: Principles of Analog Electronics

Objectives:

1. To get familiar with basic circuit elements and passive components
2. To understand DC circuit theorems and their use in circuit analysis
3. To study characteristic features of semiconductor devices
4. To study elementary electronic circuits and applications
5. To understand basics of operational amplifiers.

Term I

Unit 1: Passive Components

(12)

Study of basic circuit elements and passive components (with special reference to working principle, circuit symbols, types, specifications and applications): Resistor, Capacitor, Inductor, Transformer, Cables, Connectors, Switches, Fuses, Relays, Batteries.

Unit 2: Basic Electrical Circuits and Circuit Theorems

(14)

Concept of Ideal Voltage and Current source, internal resistance, dc sources (voltage/current) and sinusoidal ac source (amplitude, wavelength, period, frequency, phase angle), Network terminology, Ohms law, series and parallel circuits of resistors, capacitors and inductors, voltage and current dividers, Kirchhoff's Laws (KCL, KVL), Superposition theorem, concept of black box, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem (numerical problems with maximum two meshes), Charging-discharging of capacitor, AC applied to R, C and L, concept of impedance, LCR series resonant circuit, concept of phase difference, RC low pass and high pass filter

Unit 3: Semiconductor Diodes and Circuits

(10)

Study of semiconductor devices with reference to symbol, working principle, I-V characteristics, parameters, specifications: diode, zener diode, light emitting diode, photo diode, optocoupler, varactor diode, solar cell, clipper and clamper circuits Rectifiers (half and full wave), rectifier with capacitor-filter, Zener regulator, Block diagram of power supply

Term II

Unit 4: Bipolar Junction Transistor and Circuits

(14)

Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, I-V characteristics, parameters, specifications, Concept of amplification, voltage and current amplifier, Transistor amplifier configurations - CB, CC and CE, biasing circuits - voltage divider, collector feedback bias and emitter feedback bias, DC load line (CE), Q point and factors affecting the stability, transistor as a switch, concept of class A, B

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

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and class C amplifiers, emitter follower amplifier, Single stage RC coupled CE amplifier, concept of frequency response and bandwidth

Unit-5:UJT,FETs and Applications

(10)

Symbol, types, construction, working principle, I-V characteristics, Specifications parameters of: Uni-Junction Transistor (UJT), Junction Field Effect Transistor (JFET), Metal Oxide Semiconductor FET (MOSFET), comparison of JFET, MOSFET and BJT

Applications: JFET as voltage variable resistor, MOSFET as a switch

Unit 6: Operational Amplifier

(12)

Symbol, block diagram, Opamp characteristics, basic parameters (ideal and practical) such as input and output impedance, bandwidth, differential and common mode gain, CMRR, slew rate, Concept of virtual ground, concept of feedback, Information about IC741

Opamp as inverting and non-inverting amplifier, voltage follower, adder, subtractor
Opamp as a comparator and Schmitt trigger

Text/ Reference Books:

1. Basic Electronics:Bernard Grob, McGraw Hill Publication, 8th Revised Edition, 2010
2. Electronic Principles:Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
3. Principals of Electronics: V.K. Mehta, S.Chand and Co.
4. A text book of electrical technology: B.L.Theraja, S.Chand and Co.
5. Basic Electronics and Linear Circuits: Bhargava N.N., Kulshreshtha D.C., Gupta S.C., Tata McGraw Hill.
6. A First Course in Electronics: Khan Anwar, K.K.Day, PHI learning Pvt.Ltd.
7. Electronic Devices and Circuits: Bolyestad, Tata McGraw Hill.
8. Electronic Devices and circuits: A. Motorshed, Prentice Hall of India.
9. Basic Electronic Devices and Circuits: R.Y.Borse, 1stEdition 2012, Adhyayan Publishers and Distributors, New Delhi.

Paper II

ELC-102: Principles of Digital Electronics

Objectives:

1. To get familiar with concepts of digital electronics
2. To learn number systems and their representation
3. To understand basic logic gates, booleanalgebra and K-maps
4. To study arithmetic circuits, combinational circuits and sequential circuits
5. To study comparative aspects of logic families.

Term I

Unit 1: Number Systems and Logic Gates

(12)

Introduction to decimal, Binary and hexadecimal number systems and their inter-conversions,Signed and fractional binary number representations, BCD, Excess-3 and Graycodes, Alphanumeric representation in ASCII codes.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Positive and Negative Logic, Basic Logic gates (NOT, OR, AND) & derived gates (NAND, NOR, EX-OR) Symbol and truth table, Applications of Ex-OR gates as parity checker and generator.

Unit 2: Boolean Algebra and Karnaugh maps (12)

Boolean algebra rules and Boolean laws: Commutative, Associative, Distributive, AND, OR and Inversion laws, DeMorgan's theorem, Universal gates.
Min terms, Max terms, Boolean expression in SOP and POS form, conversion of SOP/POS expression to its standard SOP/POS form., Simplifications of Logic equations using Boolean algebra rules and Karnaugh map (up to 3 variables).

Unit 3: Arithmetic Circuits (12)

Rules of binary addition and subtraction, subtraction using 1's and 2's complements, half adder, full adder, Half subtractor, Full subtractor, Four bit parallel adder, Universal adder / subtractor, Digital comparator, Introduction to ALU.

Term II

Unit 4: Combinational Circuits (14)

Multiplexer (2:1, 4:1), demultiplexer (1:2, 1:4) and their applications, Code converters - Decimal to binary, Hexadecimal to binary, BCD to decimal, Encoder & decoder 3x4 matrix keyboard encoder, priority encoder, BCD to seven segment decoder.

Unit 5: Sequential Circuits (14)

Flip flops :RS using NAND/NOR, latch, clocked RS, JK, Master slave JK, D and T.
Counters: Ripple Binary counter, up down counter, concept of modulus counters, Decade counter, Counters for high-speed applications (Synchronous counters) with timing diagrams.
Shift registers: SISO, SIPO, PISO, PIPO shift registers, ring counter, universal 4-bit shift register and Applications.

Unit 6: Logic Families (8)

Introduction to Integrated circuit technologies TTL, ECL, CMOS
IC parameters: Logic levels, switching speed, propagation delay, power dissipation, noise margins and fanout of TTL and CMOS.
TTL NAND & NOT gate, Open collector gates, Wired OR operation. CMOS - NOT, NAND, NOR gate, precautions while handling CMOS gates, tri-state logic.

Text/ Reference Books:

1. Digital Electronics: Jain R.P., Tata McGraw Hill
2. Digital Principles and Applications: Malvino Leach, Tata McGraw-Hill.
3. Digital Fundamentals: Floyd T.M., Jain R.P., Pearson Education

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Paper III

ELC-103: Practical Course

- 1 The practical course consists of 20 experiments.
- 2 Any two of the following activities with proper documentation will be considered as equivalent of 4 experiments weightage in term work.
 - i. Preparatory experiments
 - ii. Hobby projects
 - iii. Internet browsing
 - iv. industrial visit / live work experience
 - v. PCB Making
 - vi. Market Survey of Electronic Systems
 - vii. Circuit Simulations and CAD toolsThese will be evaluated in an oral examination for 20% marks at internal and term end examination.

3. All the students are required to complete a minimum of 16 experiments

(four from each group) from the following list.

Group A Any Four

1. Study of forward and Reverse biased characteristics of PN Junction Diode
2. Study of breakdown characteristics and voltage regulation action of Zener diode
3. Study of output characteristics of Bipolar Junction Transistor in CE mode
4. Study of output and transfer characteristics JFET/MOSFET
5. Study of I-V characteristics of UJT and Demonstration of UJT based relaxation oscillator .
6. Study of solar cell.

Group B Any four

1. Verification of network theorems: KCL / KVL, Thevenin, Norton.
2. Verification of network theorems: Maximum Power Transfer, Superposition theorem.
3. Design, build and test Low pass and High pass RC filters.
4. Study of low voltage Half-wave, Full-wave and Bridge rectifier circuits.
5. Study of amplification action of BJT.
6. Study of potential divider biasing of BJT and its use in DC motor driving.
7. Build and test Inverting and non inverting amplifier using OPAMP.
8. Build and test adder and subtractor circuits using OPAMP.
9. Study of clipping and clamping circuits.

Group C Any Four

* Minimum Two experiments may be carried out with CMOS ICs

1. Basic Logic gates using Diodes and transistors
2. Interconversions and realizations of logic expressions using ICs
3. Study of RS, JK and D flip flops using NAND gates
4. Study of Up/Down Counter
5. Study of decade counter IC circuit configurations
6. Study of 4-bit Shift register IC

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Group D Any Four

1. Build and Test 4 bit parity checker/ generator using X-OR gate IC
2. Build and Test Half Adder, Full Adder and Subtractor using basic gate
3. Build and Test 2:1 Multiplexer and 1:2 Demultiplexer using gates
4. Build and Test 3X4 matrix Keyboard Encoder
5. Build and Test a Debounce switch using NAND or NOR gate IC
6. Build and Test Diode matrix ROM
7. Study of Four bit Universal Adder/Subtractor / ALU

Preparatory Experiments

1. Identification of Components / Tools
 - Minimum 10 different types of components must be given
 - Identification based on visual inspection / data sheets be carried out
2. Use of Multimeters (Analog and Digital)
 - Measurement of AC/DC voltage and Current – on different ranges
 - Measurement of R & C
 - Testing of Diodes & Transistors
 - Measurement of h_{fe}
 - Use of Multimeter in measurement of Variation of Resistance of LDR.
 - Thermister
3. Study of Signal Generator/CRO
 - Understand how to use Signal Generator/CRO
 - Study of front panel controls
 - Measurement of amplitude and frequency of Sine/Square waveform
 - Measurement of Phase with the help of RC circuit
 - Demonstration of Lissajous figures
 - Demonstrate the use of Component testing facility

Hobby Project Examples

Build and Test gadgets like

- Water level Indicator
 - Photo relay / smoke detector
 - Burglar Alarm
 - Fan regulator
 - Logic Probe
 - Experiments with some software's like PSPICE / LTSPICE
-

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

University of Pune

STATISTICS

For First Year B. Sc. (Computer Science) Degree Course

(Formerly known as B. C. S. Course)

Syllabus

(To be implemented from Academic Year 2013-14)

Submitted by: Board of Studies, Statistics

- 1) **Title of the Course:** First Year B. Sc. (Computer Science)
- 2) **Preamble:** Statistics is a branch of science that can be applied practically in every walk of life. Statistics deals with any decision making activity in which there is certain degree of uncertainty and Statistics helps in taking decisions in an objective and rational way. The student of Statistics can study it purely theoretically which is usually done in research activity or it can be studied as a systematic collection of tools and techniques to be applied in solving a problem in real life.

In last 5 to 7 years, computers are playing very crucial role in the society. The use of computers has horizontally spread and also penetrated vertically in the society. It has become a part and parcel of common man. Thus there is a huge demand for computer education.

The University of Pune had done a pioneering work in this area and Three year degree course B. Sc. (Computer Science) of University of Pune (formerly known as B.C.S.) is very popular among the student community and I. T. Industry. This course covers various subjects which are required directly or indirectly for becoming computer professional. Statistics is one such important subject which is required and is extensively used in a vast spectrum of computer based applications. Data Mining and Warehousing, Theoretical Computer Science, Reliability of a computer Programme or Software, Machine Learning, Artificial Intelligence, Pattern Recognition, Digital Image Processing, Embedded Systems are just few applications to name where Statistics can be extensively used.
- 3) **Introduction:** The syllabus of Statistics for First Year of this course covers basic concepts and terminology in Statistics and covers basic tools and methods required for data analysis. The teachers teaching this syllabus and students should give emphasis on understanding the concepts and ability to apply statistical tools and techniques and not on the theoretical discussion. It is

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

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expected that at the end of the course, a student should be well equipped to learn and apply acquired techniques in computer based applications.

4) Eligibility: 12th Science with Mathematics

Students admitted to F.Y.B.Sc.(C.S.) will be taking this as one of the compulsory course. Admissions to F.Y.B.Sc.(C.S.) will be given as per the selection procedure / policies adopted by the respective college keeping in accordance with conditions laid down by the University of Pune. Reservation and relaxation will be as per the Government rules.

5) Examination:

A) Pattern of examination and of question paper:

For Theory Papers (For Paper I and II):

Internal examination - 20 marks (10 marks for each semester)

Objective type/ short answer questions with maximum 2 marks for each question.

University Examination - 80 marks at the end of the year.

5 questions carrying 16 marks each.

Q1: Attempt all of the following: (2 marks each) (8 sub questions)

Q2, Q3, Q4, Q5: Attempt any four of the following (4 marks each) (any 4 out of 5 or out of 6)

For Practical paper in Statistics (Paper III):

Internal Evaluation of 20 marks -

(i) Statistics Journal & Attendance – 10 marks

(ii) Project Evaluation – 5 marks

(iii) Viva – 5 marks

External Examination of 80 marks – Total Duration 3 hours

(i) Questions based upon spreadsheet – 3 questions (1 question on diagrams) each of 10 marks should be asked. Total Duration – 1 hour, Total marks – 30.

(ii) Questions to be solved manually using scientific calculator – to solve any two questions out of 3 questions of 25 marks each. Total Duration – 2 hours, Total marks – 50.

B) Standard of Passing: In order to pass in the first year theory and practical examination, the candidate has to obtain 40 marks out of 100 in each course. (Minimum 32 marks must be obtained in the University Theory Examination.)

C) ATKT Rules: Not applicable, since Statistics is one of the compulsory courses taken at F.Y. level.

D) Award of Class: Not applicable, since Statistics is one of the compulsory courses taken at F.Y. level.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

E) **External Students:** There shall be no external students.

F) **Pattern of question paper:** As specified in A)

G) **Verification/Revaluation:** As per the University rules

6) Structure of the Course:

F. Y. B. Sc.(C.S.) Statistics

Paper	Course Title	Marks	Lectures
Paper - I	Statistical Methods I	100	Three Hours/Week per Paper (Total 36/Paper per term)
Paper - II	Statistical Methods II	100	
Practical Course	Practical Course	100	Three Hours / Week

Medium of Instruction: The medium of instruction for the course shall be English

7) **Equivalence of Previous Syllabus:** No equivalence required at F. Y. B. Sc. level, the course titles are same as previous syllabus.

8) **University Terms:** Dates for commencement and conclusion for the first and second terms will be declared by the University authorities. Terms can be kept by only duly admitted students. The term shall be granted only on minimum 75 percent attendance at theory and practical course and satisfactory performance during the term.

9) Course wise Detail Syllabus

Detailed Syllabus for Statistics Paper I (Statistical Methods I)

1.	Data condensation and Graphical methods 1.1 Raw data, attributes and variables, discrete and continuous variables. 1.2 Presentation of data using frequency distribution and cumulative frequency distribution. (Construction of frequency is not expected) 1.3 Graphical Presentation of frequency distribution –histogram, stem and leaf chart, less than and more than type ogive curves. 1.4 Numerical problems related to real life situations.	5
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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

2.	Review/Revision of Descriptive Statistics 2.1 Measures of Central tendency: Mean, Mode, Median. Examples where each one of these is most appropriate. 2.2 Partition values: Quartiles, Box-Plot. 2.3 Measures of Dispersion: Variance, Standard Deviation, Coefficient of Variation. (Section 2.1 to 2.3 should be covered for raw data, ungrouped frequency distribution and exclusive type grouped frequency distribution)	7
3.	Moments 3.1 Raw and Central moments: definition, computations for ungrouped and grouped data (only up to first four moments). 3.2 Relation between raw and central moments upto fourth order. 3.3 Numerical problems related to real life situations.	3
4.	Measures of Skewness and Kurtosis 4.1 Concept of symmetric frequency distribution, skewness, positive and negative skewness. 4.2 Measures of skewness-Pearson's measure, Bowley's measure, β_1, γ_1 4.3 Kurtosis of a frequency distribution, measure of kurtosis(β_2, γ_2) based upon moments, type of kurtosis: leptokurtic, platykurtic and mesokurtic. 4.5 Numerical problems related to real life situations.	4
5.	Discrete Random variable 5.1 Definition of random variable and discrete random variable. 5.2 Definition of probability mass function, distribution function and its properties. 5.3 Definition of expectation and variance, theorem on expectation. 5.4 Determination of median and mode using p.m.f. 5.5 Numerical problems related to real life situations.	8
6.	Standard Discrete Distributions 6.1 Discrete Uniform Distribution: definition, mean, variance. 6.2 Bernoulli Distribution: definition, mean, variance, additive property. 6.3 Binomial Distribution: definition, mean, variance, additive property. 6.4 Geometric Distribution (p.m.f $p(x) = pq^x, x = 0, 1, 2, \dots$): definition, mean, variance. 6.5 Poisson Distribution: definition, mean, variance, mode, additive property, limiting case of B(n, p) 6.6 Illustration of real life situations. 6.7 Numerical problems related to real life situations.	15
7.	Correlation (for bivariate raw data) 7.1 Bivariate data, Scatter diagram. 7.2 Correlation, Positive Correlation, Negative Correlation, Zero Correlation 7.3 Karl Pearson's coefficient of correlation (r), limits of r ($-1 \leq r \leq 1$), interpretation of r, Coefficient of determination (r^2), Auto-correlation upto lags 2. 7.4 Numerical Problems.	6

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

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8	Regression (for ungrouped data) 8.1 Regression: illustrations, appropriate situations for regression and correlation. 8.2 Linear Regression. 8.3 Fitting of straight line using least square method. 8.4 Properties of regression coefficients: $b_{xy} \cdot b_{yx} = r^2$, $b_{yx} \cdot b_{xy} < 1$, $b_{yx} = r(\sigma_y/\sigma_x)$ and $b_{xy} = r(\sigma_x/\sigma_y)$ 8.5 Non Linear regression models: second degree curve, growth curve models. i) $Y = ae^{bx}$ ii) $Y = ab^x$ iii) $Y = aX^b$ iv) logistic model $Y = k / (1+e^{a+bx})$ 8.6 Residual plot, mean residual sum of squares (m. s. s) 8.7 Numerical problems related to real life situations.	9
9	Multiple and Partial Correlation and Regression (for trivariate data) 9.1 Yule's notation and concept of multiple regression. 9.2 Fitting of multiple regression plane. 9.3 Partial regression coefficient, interpretation. 9.4 Multiple correlation coefficient, concept, definition, computation and interpretation. 9.5 Partial correlation coefficient, concept, definition, computation and interpretation.	8
10	Time Series 10.1 Meaning and Utility. 10.2 Components of Time Series. 10.3 Additive and Multiplicative models. 10.4 Methods of estimating trend: moving average method, least squares method and exponential smoothing method. 10.5 Elimination of trend using additive and multiplicative models. 10.6 Simple time series models: AR (1), AR (2). 10.7 Numerical problems related to real life situations.	7
Syllabus for 1 st term is upto Binomial Distribution in Topic 6.		

Detailed Syllabus for Statistics Paper II (Statistical Methods II)

1	Detailed Review / Revision of Theory of Probability 1.1 Counting Principles, Permutation, and Combination. 1.2 Deterministic and non-determination models. 1.3 Random Experiment, Sample Spaces (finite and countably infinite) 1.4 Events: types of events, Operations on events. 1.5 Probability - classical definition, probability models, axioms of probability, probability of an event. 1.6 Theorems of probability (with proof) i) $0 \leq P(A) \leq 1$ ii) $P(A) + P(A') = 1$ iii) $P(A) \leq P(B)$ when $A \subset B$ iv) $P(A \cup B) = P(A) + P(B) - P(A \cap B)$ 1.7 Numerical problems related to real life situations.	5
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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

2	<p>Advanced Theory of Probability</p> <p>2.1 Concepts and definitions of conditional probability, multiplication theorem $P(A \cap B) = P(A) \cdot P(B A)$</p> <p>2.2 Bayes' theorem (without proof)</p> <p>2.3 Concept of Posterior probability, problems on posterior probability.</p> <p>2.4 Definition of sensitivity of a procedure, specificity of a procedure. Application of Bayes' theorem to design a procedure for false positive and false negative.</p> <p>2.5 Concept and definition of independence of two events.</p> <p>2.6 Numerical problems related to real life situations.</p>	12
3	<p>Continuous Random Variable</p> <p>3.1 Definition of continuous random variable (r. v.),</p> <p>3.2 Probability density function (p.d.f.),</p> <p>3.3 Cumulative distribution function (c.d.f.), its properties.</p> <p>3.4 Calculation of mean, mode, median, variance, standard deviation for continuous r. v.</p> <p>3.5 Numerical problems related to real life situations.</p>	6
4	<p>Standard Continuous Probability Distributions</p> <p>4.1 Uniform Distribution: statement of p.d.f., mean, variance, nature of probability curve.</p> <p>4.2 Exponential Distribution: statement of p.d.f. of the form, $f(x) = (1/\theta) e^{-x/\theta}$, mean, variance, nature of probability curve, lack of memory property.</p> <p>4.3 Normal Distribution: statement of p.d.f., identification of parameters, nature of probability density curve, standard normal distribution, symmetry, distribution of $aX+b$, $aX+bY+c$ where X and Y are independent normal variables, computations of probabilities using normal probability table, normal approximation to binomial and Poisson distribution, central limit theorem (statement only), normal probability plot.</p> <p>4.4 Pareto Distribution: p.d.f. of the form $f(x) = \frac{\alpha}{x^{\alpha+1}}$, $x \geq 1, \alpha > 0$, mean, variance, applications.</p> <p>4.5 Numerical problems related to real life situations.</p>	13
End of First term.		
5	<p>Concepts and definitions related to testing of hypothesis</p> <p>5.1 Definitions: population, statistic, SRSWR, SRSWOR, random sample from a probability distribution, parameter, statistic, standard error of estimator.</p> <p>5.2 Concept of null hypothesis and alternative hypothesis, critical region, level of significance, type I and type II error, one sided and two sided tests, p-value.</p>	5

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

6	<p>Large Sample Tests</p> <p>6.1 $H_0: \mu = \mu_0$ Vs $H_1: \mu \neq \mu_0, \mu < \mu_0, \mu > \mu_0$ (One sided and two sided tests)</p> <p>6.2 $H_0: \mu_1 = \mu_2$ Vs $H_1: \mu_1 \neq \mu_2, \mu_1 < \mu_2, \mu_1 > \mu_2$ (One sided and two sided tests)</p> <p>6.3 $H_0: P = P_0$ Vs $H_1: P \neq P_0, P < P_0, P > P_0$ (One sided and two sided tests)</p> <p>6.4 $H_0: P_1 = P_2$ Vs $H_1: P_1 \neq P_2, P_1 < P_2, P_1 > P_2$ (One sided and two sided tests)</p> <p>6.5 Numerical problems related to real life situations.</p>	7
7	<p>Tests based on t-distribution</p> <p>7.1 $H_0: \mu = \mu_0$ Vs $H_1: \mu \neq \mu_0, \mu < \mu_0, \mu > \mu_0$ (One sided and two sided tests)</p> <p>7.2 $H_0: \mu_1 = \mu_2$ Vs $H_1: \mu_1 \neq \mu_2, \mu_1 < \mu_2, \mu_1 > \mu_2$ (One sided and two sided tests)</p> <p>7.3 Paired t-test.</p> <p>7.4 Test of significance of correlation coefficient for bivariate raw data.</p> <p>7.5 Test of significance of regression coefficients for bivariate raw data.</p> <p>7.6 Numerical problems related to real life situations.</p>	8
8	<p>Test based on Chi-square distribution</p> <p>8.1 Chi square test for goodness of fit</p> <p>8.2 Test for independence of attributes (m X n contingency table)</p> <p>8.3 Test for significance of variation for a population.</p> <p>8.4 Numerical problems related to real life situations.</p>	3
9	<p>Non parametric tests</p> <p>9.1 Run test</p> <p>9.2 Sign test.</p> <p>9.3 Kolmogrov - Smirnov test</p> <p>9.4 Mann – Whitney test</p> <p>9.5 Numerical problems related to real life situations.</p>	6
10	<p>Simulation</p> <p>10.1 Introduction to Simulation, merits and demerits and pitfall.</p> <p>10.2 Pseudo-random number generator ,requisites of a good random number generator, Testing these requirements by using various test of hypothesis using Run test, goodness of fit test, Sign test etc.</p> <p>10.3 Model Sampling from uniform and exponential distribution.</p> <p>10.4 Model sampling from Normal distribution using Box-Muller transformation.</p> <p>10.5 Numerical problems related to real life situations.</p>	7

Detailed Syllabus for Statistics Paper III (Practical)

A) Practicals to be done manually using scientific calculator

1	Measures of Central Tendency and Dispersion.
2	Problems on simple probability, conditional probability, Baye's theorem and independence of events.
3	Measures of skewness and kurtosis

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Course Catalog for B. Sc. (Computer Science) Program

4	Correlation and Linear Regression Analysis. (for bivariate raw data)
5	Fitting of second degree and exponential type models. (for bivariate raw data)
6	Multiple and Partial Correlation and Regression Analysis. (for trivariate data) + Using spreadsheet with use of readymade function.
7	Time Series (Moving Average and Fitting of AR(1) and AR(2) models).
8	Fitting of Binomial and Poisson distributions.
9	Fitting of Normal Distribution.
10	Model Sampling from Simple Continuous Distributions
11	Large Sample Tests.
12	Tests based upon t distribution.
13	Tests based upon chi square distribution.
14	Non parametric tests.

B) Practicals to be done using any spreadsheet (like MS-Excel in MS-Windows or Open-Office in Linux etc.)

1	Diagrammatic Representation and Descriptive Statistics for raw data
2	For a bivariate raw data, fitting various models and finding the "best fit". (3 problems to be solved in a slot)
3	Fitting of Geometric Distribution and Normal Distribution
4	Using random numbers, drawing of a sample from exponential distribution, normal distribution (Box Muller Transformation) etc.

C) Project –

Project is compulsory which is equivalent to 2 practicals.

Project will carry 5 marks as part of internal evaluation.

One project should be given to one practical batch of students.

The formal project report should be prepared by each student and it must be attached in Statistics journal.

10) Recommended books

Author Name	Year of Publication	Title	Publisher
Medhi J.	1992	Statistical Methods (An Introductory Text)	New Age International
Freund J.E.	2005	Modern Elementary Statistics	Pearson Publication
Trivedi K.S.	2001	Probability, Statistics, Design of Experiments and Queuing Theory with Applications of Computer Science	Prentice Hall of India, New Delhi

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Gupta S. C. and Kapoor V. K.	1987	Fundamentals of Applied Statistics (3rd Edition)	S. Chand and Sons, New Delhi.
Ross S. M.	2006	A First Course In Probability 6th Edition	Pearson publication
Law A. M. and Kelton W. D.	2007	Simulation Modelling and Analysis	Tata McGraw Hill
Box G. E. P. and Jenkins G. M.	2008	Time Series Analysis, 4 th edition	Wiley
Brockwell P. J. and Davis R. A.	2006	Time Series Methods	Springer
Snedecor G. W. Cochran W. G.	1989	Statistical Methods	John Wiley & sons
Kulkarni M.B., Ghatpande S.B., Gore S.D.	1999	Common Statistical Tests	Satyajeet Prakashan, Pune
Kulkarni M.B., Ghatpande S.B.	2007	Introduction to Discrete Probability and Probability Distributions	SIPF Academy
Sarma K.V.S.	2001	Statistics Made Simple. Do it Yourself on P.C.	Prentice Hall

11) Qualification of Teacher: As per the University rules

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Syllabus of S.Y. B.Sc. (Computer Science)

Academic Year 2009-10

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Course : S.Y. B. Sc. (Computer Science)

Proposed Syllabus (to be implemented from the academic year 2009-2010)

Pattern: Semester Pattern

Examination:

Pattern of Examination: Internal Examination (10 Marks) + University Examination (40 Marks) for each paper

Medium of Instruction: English

Equivalence of Subject: Table of Equivalence

Semester & Paper	Title of Paper (Old Pattern) (Implemented from the academic year 2003-04)	Title of Paper (New Pattern) (to be implemented from the academic year 2009-10)
Semester-I, Paper-I	CS-211, Data Structures, Image Structures and Related Algorithms in C	CS-211, Data Structures using C
Semester-I, Paper-II	CS- 212, File Structures and Database Concepts	CS-212, Relational Database Management System (RDBMS)
Semester-II, Paper-I	CS-221, Object Oriented Concepts and Programming in C++	CS-221, Object Oriented Concepts and Programming in C++
Semester-II, Paper-II	CS- 222, File Structures and Database Concepts	CS-222, Software Engineering

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Theory Paper I
SEM I
DATA STRUCTURES USING C (CS 211)
(Compulsory Course)

Total Lectures: 48

Objective:

- To learn the systematic way of solving problem
- To understand the different methods of organizing large amount of data
- To efficiently implement the different data structures
- To efficiently implement solutions for specific problems

Prerequisites: Knowledge of C Programming Language

1. Introduction to data structures [2]
 - 1.1 Concept
 - 1.2 Data type, Data object, ADT
 - 1.3 Need of Data Structure
 - 1.4 Types of Data Structure
2. Algorithm analysis [2]
 - 2.1 Algorithm – definition, characteristics
 - 2.2 Space complexity, time complexity
 - 2.3 Asymptotic notation (Big O, Omega Ω)
3. Linear data structures [6]
 - 3.1 Introduction to Arrays - array representation
 - 3.2 sorting algorithms with efficiency
 - bubble sort, Insertion sort, Merge sort, Quick Sort
4. Linked List [6]
 - 4.1 Introduction to List
 - 4.2 Implementation of List – static & dynamic representation,
 - 4.3 Types of Linked List
 - 4.4 Operations on List
 - 4.5 Applications of Linked List – polynomial manipulation
 - 4.6 Generalized linked list – concept & representation
5. Stacks [6]
 - 5.1 Introduction
 - 5.2 Representation-static & dynamic
 - 5.3 Operations
 - 5.4 Application - infix to postfix & prefix, postfix evaluation,
 - 5.5 Recursion using implicit stack
 - 5.6 Concept of Multiple stacks
6. Queues [8]
 - 6.1 Introduction
 - 6.2 Representation -static & dynamic
 - 6.3 Operations
 - 6.4 Circular queue, DeQue, priority queues
 - 6.5 Concept of Multiple Queues
7. Trees [12]
 - 7.1 Concept & Terminologies
 - 7.2 Binary tree, binary search tree
 - 7.3 Representation – static & dynamic
 - 7.4 Operations on BST – create, Insert, delete, traversals (preorder, inorder, postorder), counting leaf, non-leaf & total nodes
 - 7.5 Application - Heap sort
 - Height balance tree- AVL trees- Rotations

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

8. Graph

[6]

- 8.1 Concept & terminologies
- 8.2 Graph Representation
- 8.3 Traversals – BFS & DFS
- 8.4 Applications – AOV network – topological sort
AOE network – critical path
Shortest path with implementation

References:

1. Fundamentals of Data Structures ---- By Horowitz Sahani (Galgotia)
2. Data Structures using C --- By ISRD Group (Tata McGraw Hill)
3. Introduction to Data Structures using C---By Ashok Kamthane
4. Data Structures using C --- Bandopadhyay & Dey (Pearson)

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Theory Paper I

SEM II

Object Oriented Concepts and Programming in C++ (CS-221)
(Compulsory Course)

Total Lectures: 48

Objective:-

- Acquire an understanding of basic object oriented concepts and the issues involved in effective class design
- In order to write C++ programs that use object oriented concepts such as information hiding, constructors, destructors, inheritance etc.

Prerequisites: Knowledge of C Programming Language

1. Object oriented concepts [2]
 - 1.1 Object oriented methodology
 - 1.2 Features, advantages and Applications of OOPS
2. Introduction to C++ [8]
 - 2.1 Data types, new operators and keywords, type conversion in C++
 - 2.2 Introduction to reference variables
 - 2.3 Classes & Objects
 - 2.4 Classes & Object specifiers
 - 2.5 Defining data members and member functions
 - 2.6 Array of objects
 - 2.7 Managing consol I/O
 - 2.8 C++ stream classes
 - 2.9 Formatted and unformatted console I/O
 - 2.10 Usage of manipulators
3. Function in C++ [6]
 - 3.1 Call by reference, Return by reference
 - 3.2 Function overloading and default arguments
 - 3.3 Inline function
 - 3.4 Static class members
 - 3.5 Friend functions
4. Constructors and destructor [4]
 - 4.1 types of constructors
 - 4.2 memory allocation (new and delete)
 - 4.3 usage of destructor
5. Operator overloading [4]
 - 5.1 overloading unary and binary operators
 - 5.2 overloading using friend function
 - 5.3 usage of this pointer
 - 5.4 overloading insertion and extraction operator
6. Inheritance [10]
 - 6.1 types of inheritance with examples
 - 6.2 virtual base classes and abstract base classes
 - 6.3 constructor and destructor in derived class
 - 6.4 virtual functions and pure virtual function
7. Working with files [6]
 - 7.1 File operations
 - 7.2 File pointer and their manipulation
 - 7.3 File updation with random access
8. Templates [4]
 - 8.1 Introduction to templates,
 - 8.2 Class templates, function templates and overloading of function templates
 - 8.3 With multiple parameters
 - 8.4 CASE study on STL (with reference to container classes, operational utilities)

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

9. Exception Handling in C++ [4]
9.1 try, catch and throw primitives

Reference Books: -

1. Object Oriented Programming with C++ by Robert Lafore
2. Object Oriented Programming with C++ by E. Balagurusamy
3. Object Oriented Modeling and Design by James Rambaugh
4. The Complete Reference C++ by Herbert Schildt
5. Let us C++ by – Yashwant Kanitkar

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Theory Paper – II
SEM I
Relational Database Management System (RDBMS)(CS-212)
(Compulsory Course)

Total Lectures: 48

Objective:-

- To teach fundamental concepts of RDBMS (MySQL)
- To teach principles of databases
- To teach database management operations
- To teach data security and its importance
- To teach client server architecture

Prerequisites: Knowledge of DBMS

1. MySQL

[12]

- 1.1. Creating a Database and Tables
- 1.2. Inserting, Selecting, Ordering, Limiting, Grouping, Analyzing and Manipulating Data
- 1.3. Changing, Deleting, Searching, Importing Data
- 1.4. Command Line Interface
- 1.5. Database and Table Schema Statements
- 1.6. Data Manipulation Statements and Functions
- 1.7. Table Statements and Functions
- 1.8. Replication Statements and Functions
- 1.9. Stored Routine Statements
- 1.10. Aggregate Clauses, Aggregate Functions
- 1.11. String Functions
- 1.12. Date and Time Functions
- 1.13. Mathematical Functions
- 1.14. Flow Control Functions
- 1.15. Stored Functions and Cursors
- 1.16. Stored Procedures, Views and Triggers
- 1.17. Exception Handling

2. Transaction Concepts

[14]

- 2.10. Describe a transaction, properties of transaction, state of the transaction.
- 2.11. Executing transactions concurrently associated problem in concurrent execution.
- 2.12. Schedules, types of schedules, concept of serializability, precedence graph for Serializability.
- 2.13. Ensuring Serializability by locks, different lock modes, 2PL and its variations.
- 2.14. Basic timestamp method for concurrency, Thomas Write Rule.
- 2.15. Locks with multiple granularity, dynamic database concurrency (Phantom Problem).
- 2.16. Timestamps versus locking.
- 2.17. Deadlock handling methods
- 2.18. Detection and Recovery (Wait for graph).
- 2.19. Prevention algorithms (Wound-wait, Wait-die)

3. Database Security Concepts

[8]

- 3.10. Introduction to database security concepts
- 3.11. Methods for database security
- 3.12. Discretionary access control method
- 3.13. Mandatory access control and role base access control for multilevel security.
- 3.14. Use of views in security enforcement.
- 3.15. Overview of encryption technique for security.
- 3.16. Statistical db security.

4. Crash Recovery

[8]

- 4.1. Failure classification
- 4.2. Recovery concepts
- 4.3. Log base recovery techniques (Deferred and Immediate update)
- 4.4. Checkpoints
- 4.5. Recovery with concurrent transactions (Rollback, checkpoints, commit)
- 4.6. Database backup and recovery from catastrophic failure.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

5. Client-Server Technology [6]
- 5.1 Describe client-server computing.
 - 5.2 Evolution of Client - Server information systems.
 - 5.3 Client – Server Architecture benefits.
 - 5.4 Client Server Architecture
 - Components, Principles, Client Components
 - Communication middleware components
 - Database middleware components
 - Client Server Databases

References:-

1. Fundamentals of Database Systems (4th Ed) By: Elmasri and Navathe
2. Database System Concepts (4th Ed) By: Korth, Sudarshan, Silberschatz
3. MySQL The Complete Reference By Vikram Vaswani
4. Learning MySQL by O'reilly
5. MySQL in Nut Shell by Dyer 2nd Edition

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Theory Paper – II
SEM II
Software Engineering (CS 222)
(Compulsory Course)

Total Lectures: 48

Objective:-

- To teach concepts of Software Engineering
- To teach principles of Software Engineering
- To teach various process models used in practice
- To know about the system engineering and requirement engineering
- To build analysis model

Prerequisites: Basic knowledge of system concepts and DBMS

1. Introduction To Software Engineering [4]
 - 1.1 The Evolving Role of Software
 - 1.2 Software
 - 1.3 The Changing Nature of Software
 - 1.4 Legacy Software
 - 1.4.1 The Quality of Legacy Software
 - 1.4.2 Software Evolution
 - 1.5 Software Myths
2. A Generic View of Process [6]
 - 2.1 Software Engineering – A Layered Technology
 - 2.2 A Process Framework
 - 2.3 Personal and Team Process Models
 - 2.3.1 Personal Software Process (PSP)
 - 2.3.2 Team Software Process (TSP)
 - 2.4 Process Technology
 - 2.5 Product and Process
3. Process Models [6]
 - 3.1 Prescriptive Models
 - 3.2 The Waterfall Model
 - 3.3 Incremental Process Models
 - 3.3.1 The Incremental Model
 - 3.3.2 The RAD Model
 - 3.4 Evolutionary Process Models
 - 3.4.1 Prototyping
 - 3.4.2 The Spiral Model
 - 3.4.3 The Concurrent Development Model
 - 3.4.4 A Final Comment of Evolutionary Processes
4. An Agile View of Process [4]
 - 4.1 What Is Agility?
 - 4.2 What Is an Agile Process?
 - 4.2.1 The Politics of Agile Development
 - 4.2.2 Human Factors
 - 4.3 Agile Process Models
 - 4.3.1 Extreme Programming (XP)
 - 4.3.2 Adaptive Software Development (ASD)
 - 4.3.3 Dynamic Systems Development Method (DSDM)
 - 4.3.4 Scrum
 - 4.3.5 Crystal
 - 4.3.6 Feature Driven Development (FDD)
 - 4.3.7 Agile Modeling (AM)

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

5. Software Engineering Practice	[6]
Software Engineering Practice	
The Essence of Practice	
Core Principles	
Communication Practices	
Planning Practices	
Modeling Practices	
Analysis Modeling Principles	
Design Modeling Principles	
6. System Engineering	[4]
6.1 Computer-Based Systems	
6.2 The System Engineering Hierarchy	
6.2.1 System Modeling	
6.2.2 System Simulation	
6.3 Business Process Engineering: An Overview	
7. Requirements Engineering	[10]
7.1 A Bridge to Design and Construction	
7.2 Requirements Engineering Tasks	
7.2.1 Inception	
7.2.2 Elicitation	
7.2.3 Elaboration	
7.2.4 Negotiation	
7.2.5 Specification	
7.2.6 Validation	
7.2.7 Requirements Management	
7.3 Initiating the Requirements Engineering Process	
7.3.1 Identifying the Stakeholders	
7.3.2 Recognizing Multiple Viewpoints	
7.3.3 Working Toward Collaboration	
7.3.4 Asking the First Questions	
7.4 Eliciting Requirements	
4.4.1 Collaborative Requirements Gathering	
4.4.2 Quality Function Deployment	
4.4.3 User Scenarios	
4.4.4 Elicitation Work Products	
7.5 Building the Analysis Model	
7.5.1 Elements of the Analysis Model	
7.5.2 Analysis Patterns	
7.6 Negotiating Requirements	
7.7 Validating Requirements	
8. Building the Analysis Model	[8]
8.1 Requirements Analysis	
8.1.1 Overall objective and Philosophy	
8.1.2 Analysis rule of Thumb	
8.1.3 Domain Analysis	
8.2 Analysis Modeling Approaches	
8.3 Data Modeling Concepts	
8.3.1 Data Objects	
8.3.2 Data Attributes	
8.3.3 Relationships	
8.3.4 Cardinality and Modality	

Reference Books:

1. Software Engineering – A Practitioner's Approach 7th Edition – Roger S. Pressman [McGraw Hill International Edition]
2. Software Engineering – IAN Sommerville 7th / 8th Edition (Pearson Edition)

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

S.Y.B.Sc. (Computer Science)

Lab Course-I

Practical Assignment

Teaching Scheme:- 4 Lectures Per Week per batch of 15 students

Examination Scheme:-

Practical examination will be conducted by respective colleges at the end of academic year, 80 marks will be assigned to practicals and 20 marks for journals and orals.

LAB I: Data Structures using C Assignments

1. Sorting Algorithms – Bubble sort, Insertion, selection, quick sort and merge.
2. Static/Dynamic stack implementation, infix to postfix, infix to prefix and evaluation of Postfix.
3. Static and Dynamic Queue Implementation.
4. Singly Linked List, Doubly Linked List and Circular Linked List.
5. Polynomial addition (Using Linked list).
6. Binary Tree Traversal: Create, add, delete, display nodes.
7. Graph: in degree, out degree, DFS, BFS.
8. Shortest path Dijkstra algorithm.
9. Adjacency matrix to adjacency list conversion.

LAB I: C++ Assignments

1. Class and Object, Array of Objects.
2. Inline function, friend function, default argument, function overloading.
3. Operator Overloading
4. Constructor: Copy Constructor, Default Constructor, Parameterized Constructor.
5. Memory Allocation: new and delete operators
6. Inheritance: Single, multiple, multilevel, hierarchy.
7. File Handling: Updation of files using random access
8. Templates: Function and Class.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

S.Y.B.Sc. (Computer Science)
Lab Course-II
Practical Assignment

Teaching Scheme:- 4 Lectures Per Week per batch of 15 students

Examination Scheme:-

Practical examination will be conducted by respective colleges at the end of academic year. There will be grading system based on performance of candidates.

The grading system is as follows.

Marks	Grade
Below 40	D (D Grade indicates fail)
40 - 49	C
50 - 59	C+
60 - 69	B
70 - 79	B+
80 - 89	A
90 and Above	A+

Q. 1. My-SQL Assignments

- Simple and Nested Queries
- Queries using function
- Queries using cursors
- Stored procedure and function
- triggers
- cursor and database schema

Q. 2. Mini Project based on SE Concept

- Problem Definition
- Scope of the system
- Proposed System
- Fact finding techniques
- Feasibility study
- ERD
- DFD
- I/O Screens
- O/P Formats
- Report Layout
- Conclusion
- Bibliography

NOTE: A booklet should be made available to the students for the Lab Course I and II assignments.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

1

S.Y.B.Sc. Computer Science: Electronics

Revised Syllabus

To be implemented from June 2009.

1) **Title of the course:** Second Year B.Sc. Computer Science : Electronics

2) **Introduction :**

The syllabus at S.Y.B.Sc.(Computer Science) contains proper blend of core theoretical concepts of Microprocessor Architecture and assembly language programming , with introduction to microcontrollers , principles of communication systems and applications in the fields like embedded systems and digital signal processing. Semester Pattern is followed at S.Y.B.Sc. Electronic Science. Student taking admission to S.Y.B.Sc.(Computer Science) have to complete 4 theory courses two each semester and one practical course (Annual) in subject Electronics. In the theory courses adequate knowledge of Microprocessor Architecture and Programming, Communications Principles, 8051 Microcontroller and embedded systems and Digital Signal Processing. In the practical course of 100 marks there are compulsory experiments along with the activities to be done. There are two types of activities – One by the student by his own area of interest and other to be organised by the teacher such that it will enhance the practical quality skills of the students.

3) **Aims and Objectives :**

The aim of the course is to generate the manpower with adequate theory knowledge of the Microprocessor and microcontroller, Assembly Language, communication principles, embedded system and Digital signal processing. The advanced topics like Digital Signal Processing and 8051 Microcontroller along with embedded system will open doors for the students to work in recent modern development environment of electronics in the world.

Following are the objectives –

- i) To design the syllabus with specific focus on key Learning Areas.
- ii) To equip student with necessary fundamental concepts and knowledge base.
- iii) To develop specific practical skills.
- iv) To develop specialists in hardware-software co-design for application specific electronic system.
- v) To prepare students for demonstrating the acquired knowledge.
- vi) To encourage student to develop skills for accepting challenges of upcoming technological advancements.

These objectives can be achieved by implementing this syllabus at the second year B.Sc. Computer Science in the subject Electronics.

4) **Eligibility:** First Year B.Sc. Computer Science Pass / ATKT .

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

2

5) Examination –

A) Pattern of Examination :

i) Semester and Practical

Theory Papers - Two Theory papers of 50 marks per semester
(Internal examination 10 +
Semester Examination 40, Total 50)

Practical - At the end of year 100 marks Examination.
(Internal examination 20 +
Semester Examination 80, Total 100)

ii) Pattern of the question Paper:

The pattern adopted for theory and practical examination is as below.

Theory: The topic wise weightage is decided as per lecture allotted to cover the syllabus for the topics. The Internal option is also taken into consideration in the process. Equal weightage is given for each topic, and none of the topic can be put up as option by the student for examination.

Internal Examination 10 Marks

Four types of questions – Objective, Fill in the blanks, True or False and One sentence answer.

There are two or three different sets of the question papers used for internal examination in the same class for same paper.

It is continues evaluation process and is executed by the teacher conducting the course.

External Examination 40 Marks

Pattern is as follows-

Q.1 Answer any all of the following : 10 marks

Compulsory no internal option , contains one mark.

Q.2 Answer any TWO. : 10 marks

Three questions are given, each having 5 marks, any two are to be solved.

Q.3 Answer any TWO. : 10 marks

Three questions are given, each having 5 marks, any two are to be solved.

Q.4 Answer any ONE. : 10 marks

Two questions are given solve any one is to be solved for 10 marks.

OR

Split the 10 mark question with proper weightage for the topics

Practical : Internal Marks 20 : Continuous assessment

External Examination 80 Marks. –

Have to perform 2 experiments of 40 marks of the duration 3 hours each. (Practical Examination is scheduled in two sessions.)

B) Standard of passing: Candidate must score 40% marks at the semester examination in each course.

i.e. 16 marks at semester theory paper

32 marks at the practical course

There is no separate passing for internal course , however the total marks of internal and external should cross 40% of the total marks to be awarded for the paper.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

3

- C) **ATKT Rules:** As per University statutes
D) **Award of Class:** It will as per University rules as –
Above 70% First class with distinction
Between 60% to 70% First Class
Between 50% to 60% Second Class
From 40% to 50 % Pass class.

E) **External Students:** Not applicable for this course. External Students are not admitted for the course.

F) **Setting of Questions paper/ Pattern of Question paper:**

Setting of the question paper is as per University Schedule and it is centralized system adopted by University of Pune. Pattern of question paper will be as per decided by Board of Electronic Science, University of Pune.

G) **Verification of Revaluation:** As per University Statutes and rules for verification and revaluation of marks in stipulated time after declaration of the semester examination result.

6) **Structure of the course :**

i)

- a) **Compulsory Paper** : Four theory papers
b) **Optional Paper** : Nil
c) **Question paper** : Theory -
For Internal Examination 10 Marks
For Semester Examination 40 Marks

Practical
For Internal Examination 20 Marks
For Semester Examination 80 Marks

ii) **Medium and Instructions: ENGLISH**

7) **Equivalence subject/Paper and Transitory Provision:**

Semester	OLD Syllabus	New Syllabus
Semester I	ELC 211 Computer Organisation	Microprocessor Architecture And Programming
	ELC 212 Process Control Instrumentation	Communications Principles
Semester II	ELC 221 Microprocessors	8051 Microcontroller and Embedded systems
	ELC 222 Communication Principles	Digital Signal Processing

- 8) **University Terms:** More than 75% attendance is necessary for the course as per University statutes.
16 Weeks will be available for completion of theory course.
Practical course will be throughout the year.
- 9) **Subject wise Detail Syllabus and Recommended books:**

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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S.Y.B.Sc. Computer Science Semester I

Electronics: Paper- I MICROPROCESSOR ARCHITECTURE AND PROGRAMMING

- 1) Computer Organization** [12]
 CPU organisation: Different registers organisation
 Memory organisation: cache mapping, memory management (Segmentation, paging), memory mapping.
 I / O organisation: I / O interface, DMA concept, Serial bus interface (RS 232, USB), Parallel port, PCI bus, PCMCIA bus
- 2) Introduction to microprocessor** [8]
 Features of Pentium based microprocessors (Data bus, Address bus, Speed, Addressable memory capacity, cache memory, Number of instructions executed parallelly)
 Pentium microprocessor architecture
 General purpose, Special purpose Registers of Pentium microprocessor
 Real mode and protected mode addressing
- 3) Pentium Processor** [12]
 Pentium addressing mode
 Instruction set of Pentium
 Interrupt processing in Pentium: classification of interrupt, Interrupt handler, Interrupt vector table, multiple interrupt processing, DOS INT 21H, Interrupt function codes
- 4) Assembly programming** [16]
 Introduction to assembler (NASM), Assembly directives, introduction to Programming (Flow chart, Algorithm, program), Assembly programmes of Addition, subtraction, multiplication, division, code conversion, Array processing (Finding largest-smallest number, arranging elements in ascending – descending order), I/O related programming (Reading of key from keyboard, displaying string, displaying graphic character), software device driver.

Recommended Books:

1	Morris Mano	Computer System Architecture(3 rd Edition)	PHP
2	Berry B. Brey & C.R. Sarms	The Intel Microprocessors	Pearson Education
3	James Antonakos	Pentium Microprocessors	Pearson Education
4	Michel Meyers	Managing and troubleshooting PC	
5	William Stalling	Computer Organisation and Architecture (2002)	PHI
6	Ron White	How computer Works(4 th Edition)	Techmedia Publication
7	Scott Mueller	Upgrading and repairing PC's (10 th Edition)	
8	Stephen J. Bigelow	Troubleshooting, Maintaining and repairing PC's (5 th Edition)	TMH
9	Peter Abel	Assembly Language Programing	PHP

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Course Catalog for B. Sc. (Computer Science) Program

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S.Y.B.Sc. Computer Science Semester I
Electronics: Paper- II **Communications Principles**

1. Introduction to Electronic Communication [10]

Importance of Communication, Elements of Communication system, Electromagnetic spectrum, types of communication, Concepts of communication system: channel bandwidth, Nyquist theorem, S/N ratio, channel capacity, error handling, Shannon theorem, companding, Data rate, baud rate, serial communication and protocol.

2. Modulation and Demodulation [10]

Basics of modulation and Demodulation Introduction to Modulation techniques: Analog (Amplitude, Phase, Frequency modulation), Digital modulation, PAM, PCM, delta modulation, MODEM - concept of ASK, FSK, QPSK, MSK, GMSK, 16 QAM

3. Multiplexing and Multiple Access Techniques [10]

Space division multiplexing, Time division multiplexing, Frequency Division Multiplexing, Code division multiplexing, Introduction to multiple access, FDMA, TDMA, Spread spectrum multiple access: Frequency Hopped Multiple access, CDMA, Hybrid spread spectrum techniques, SDMA.

4. Introduction to wireless Communication [08]

Introduction to antennas, Parameters of antenna, multielement antennas (arrays), multidirectional and omni directional antenna, microstrip antenna, Concept of wireless communication
Comparison of wired and wireless communication, Wireless communication architecture, Ad-hoc networks, Protocols – listing and details of RFID.

5. Mobile communication [10]

Introduction to mobile communication, Cellular concept, Working of GSM: Hand over, RTS-CTS protocol, Introduction to GPRS, IR transmission, blue tooth Applications: SMS, EMS, MMS

Recommended Books:

1	Micheal A . Miller	Digital and Data Communication ,4 th edition	Jaico Pub. House
2	Thiagarajan Vishwanathan	Telecommunication switching system and networks	PTH
3	Frenezal Louis E.	Communication Electronics	TMH
4	Rappaport	Wireless Communication, 2 nd edition	PHI
5	Schiller Jochen	Mobile Communication	Pearson
6	Stern and Mahmoud	Communication systems : analysis and design	Pearson
7	Yi-Bang LIN	Wireless & Mobile Network Architectures	Wiley India
8	Imrich Chal amtac	Wireless Communication Technology	Roy Blake

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Course Catalog for B. Sc. (Computer Science) Program

S. Y. B. Sc. Computer Science Semester II

Electronics : Paper- I 8051 Microcontroller and Embedded systems

1. **8051 microcontroller block diagram,** (12)
(Registers, Flags, PSW, PC, Input/Output Pins, Ports, Internal memory, External memory Oscillator & Clock, counters and Timers, Serial Data IO Transfer, Interrupts)

Instruction set (To be covered quickly with no questions directed to wards syntax of Instructions)
2. **I/O port programming; sensor and indicators interface** (06)
8051 I/O programming, I/O bit manipulation programming.
3. **Timer and counter programming** (06)
Programming 8051 timers, counter programming, programming timers 0 and 1 in 8051 C.
4. **Serial port programming with and without interrupt** (06)
8051 interrupts, programming timer interrupts, programming external hardware interrupts, o/programming the serial communication interrupt, interrupt priority in the 8051
5. **Real world interfacing:** (06)
Parallel and serial ADC, DAC interfacing, LCD interfacing
6. **Embedded systems:** (12)
Definition, examples, classification – w.r.t. size and real time requirements, software tools required for development – cross assemblers, cross compilers, locators, loaders, simulators, emulators

Recommended Books:

1	Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. Mckinlay	"The 8051 microcontroller and Embedded systems using Assembly and C", Second Edition	Pearson
2	KENNETH AYALA, DELMAR CENGAGE FEARNING	"The 8051 Microcontroller Architecture ,Programming & Applications", Third Edition	TMH
3	Michael Barr and Anthony Massa	"Programming Embedded systems with 'C' and GNU development tools" Second Edition	Shroff Publishers
4	Myke Predko	Programming and customizing the 8051 microcontroller	TMH
5	RajKamal	Embedded systems Architecture, Programming and Design	TMH

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Course Catalog for B. Sc. (Computer Science) Program

S. Y. B. Sc. Computer Science Semester II

Electronics : Paper- II Digital Signal Processing

1: Electronic Signals and Systems (12)

Basics: Concept of signal and signal processing, Block diagram representation of a DSP system Analog to Digital conversion of signals classification of signals, concept of sampling of CT signals, presentation of DT signal

Fourier Transform: Fourier Transform, Concept of Amplitude and phase spectrum of CT signals, Discrete Time Signals, Discrete Fourier Transform, Inverse DFT, Fast Fourier Transform.
Concept of convolution and co-relation
Concept of transfer function of DT system, Impulse response, Time and frequency domain analysis of DT system using transfer function, concept of realization of transfer function.

2: Time and Frequency Domain analysis of DT signals (12)

Laplace Transform: Definition, Inverse Laplace transform, Properties of LT, Applications in t-domain, s-domain signal analysis.

Z-transform: Definition, Inverse Z-transform, difference equation and its solution

Digital Filters: Concept, Impulse Invariant and BLT method for designing of DT filters, IIR and FIR filters, brief introduction of window technique for DT filters

3: Digital Signal Processor (12)

Digital signal processor Architecture, Multiplier and Accumulators, ALU and Barrel shifter, Memory and Cache, Registers, Buses, peripheral interfaces.

4: Applications of DSP: (12)

Practical A/D and D/A converters : Important parameters .
Audio signal processing in detail, summary of the DSP applications for the - Filtering, Modulation, demodulation, Motion control and positioning, seismography, Radar, Sonar, noise reduction and echo cancellation, speech recognition, interference rejection, image processing.

Recommended Books:

1	S. Salivahan, A. Valuraj, C.Gnanapriya	Digital Signal Processing , 2006 Edition	TMH
2	Charles Schuller, Mahesh Chugani	Digital Signal Processing: A Hands on Approach , 2006 Edition	TMH
3	John G Proakis, Dimitris G Monolkis	Digital Signal Processing: - Principles, Algorithms and Applications	Pearson
4	Steven W.Smith, Newnes	Digital Signal Processing- A practical Guide for Engineers and Scientists	Elsevier
5	Palan N.G.	Computer Algorithms in Signal Processing	Technova
6	Haykin Simon , Veevan Barry	Signals and Sysytems	John Wiley
7	Bhat P.V.	Network Analysis and Synthesis	Technova
8	John Prokis	DSP using MATLAB	Pearson

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S.Y.B.Sc. Computer Science
Electronics : Practical Course

- Total Experiments to be performed 20.
- 16 experiments compulsory: At least four practical from each of the ABCD groups.
- One activity Equivalent to 2 practical.
 - Continuation of F. Y. activity.
 - PSPICE Simulation or equivalent
 - Documentation type experiments
 - Presentation/Seminar on Electronics /advanced topic/research topics.
- Two activities to be organised by the teacher, (equivalent to two experiments) like arranging experts lecture, demonstrations, skill development demonstration, basics of electronics essential for B.Sc. Computer student.
- Both the activities will be examined at annual examination.

Practical Examination –

A) Internal Marks 20 : 16 Marks
as usual for 16 marks for experiments and 04 marks for activities

B) Annual examination : 80 Marks in two session of 3 Hours as usual practice.

Session I 40 marks
Practical work 32 marks
Oral based on the student's own activities 8 marks

Session II 40 marks
Practical work 32 marks
Oral based on Common activities arranged by teachers 8 marks

32 Marks can be divided as -	Circuit diagram	05
	Connection	05
	Demonstration and working explanation	10
	Result	05
	Result analysis / conclusion / comments	02

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LIST OF PRACTICALS :

Group "A" Microprocessor based experiments:

1. Interfacing of keyboard and comparing two strings. (One string is in the program and other string read from keyboard.)
2. Read the strings through the keyboard. Arranging strings in ascending and descending order.
3. Code conversion (Decimal to hex, hex to decimal, decimal to binary, binary to decimal by hex dabble and double dabble method.)
4. Finding largest and smallest of a number in an array.
5. Finding roots of quadratic equation and finding factorial of a number.
6. Define cursor position and display character string using different font size and colour.
7. Read and display printer status.
8. Interfacing seven-segment display through parallel port of Pentium motherboard.
9. Interfacing stepper motor to parallel port of Pentium motherboard.

Requirement for Microprocessor based experiments:

1. NASMW/ NASM 32
2. NASM IDE

Group "B" Micro controller based Experiments:

1. Arithmetic and logical problems – String addition, Largest/Smallest number in string, hex to decimal conversion and vice versa.
2. Frequency generation using 8051 micro controller.
3. To design and test rolling display using 8051 micro controller.
4. To design and test traffic light control system using 8051 micro controller.
5. To design and test thumb wheel switch and SSD 8051 interfacing with microcontroller.
6. Interfacing D.C. motor and speed control using PWM.
7. To study waveform generator (square, triangular and saw tooth using DAC) with microcontroller.
8. Write a program for interfacing LCD with microcontroller.
9. Write a program to generate even/odd parity and check the parity of a number.

Requirement for Micro controller based Experiments:

1. IDE 8051 (Assembler)
2. ISP programmer
3. 89S51/52
4. Target board (PCB).

Group "C" Communication

1. Build and test FSK Modulation / Demodulation.
2. Build and test TDM.
3. Build and test Hamming code for error detection and correction.
4. Study of PN sequence generator for Spread Spectrum communication.
5. Study of Radiation pattern of an antenna.
6. Demonstration of working of Wi-fi card.
7. Demonstration Experiment on RFID application.

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Group "D" Digital Signal Processing

- 1) Study of Fourier Analysis of Different Wave shapes.
 - 2) Synthesis of Waveforms using multiple sine waves.
 - 3) Study of Sampling theorem, Aliasing and it's effect.
 - 4) Study of transfer function and convolution principles.
 - 5) Study of FIR and IIR Digital filters.
 - 6) Study of windowing techniques for filters.
 - 7) Study of AM modulation and demodulation.
 - 8) Study of FSK and ASK modulation and demodulation.
 - 9) Demonstration experiment on image processing and compression.
 - 10) Demonstration experiment on sound processing and compression.
-

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Course Catalog for B. Sc. (Computer Science) Program

University of Pune
Board of Studies in Mathematics

S.Y.B.Sc. (Comp. Sc.)
Syllabus of Mathematics

	Semester – I		Semester – II	
<u>Paper I</u>	Linear Algebra	(MTC:211)	Computational Geometry	(MTC : 221)
<u>Paper II</u>	Numerical Analysis	(MTC:212)	Operations Research	(MTC:222)
<u>Paper III</u>	Practical			(MTC:223)

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Course Catalog for B. Sc. (Computer Science) Program

Paper I- (Semester I) :
Linear Algebra (MTC:211)

1. Linear Equations and Matrices

Linear systems
Matrices
Dot Product and Matrix Multiplication
Matrix Transformations
Solutions of Linear Systems of Equations
LU- Factorization. (12 lectures)

2. Real Vector spaces

Vector Spaces
Subspaces
Linear Independence
Basis and Dimension
Homogeneous Systems
The Rank of a Matrix and Applications
Coordinates and Change of Basis
Orthonormal Bases in \mathbb{R}^n (20 lectures)

3. Eigenvalues, Eigenvectors and diagonalization

Eigenvalues and Eigenvectors
Diagonalization
Cayley Hamilton theorem (Statement only) (10 lectures)

4. Linear Transformations and Matrices

Definitions and Examples
The Kernel and Range of a Linear transformation
The Matrix of a Linear Transformation (6 lectures)

Text Book

B. Kolman , D. Hill, Introductory Linear Algebra, An Applied
First Course, Pearson Edn; 8th Edn; (2008)

Chapters : 1, 6, 8, 10(Only Arts. 10.1, 10.2, 10.3)

Reference Book: H.Anton, Chris Rorres, Linear Algebra with Applns.,
Wiley, 7th Edn; (1994)

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**Paper I- Semester II :
Computational Geometry (MTC:221)**

1. **Two dimensional transformations -** (16 Lectures)
 - a) Introduction.
 - b) Representation of points.
 - c) Transformations and matrices.
 - d) Transformation of points.
 - e) Transformation of straight lines.
 - f) Midpoint transformation.
 - g) Transformation of parallel lines.
 - h) Transformation of intersecting lines.
 - i) Transformation: rotations, reflections, scaling, shearing.
 - j) Combined transformations.
 - k) Transformation of a unit square.
 - l) Solid body transformations.
 - m) Transformation and homogeneous coordinates. Translation.
 - n) Rotation about an arbitrary point.
 - o) Reflection through an arbitrary line.
 - p) Projection – a geometric interpretation of homogeneous coordinates.
 - q) Overall Scaling.
 - r) Point at infinity.

2. **Three dimensional transformations** (16 Lectures)
 - a) Introduction.
 - b) Three dimensional – Scaling, shearing, rotation, reflection, translation.
 - c) Multiple transformations.
 - d) Rotation about – an axis parallel to coordinate axes, an arbitrary axis in space.
 - e) Reflection through – coordinate planes, planes parallel to coordinate planes, arbitrary planes.
 - f) Affine and perspective transformations.
 - g) Orthographic projections.
 - h) Axonometric projections.
 - i) Oblique projections.
 - j) Single point perspective transformations.
 - k) Vanishing points.

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3. **Plane Curves** (10 Lectures)
- a) Introduction.
 - b) Curve representation.
 - c) Non – parametric curves.
 - d) Parametric curves.
 - d) Parametric representation of a circle and generation of circle.
 - e) Parametric representation of an ellipse and generation of ellipse.
 - f) Parametric representation of a parabola and generation of parabolic segment.
 - g) Parametric representation of a hyperbola and generation of hyperbolic segment.

5. **Space curves** (6 Lectures)
- a) Bezier Curves – Introduction, definition, properties(without proof), curve fitting (up to $n = 3$), equation of the curve in matrix form (upto $n = 3$)

TextBook :

D. F. Rogers, J. A. Adams, Mathematical elements for Computer graphics, Mc Graw Hill Intl Edition.

References :

- Schaum Series, Computer Graphics.
- M. E. Mortenson, Computer Graphics Handbook, Industrial Pres Inc.

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Paper II- Semester I :
Numerical Analysis (MTC:212)

- 1. Errors:** [4 lectures]
 - (1) Rounding off numbers to n significant digits, to n decimal places.
 - (2) Absolute, relative and percentage errors.

- 2. Solution of Equations:** [14 lectures]
 - (1) Location of roots.
 - (2) Descartes' Rules.
 - (3) Sturm's theorem (without proof).
 - (4) Bisection Method
 - (5) Regula Falsi
 - (6) Newton- Raphson Method.
 - (7) Gauss-Seidel Method.

- 3. Interpolation:** [14 lectures]
 - (1) Operator Δ, ∇, E and their relations.
 - (2) Fundamental theorem of difference calculus.
 - (3) Newton's Interpolation Formulae (Forward and Backward).
 - (4) Lagrange's Interpolation Formula.
 - (5) Divided difference and Newton's divided difference formula.
 - (6) Central Difference and Average operators.

- 4. Numerical Differentiation:** [3 lectures]

- 5. Numerical Integration:** [7 lectures]
 - (1) General quadrature formula.
 - (2) Trapezoidal rule.
 - (3) Simpsons's $\frac{1}{3}$ rule.
 - (4) Simpsons's $\frac{3}{8}$ rule.

- 6. Numerical solution of first order ordinary differential equations:** [6 lectures]
 - (1) Euler's method.
 - (2) Modified Euler's methods.
 - (3) Runge - Kutta Methods.

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Text Books :

- (1) S.S. Sastry; Introductory Methods of Numerical Analysis, 3rd edition, Prentice Hall of India, 1999.
- (2) H.C. Saxena; Finite differences and Numerical Analysis, S. Chand and Company.

Reference Books:

- (1) K.E. Atkinson; An Introduction to Numerical Analysis, Wiley Publications.
- (2) Balguruswamy; Numerical Analysis.

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**Paper II- Semester II :
Operations Research (MTC:222)**

- 1. Linear Programming Problem** (20 Lectures)
 - a) Definition, terminology, advantage and limitations.
 - b) Formulation of LPP and Graphical Method.
 - c) Feasible solution, basic solution, optimal solution.
 - d) Solution by Simplex method : All types of objective functions, all types of constraints.(Only non – degenerate problems)
 - e) Duality : Concept, relation between primal and dual, advantages and interpretation of dual.

- 2. Transportation and assignment problems** (18 Lectures)
 - a) Introduction to transportation problem, illustrations.
 - b) Initial solution by North west corner rule, Matrix Minima method and VAM.
 - c) Optimal solution by MODI method.
 - d) Assignment problem (Hungarian Method)

- 3. Theory of games** (10 Lectures)
 - a) Two person zero sum game, pure and mixed strategies, statement of min – max theorem.
 - b) Graphical method for solving $2 \times m$ and $n \times 2$ games.
 - c) Subgames.
 - d) Solution of 2×2 game by arithmetic and algebraic methods.
 - e) Principle of dominance and solving some simple games.
 - f) Presentation of game problem as L.P.P.

Text Book: S. D. Sharma, Operations Research.

Reference Books:

- 1) R. Panneerselvam, Operations Research – Prentice Hall of India.
- 2) H. M. Wagner, Principles of Operations Research – Prentice Hall of India.
- 3) H. A. Taha, Operations Research.
- 4) Gupta and Hira, Operations Research.

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**Paper III : (MTC:223)
Practical Course**

Experiment No.	TITLE
Section – I : (Semester – I)	
1.	System of linear equations : (a) Gaussian elimination method, (b) Gauss-Jordan Elimination method
2.	Gram-Schmidt Process (consider only Euclidean inner product space R^n)
3.	Eigenvalues and Eigenvectors of a matrix, Diagonalization
Section – II : <u>Computer Sessions</u>	
4.	Introduction of Scilab
5.	Computing with Scilab Part – I : Problems on each of the following topics are to be solved by using Scilab : (a) Solve system of linear equations, (b) Determinant and inverse of the matrix, (c) Eigenvalues and Eigenvectors (compute characteristic polynomial, eigenvalues, eigenvectors and diagonalization)
6.	C-Programs of Numerical methods Part – I : (a) Bisection Method (b) Regula-Falsi Method (c) Newton-Raphson Method
7.	Computing with Scilab Part – II : (a) Bisection Method. (b) Regula-Falsi Method. (c) Newton-Raphson Method
8.	C-Programs of Numerical methods Part – I : (a) Numerical Integration by Trapezoidal method, (b) Numerical Integration by Simpson's $(1/3)^{rd}$ Rule, (c) Numerical Integration by Simpson's $(3/8)^{th}$ Rule,

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Section – I : (Semester – II)	
9.	Two-dimensional Transformations
10.	Three-dimensional Transformations
11.	Generation of Plane Curves and Bezier curve
12.	Simplex method
13.	Transportation and Assignment Problems
Section – II : <u>C- Programs</u>	
14.	Utility – I : (a) Sorting a set of points in a plane with respect to a line, (b) Sorting a set of points in a plane with respect to rectangle with sides parallel to coordinate axes (c) Sorting a set of points in a plane with respect to a given convex polygon.
15.	Utility – II : (a) Given set of points in the plane, find the pair that is farthest apart and with least mutual distance, (b) Find nearest neighbor of each point in a given set of points in the plane.
16.	Utility – III : Sorting a set of points in 3-dimensional space with respect to a rectangular box with sides parallel to coordinate axes.
17.	Utility – IV : (a) Generation of plane curves: (i) Circle (ii) Ellipse

Instructions :

- (1) The annual examination is of 80 marks and 20 marks are based on internal evaluation (journal, viva-voce etc.).
- (2) The annual examination is of 80 marks and of 3 hours duration. It has two parts :
(i) Question paper solving, (ii) Computer Session.
- (3) The maximum marks for the question paper is 50 and is of 2 hours duration. There are three questions; each of 25 marks and a student has to solve any two questions out of 3 questions. There is no internal option. Each question will have three sub questions of marks 10, 10 and 5 respectively.
- (4) Computer session is of 1 hour duration. It consists of one question on writing C-program, which is of 20 marks and one question of 10 marks for solving problems using Scilab.
- (5) The slips for the questions on C-programs and problem solving by Scilab should be prepared and can be used in annual examination at least for 3 years.

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Course Catalog for B. Sc. (Computer Science) Program

Syllabus of A Course in Environmental Awareness

(Course code – 22777)

To be implemented from 2004 for S.Y.B.Sc. (CS)

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Course Catalog for B. Sc. (Computer Science) Program

University of Pune

"A Course in Environmental Awareness"
(Compulsory at the B.A., B.Com., B.Sc. Degree Level)

Guidelines for the conduct of the course

1. A Certificate course in Environmental Awareness with duration of six months (40 lectures) has been introduced from the academic year 2004-05 at the second year of degree course (B.A., B.Com and B.Sc.) as a compulsory course.
2. The syllabus prepared by the University is enclosed (see enclosure)
3. The details of the teaching plan are enclosed herewith
4. A proposed evaluation system has been enclosed
5. A Fee of Rs.200 per student be charged to meet the expenditure on the conduct of the course. The Utilization of Rs. 200/- shall be as follows -
 - A. Rs. 50/- will be send to University of Pune.
 - B. Rs. 5/- each to Principal, Coordinator & Asstt. Coordinator per student.
- 6.a. A course Coordinator be appointed to organize teaching and evaluation.
- 6.b. Coordinator will be appointed by the Principal.
7. Faculty wise Asstt. Coordinator shall be appointed in multifaculty colleges.
8. **Qualifications of a Teacher.**
University approved teacher (Lecturer) in any subject possessing substantial knowledge to teach, courses on environmental studies shall be eligible to teach the proposed course.

Principal of the College shall be authorized to decide the eligibility of the teacher. based on published work or expository articles or books written by the teacher on environmental studies or workshop/refresher course/ training programme on environmental studies attended by the teacher.
9. A candidate has to appear for this course in the IInd year / IInd Terms of the degree course.

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10 a. This course can be cleared in the IIIrd year also if candidate remains absent or fails in this course in the IInd year of degree course

b. The candidate will have to pass in the examination of "A Course in Environmental Awareness" in order to obtain degree certificate from the University.

11. **Appointment of Examiner** : Principal shall appoint Chairman An examiner, paper setter, remuneration for Examination work shall be paid out of the fees mentioned above. The norms for payment shall be as follows:

- A. MCQ Rs. 5/-
- B. Essay type question Rs. 5/-
- C. Field work Rs. 10/- per candidate

12. A candidate has to pass in this paper in order to obtain degree certificate. If the candidate passes in all subjects of degree course but fails in this paper, he will not obtain degree certificate.

13. This Scheme will start from academic year 2004-2005 for second year students of degree course.

14. **Examination** : The evaluation along the pattern suggested below shall be organized by the principal at the College level. The grade sheet shall be submitted to the Controller of Examination, University of Pune before the end of the University Examination's of B.A./B.Sc./B.Com. The grade shall reflect on the final Mark statement of each student. The results of University examination of the student who fail to get Minimum C Grade in this course shall be Kept in reserve till the concerned students complete the course and secure the required (Minimum) Grade.

- A) Multiple Choice Question : 50 Marks
- B) Essay type questions : 25 Marks
- C) Field Works : 25 Marks

Total : 100 Marks Passing Marks : 40 Marks

Following Grades will be awards.

Grade O : above 75 , Grade A : 61 to 75, Grade B : 51 to 60, Grade C : 40 to 50

15. **Administration Charges** : Principal will be authorized for sufficient administration charges which will include charges of the non-teaching staff, use of class rooms & other infrastructure of the College etc.

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Course Catalog for B. Sc. (Computer Science) Program

A Course in Environmental Awareness
Syllabus

SECTION-I

Sr. No.	Topic	Sub-topics	No. of periods
1.	Nature & Scope of Environmental Studies.	Definition scope, importance, Multi disciplinary nature, Need for public awareness	2
2	Natural Resources	Renewable & non-renewable Natural resources & associated problems of forest, water, mineral, energy, land & food - case studies, conservation of resources.	7
3.	Eco system	Types, characteristics, structure & function.	6
4	Biodiversity & its conservation	Definition: Genetic species & eco system diversity, Biogeographical classification of India. Biodiversity at global, national & local levels, conservation of biodiversity.	5
SECTION II			
5.	Environmental Pollution	Definition course effects & control measures of air, water, soil marine noise, thermal nuclear, Role of an individual in prevention of pollution -case studies, Disaster management.	7
6.	Social Issues & the environment	Urban problems, Resettlement problems, climatic change, global warming acid rain, ozone layer depletion, nuclear accidents, Air act, Environment Protection Act, water, forest wild life act, public awareness.	5
7.	Human Population & environment	Population - explosion, Family Welfare Programme, Environment & Human Health, Human Rights, Value Education, HIV/AIDS, Role of I.T. in Environment & human health - case studies.	4
8.	Fieldwork	Visit to a local area- urban, rural, industrial, agricultural, study of simple eco system-pond, river, hill etc	4

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

List of Reference Books.

1. A text Book of environmental Sciences – S.S. Purohit shammi & A.K. Agarwal
2. The Biodiversity of India- Bharucha Erach
3. Marine Pollution – Clark R.S.
4. Down to Earth, Center for Science & Environment
5. Encyclopedia of Indian Natural History – (B.N.H.S.) Hawkins R.E. Mumbai
6. Environmental Protection & Laws-Jadhav H. & Bosale V.M. (1995) Himalaya Pub. House, Delhi.
7. पर्यावरण शास्त्र – डॉ. फोल्प टी. एस.
8. पर्यावरण शास्त्र – डॉ. करमकर, प्रा. पागनीस, देवस्थळी, छोईफोटे.
9. पर्यावरण शास्त्र – डॉ. घारपुरे.
10. पर्यावरण विज्ञान – प्रा. अहिररावपू अलिद्वाराद, वयाद, धापटे, भोस.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Syllabus of T.Y. B.Sc. (Computer Science)

Academic Year 2010-11

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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)

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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

=====

Semester-III

Total Lectures:48

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.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- 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 [10]

- 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 [14]

- 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.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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 [2]

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 [6]

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.Dhamdhare
(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]
3. Compilers: Principles, Techniques and Tools – Aho, Lam, Sethi, Ullman
(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

=====

Semester-IV

Total Lectures:48

1. Introduction

[5]

- 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, Caching, 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

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

1.13 Open Source Operating Systems – introduction, Linux only

2. System Structure [4]

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 [4]

3.1 Process Concept – The process, Process states, Process control block.

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]

4.1 Overview

4.2 Multithreading Models

4.3 Thread Libraries – Pthreads

5. Process Scheduling [6]

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

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

5.4 Thread Scheduling

6. Process Synchronization [5]

6.1 Background

6.2 Critical Section Problem

6.3 Synchronization Hardware

6.4 Semaphores: Usage, Implementation

6.5 Classic Problems of Synchronization – The bounded buffer problem, The reader writer problem, The dining philosopher problem

7. Deadlocks [7]

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 [9]

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

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

9. File System

[4]

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:

- 1) Operating System Concepts - Silberchatz, Galvin, Gagne (8th Edition).
- 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.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

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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

=====

Semester-III

Total Lectures:48

AIM

To have an 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

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- 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 :

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- 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

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- 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
Daniel I. A. Cohen – Second edition – John Wiley & Sons
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)
K. L. P. Mishra & N. Chandrasekaran, PHI Second Edition
6. Introduction to Languages and The Theory of Computation
John C. Martin TMH, Second Edition

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Course Catalog for B. Sc. (Computer Science) Program

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)

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Error handling.

3. Parser

[20 Lectures]

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

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Course Catalog for B. Sc. (Computer Science) Program

Algorithm for LEADING & TRAILING(with ex.)

Algorithm for Operator Precedence Parsing (with ex.)

Precedence 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

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Course Catalog for B. Sc. (Computer Science) Program

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 [8 Lectures]

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 (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

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2) Principles of Compiler Design By :

Alfred V. Aho, Jeffrey D. Ullman (Narosa Publication House)

3) LEX & YACC (O'reilly Publication)

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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-I

Code No. : CS-333

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Semester-III

Total Lectures:48

Ch. No		Total Lectures	Reference Books	
1	Introduction to Computer Networks (Lectures: 7)			
	Computer Networks	<i>goals and applications</i>	1	TAN. Ch. 1
	Network Hardware	<i>broadcast and point-to-point, topologies – star, bus, mesh, ring etc.</i>	1	TAN. Ch. 1
	Network Types	LAN, MAN, WAN, Wireless Networks, Home Networks, Internetworks, Protocols and Standards – <i>Definition of Protocol, Defacto and Dejure standard</i> <i>Peer –to-peer and Server – based LAN</i>	3	TAN. Ch. 1
	Network Software	Protocol Hierarchies - <i>layers, protocols, peers, interfaces,</i>	2	TAN. Ch. 1

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

		<p><i>network architecture, protocol stack</i></p> <p>design issues of the layers – <i>addressing, error control, flow control, multiplexing and de-multiplexing, routing</i></p> <p>Connection-oriented and connectionless service</p> <p>Service Primitives – <i>listen, connect, receive, send, disconnect and Berkley Socket</i></p> <p>The relationships of services to protocol</p>		
2	Network Models	(Lectures: 5)		
	OSI Reference Model	Functionality of each layer	2	FORO. Ch2
	TCP/IP Reference Model	Introduction to IP, TCP, and UDP TCP/IP Protocol Suite	1	FORO. Ch2
	Comparison of OSI and TCP/IP model		1	FORO. Ch2
	Addressing	Physical, Logical and Port addresses	1	FORO. Ch2
3	The Physical Layer	(Lectures: 10)		
	Basic Concepts	<p>Signals, Types – Analog and Digital Signals, Bit rate, bit length, baseband transmission</p> <p>Transmission Impairments – <i>attenuation, distortion and noise</i></p> <p>Data Rate Limits – <i>Nyquist's bit rate formula for noiseless channel and Shannon's law</i></p> <p>(Enough problems should be covered on every topic.)</p>	3	FORO. Ch3

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

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	Performance of the Network	Bandwidth, Throughput, Latency(Delay), Bandwidth –Delay Product, Jitter (Enough problems should be covered on every topic.)	1	FORO. Ch3
	Line Coding	Characteristics, Line Coding Schemes – <i>Unipolar, NRZ, RZ, Manchester and Differential Manchester</i>	2	FORO Ch.4
	Transmission Modes	Parallel Transmission Serial Transmission – <i>Asynchronous and Synchronous</i>	1	FORO. Ch4
	Multiplexing	FDM and TDM		
	Switching	Circuit Switching, Message Switching and Packet Switching	1	TAN. Ch2
	ISDN	Services, Evolution, Architecture	2	TAN. Ch.2

4	The Data Link Layer (Lectures:12)			
	Design Issues	Services to Network Layer, Flow Control, Error Control	1	
	Framing	Character Count, Byte Stuffing, Bit Stuffing and Physical Layer Coding Violations	2	TAN Ch3
	Error Control	Hamming Code and CRC (Enough problems should be covered	2	TAN Ch3.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

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		on every topic.)		
	Elementary Data Link Layer Protocols	Utopia, A Simplex Stop-And-Wait, A Simplex protocol for noisy channel	2	TAN Ch3
	Sliding Window Protocols	Piggybacking- <i>Need, Advantages/Disadvantages</i> , 1-bit sliding window protocols, Pipelining – <i>Go-Back N and Selective Repeat</i>	3	TAN Ch3.
	Data Link Layer Protocols	HDLC – <i>frame format, all frame types</i> PPP – <i>Use, Frame Format, Use of PPP in the Internet</i>	2	TAN Ch.3
5	The Medium Access Sublayer (Lectures:7)			
	Random Access Protocols	ALOHA – <i>pure and slotted</i> CSMA – <i>1-persistent, p-persistent and non-persistent</i> CSMA/CD CSMA/CA	3	FORO. Ch12
	Controlled Access	Reservation, Polling and Token Passing	1	FORO. Ch12
	Channelization	FDMA, TDMA and CDMA- <i>Analogy, Idea, Chips, Data Representation, Encoding and Decoding, Signal Level, Sequence Generation</i> (Enough problems should be covered on every topic.)	3	FORO. Ch.12
6	Wired LANS (Lectures:7)			
	IEEE Standards	Data Link Layer, Physical Layer	1	
	Standard Ethernet	MAC Sublayer – <i>Frame Format, Frame Length, Addressing, Access Method</i> Physical Layer – <i>Encoding and Decoding, 10Base5, 10Base2, 10Base-</i>	6	FORO. Ch.13

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		<i>T, 10Base-F, Changes In The Standard – Bridged Ethernet, Switched Ethernet, Full Duplex Ethernet Fast Ethernet – Goals, MAC Sublayer, Topology, Implementation Gigabit Ethernet – goals, MAC Sublayer, Topology, Implementation Ten-Gigabit Ethernet – goals, MAC Sublayer, Physical Layer</i>		
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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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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

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Semester-IV

Total Lectures:48

1	Wireless LAN (Lectures: 2)			
	IEEE 802.11	Architecture – <i>Basic Service Set, Extended Service Set</i>	1	FORO. Ch.14
	Bluetooth	Architecture – <i>piconet, scatternet</i>	1	FORO. Ch. 14
.	The Network Layer (Lectures:11)			
	Design Issues	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	3	TAN. Ch.5
	Logical Addressing	IPV4 Addresses – <i>Address Space, Notations, Classful Addressing, Subnetting, Supernetting, Classless Addressing, Network Address Translation(NAT)</i>	3	FORO. Ch. 19

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

		(Enough problems should be covered on Addressing)		
	IPV4 Protocol	Datagram Format, Fragmentation, Checksum, Options	3	FORO. Ch. 20
	Routing	Properties of routing algorithm, Comparison of Adaptive and Non-Adaptive Routing Algorithms	1	TAN. Ch. 5
	Congestion Control	General Principles of Congestion Control, Congestion Prevention Policies	2	TAN. Ch. 5
3	Address Mapping (Lectures: 04)			
	Address Resolution Protocol(ARP)	Cache Memory, Packet Format, Encapsulation, Operation, Four Different Cases, Proxy ARP, RARP	4	FORO. Ch.21
4	The Transport Layer (Lectures:06)			
	Process-to-Process Delivery	Client Server Paradigm, Multiplexing and Demultiplexing, Connectionless Vs Connection-Oriented Service, Reliable Vs Unreliable	2	FORO. Ch.23
	User Datagram Protocol (UDP)	Datagram Format, Checksum, UDP operations, Use of UDP	2	FORO. Ch.23
	Transmission Control Protocol (TCP)	TCP Services – <i>Process-to-Process Communicatio, Stream Delivery Service, Full – Duplex Communication</i> TCP Features – <i>Numbering System, Flow Control, Error Control, Congestion Control</i>	2	FORO. Ch.23

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

		TCP Segment – <i>Format</i>		
5	The Application Layer (Lectures:07)			
	Domain Name System (DNS)	Name Space, Domain Name Space, Distribution of Name Space, DNS in the Internet, Name – Address Resolution	2	FORO. Ch.25
	E-MAIL	Architecture, User Agent, Message Transfer Agent-SMTP, Message Access Agent-POP, IMAP, Web Based Mail	2	FORO. Ch.26
	File Transfer Protocol (FTP)	Communication over control connection, Communication over Data Connection, Anonymous FTP	1	FORO. Ch. 26
	WWW	Architecture, WEB Documents	1	FORO. Ch. 27
	HTTP	HTTP Transaction, Persistent and Non-persistent Connection, Proxy Server	1	FORO. Ch. 27
6	Internetworking Devices (Lectures:5)			
	Physical Layer Devices	Repeaters, Hubs		FORO. Ch. 15
	Data Link Layer Devices	Bridges – <i>Transparent and Source Routing Bridges, Bridges Connecting Different LANs</i>	2	FORO. Ch. 15
	Network Layer Devices	Routers	1	FORO. Ch. 15

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

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	Gateways			FORO. Ch. 15
	Backbone Networks	Bus Backbone, Star Backbone, Connecting Remote LANs	1	FORO. Ch. 15
	Virtual LANs	Membership, Configuration, Communication between Switches, Advantages	1	
7	Network Security(Lectures:10)			
	Cryptography	Encryption Model, Substitution Cipher and Transposition Cipher, Two Fundamental Cryptographic Principles (Problems should be covered.)	3	TAN. Ch. 8
	Communication Security	Firewalls	1	TAN. Ch. 8
	Web Security	Threats, Secure Naming, DNS Spoofing – <i>DNS Spoofing, Secure DNS, Self Certifying names</i>	2	TAN. Ch. 8
	Mobile Mode Security	Java Applet Security, ActiveX, JavaScript, Viruses	2	TAN. Ch. 8
	Social Issues	Privacy, Anonymous Remailers, Freedom of Speech, Steganography	2	TAN. Ch. 8

Reference Books:

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

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- 3) Computer Networks by Natalia and Victor Olifer, Wiley Publications.

Guidelines For Examination:

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

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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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-1

Code No. : CS-334

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Semester-III		Total Lectures:48
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	8	
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	10	

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Comparing strings	
Manipulating and searching strings	
Regular expressions	
Book 1 chapter 3 and 4	
3. Arrays	6
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	8
Classes	
Objects	
Introspection	
Serialization	
Inheritance	
Interfaces	
Encapsulation	
Book 1 , 2 chapter 12	
5. Files and directories	6

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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

10

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

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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

Sem IV		Total Lectures:48
1. Databases		10
Using PHP to access a database		
Relational databases and SQL		
PEAR DB basics		
Advanced database techniques		
Sample application (Mini project)		
Book 1 chapter 9		
2. Generating Graphics		8
Basics of computer graphics		
Working with Raster images		
Manipulating Raster images		
Using text in images		
Book 2 chapter 16		
3. XML		6
What is XML?		
XML document Structure		
PHP and XML		

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

	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	

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Book 4 chapter 1,2 and 9

References

6. Programming PHP
Rasmus Lerdorf and Kevin Tatroe
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

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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

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Semester-III

Total Lectures:48

1. An Introduction to Java (3)
 - 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 (3)
 - 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 (6)
 - Defining Your Own Classes and Use of 'this' Keyword.
 - Using Predefined Classes
 - Object the cosmic class
 - Constructor and Overloading Constructors

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- Method Parameters
 - Static Fields and Methods
 - Access Specifiers (public, protected, private, friendly(default))
 - 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

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- Random Access files
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 JCombo) 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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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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-II

Code No. : CS-345

Semester-IV		Total Lectures:48
1. Graphics Programming Using Swing	(4)	
<ul style="list-style-type: none">• Working with 2D Basic Shapes• Using Color• Using Font• Displaying Images		
2. Multithreading	(6)	
<ul style="list-style-type: none">• What are threads• Running and starting thread• Running multiple threads• The Runnable interface• Thread priorities• Synchronization and interthread communication		
3. Database Programming	(10)	
<ul style="list-style-type: none">• The design of jdbc, jdbc configuration• Types of drivers• Executing sql statements, query execution• Scrollable and updatable result sets, rowset• Metadata, transactions		
4. Collections	(6)	

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- Collections, Introduction to the Collection framework (Interfaces, Implementation and algorithms), Interfaces, collection classes : Set, List, Queue and Map
 - Set : HashSet, TreeSet, and LinkedHashMap
 - Interfaces such as Lists, Set, Vectors, LinkedList, Comparator, Iterator, hash tables.
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

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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
- 5) Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press.
- 6) Core Java Volume-II-Advanced Features, Eighth Edition, Cay S. Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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

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Semester-III

Total Lectures:48

Ch. No	Name of the Chapter / Topic	No. of Lectures
1	Object Oriented Concepts and Principles	[4]
	1.1 What is Object Orientation - 1.1.1 Introduction - 1.1.2 Object - 1.1.2 Classes and Instance - 1.1.3 Polymorphism - 1.1.4 Inheritance 1.2 Object Oriented System Development - 1.2.1 Introduction - 1.2.2 Function/Data Methods (With Visibility) - 1.2.3 Object Oriented Analysis - 1.2.4 Object Oriented Construction 1.3 Identifying the Elements of an Object Model 1.4 Identifying Classes and Objects 1.5 Specifying the Attributes (With Visibility) 1.6 Defining Operations 1.7 Finalizing the Object Definition	
2.	Introduction to UML	[2]
	2.1 Concept of UML 2.2 Advantages of UML	
3.	Basic Structural Modeling	[5]
	3.1 Classes 3.2 Relationship 3.3 Common Mechanism 3.4 Class Diagram (Minimum three examples should be covered)	
4	Advanced Structural Modeling	[7]

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

	4.1 Advanced Classes 4.2 Advanced Relationship 4.3 Interface 4.4 Types and Roles 4.5 Packages 4.6 Object Diagram (Minimum three examples should be covered)	
5	Basic Behavioral Modeling	[9]
	5.1 Interactions 5.2 Use Cases and Use Case Diagram with stereo types (Minimum three examples should be covered) 5.3 Interaction Diagram (Minimum two examples should be covered) 5.4 Sequence Diagram (Minimum two examples should be covered) 5.5 Activity Diagram (Minimum two examples should be covered) 5.6 State Chart Diagram (Minimum two examples should be covered)	
Ch. No	Name of the Chapter / Topic	No. of Lectures
6	Object Oriented Analysis	[6]
	6.1 Iterative Development and the Rational Unified Process 6.2 Inception 6.3 Understanding Requirements 6.4 Use Case Model From Inception to Elaboration 6.5 Elaboration	
7	Object Oriented Design	[4]
	7.1 The Booch Method, The Coad and Yourdon Method and Jacobson Method and Raumbaugh Method 7.2 The Generic Components of the OO Design Model 7.3 The System Design Process 7.3.1 Partitioning the Analysis Model 7.3.2 Concurrency and Sub System Allocation 7.3.3 Task Management Component 7.3.4 The Data Management Component 7.3.5 The Resource Management Component 7.3.6 Inter Sub System Communication 7.4 Object Design Process	
8	Architectural Modeling	[6]

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

	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	[5]
	9.1 Object Oriented Testing Strategies 9.2 Test Case Design for Object Oriented Software 9.3 Inter Class Test Case Design	

References:

Sr. No.	Authors	Title	Publication
1	Grady Booch, James Rumbaugh	The Unified Modeling Language User/Reference Guide	Pearson Education INC
2	Ivar Jacobson	Object Oriented Software Engineering	Pearson Education INC
3	Craig Larman	Applying UML and Patterns	Pearson Education INC
4	Bennett, Simon	Object Oriented Analysis and Design	McGraw Hill

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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

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Semester-IV

Total Lectures:48

Ch. No	Name of the Chapter / Topic	No. of Lectures
1.	Sales and Distribution Management System	[8]
	1.1 Sales Budgeting-Market Segments/Customer/Product	
	1.2 Customer Enquiry and Preparation of Quotation.	
	1.3 Customer Order Processing	
	1.4 Pending Customer Orders	
	1.5 Sales Analysis	
	1.6 Case Study on Sales Analysis with specific reference to Shopping Mall / Sales Organization	
2.	Human Resource Management System	[10]
	2.1 Employee Database and Knowledge Management System	
	2.2 Recruitment – Technique	
	2.3 Employee Appraisal – Performance Efficiency	
	2.4 Employee Training	
	2.5 Leave Accounting and Payroll	
	2.6 Case Study on Human Resource Management	
3.	Manufacturing / Production Planning Control System	[10]

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	3.1 Capacity Requirements Planning for Equipment, MRP-I	
	3.2 Manpower and Time, Material Resource Planning, MRP-II	
	3.3 Production Planning – Work Order Management- EOQ	
	3.4 Material Procurement –Indenting, Purchasing, Vendor Analysis, BOM, Supplier Bill Passing and Receipt of Material	
	3.5 Case Study on Manufacturing/ Production Planning and Control	
4.	Banking	[8]
	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.	Advanced Business System	[12]
	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

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

References:

References:

Sr. No.	Author	Title
1.	Mayer	Production and Operation Management
2.	K. Aswathapa	Human Resource and Personal Management
3.	M. M Shaikh	Enterprise Resource Planning and Business Process
4.	Dr. Milind Oka	Business Applications

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Proposed Syllabus for TY BSC COMPUTER SCIENCE PRACTICAL

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

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 , LORG
 - 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

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- 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)

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Title : CS - 348 (32110) Programming in Java and PHP

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

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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

LinkedList, 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

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Cookies & HttpSession class(Shopping, counting number of visits)

Applet/Servlet 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)

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

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:

Marks	Grade
Below 40	D (Indicates FAIL)
40 - 49	C
50 - 59	C+
60 – 69	B
70 - 79	B+
80 - 89	A
90 – 100	A+

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

University of Pune

Equivalence of Old Courses with New Courses

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

Old Course	New Course
Systems Programming & Operation Systems	Systems Programming & Operation Systems
Theoretical Computer Science & Compiler Construction	Theoretical Computer Science & Compiler Construction
Computer Networks and Network Administration	Computer Networks-I & II
Server Databases & Application Development	Web Development and PHP programming
Programming in Java & Advanced Java	Programming in Java-I & II
Software Engineering	Object Oriented Software Engineering & Business Applications

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Syllabus of S.Y. B.Sc. (Computer Science)

Academic Year 2014-15

Syllabus for S.Y.B.Sc.(Computer Science) to be implemented from 2014-15

Important to Note about Laboratory courses: It is absolutely necessary and essential that all the practical's for Paper III and Paper IV be conducted on Free and Open Source Operating System like Linux.

- All the practical's related to C and C++ needs to be conducted using GCC compiler.
- For laboratory work/assignments of Database Systems, PostgreSQL to be used.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

1) Title of the Course : B. Sc. Computer Science

S.Y.B.Sc. Computer Science Syllabus
(To be implemented from Academic Year 2014-15)

2) Preamble:

B. Sc. Computer Science is a systematically designed three year course that prepares the student for a career in Software Industry. The syllabus of computer Science subject along with that of the three allied subjects (Mathematics, Electronics and Statistics) forms the required basics for pursuing higher studies in Computer Science. The Syllabus also develops requisite professional skills and problem solving abilities for pursuing a career in Software Industry.

3) Introduction:

At **first year of under-graduation** basic foundation of two important skills required for software development is laid. A course in programming and a course in database fundamentals forms the preliminary skill set for solving computational problems. Simultaneously two practical courses are designed to supplement the theoretical training. The second practical course also includes a preliminary preparation for website designing in the form of HTML programming.

Alongwith Computer Science two theory and one practical course each in Statistics, Mathematics and Electronics help in building a strong foundation.

At **second year under-graduation:** The programming skills are further strengthened by a course in Data structures and Object oriented programming. The advanced topics in Databases and preliminary software engineering form the second course. Two practical courses alongside help in hands-on training. Students also undertake a mini project using software engineering principles to solve a real world problem.

Simultaneously two theory and one practical course each in Mathematics and Electronics help in strengthening problem solving abilities.

At **third year under-graduation:** Six theory papers in each semester and practical courses cover the entire spectrum of topics necessary to build knowledge base and requisite skill set. Third practical course also includes project work which gives students hands on experience in solving a real world problem.

Objectives:

- To develop problem solving abilities using a computer
- To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
- To imbibe quality software development practices. To create awareness about process and product standards
- To train students in professional skills related to Software Industry.

P.V.G.'s College of Science, Pune 9

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- To prepare necessary knowledge base for research and development in Computer Science
- To help students build-up a successful career in Computer Science

4) Eligibility:

Higher Secondary School Certificate (10+2) Science stream or its equivalent Examination as per the University of Pune eligibility norms.

Note: Admissions will be given as per the selection procedure / policies adopted by the respective college, in accordance with conditions laid down by the University of Pune. Reservation and relaxation will be as per the Government rules.

5 A) Examination Pattern:

First Year B. Sc. Computer Science

Subject: Computer Science

Pattern of Examination: Annual

Theory courses (CS-101): Annual

(CS-102): Annual

Practical Course (CS-103): Annual

(CS-104): Annual

Paper/ Course No.	Title	Total Number of lectures/practical's per Term	Standard of passing		
			Internal marks out of 20	External marks out of 80	Total marks out of 100
Computer Science Paper I (CS-101)	Problem Solving Using Computers and 'C' Programmi ng	Three lectures/Week (Total 80 lectures)	08	32	40 *
Computer Science Paper II CS-102)	File Organizatio n and Fundament al of Databases	Three lectures/Week (Total 80 lectures)	08	32	40 *
Computer Science Practical Paper I (CS-103)	Computer Science Practical Paper I	25 Practical slots of 4 lectures each	08	32	40 *

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Computer Science Practical Paper II (CS-104)	Computer Science Practical Paper II	25 Practical slots of 4 lectures each	08	32	40 *
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* Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Notes:

1. Total marks: Theory (100 + 100) = 200 marks
2. Total marks per year 200 (Theory) + 100 marks (practical)+ Grade(practical) = 300 marks +Grade
3. Internal marks for theory papers given on the basis of internal assessment tests and for practicals on continuous assessment of lab work.
4. In case of Computer Science Practical Paper II, marks out of 100 will be converted to grades

Marks	Grade
75 and above	O
65 and above	A
55 and above	B
50 and above	C
45 and above	D
40 and above	E
Below 40 (indicates Failure)	F

Theory examination will be of three hours duration for each theory course. There shall be 5 questions each carrying equal marks. The pattern of question papers shall be:

Question 1	8 sub-questions, each of 2 marks; answerable in 2 -3 lines and based on entire syllabus
Question 2, 3 ,4 and 5	4 out of 5/6- short answer type questions; answerable in 8 – 10 lines ; mix of theory and problems

P.V.G.'s College of Science, Pune 9

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each term. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain). There shall be 20 questions.

Practical: Continuous assessment of Lab work and mini project.

Practical Examination: Practical examination shall be conducted by the respective college at the end of the academic year. Practical examination will be of 3 hours duration for each practical course. Certified journal is compulsory to appear for practical examination. There shall be two expert and two examiners per batch for the practical examination.

Second Year B. Sc. Computer Science

No	Paper	Title: Semester I	Title: Semester II
1	Computer Science Paper I	CS-211:Data Structures using 'C'	CS-221:Object Oriented Concepts using C++
2	Computer Science Paper II	CS-212: Relational Database Management System	CS-222:Software Engineering
3	Computer Science Paper III	CS-223:Data structures Practicals and C++ Practicals	
4	Computer Science Paper IV	CS-224:Database Practicals & Mini Project using Software Engineering techniques	
5	Mathematics Paper I	MT-211:Mathematics Paper I-Sem I	MT-221:Mathematics Paper I-Sem II
6	Mathematics Paper II	MT-212:Mathematics Paper II-Sem I	MT-222:Mathematics Paper II-Sem II
7	Mathematics Paper III	MT-223:Practical Course in Mathematics	
8	Electronics Paper I	EL-211:Electronics Paper I-Sem I	EL-221:Electronics Paper I-Sem II
9	Electronics Paper II	EL-212:Electronics Paper II-Sem I	EL-222:Electronics Paper II-Sem II
10	Electronics Paper III	EL-223:Practical Course in Electronics	
11	English	EN-211:Technical English-Sem I	EN-221:Technical English – Sem II

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Pattern of examination: Semester

Theory courses (Sem I: CS-211 and CS212): Semester
(Sem II: CS-221 and CS-222): Semester

Practical Course (CS-223 and CS-224): Annual

Paper/ Course No.	Title	Total Number of lectures/practicals Per Semester	Standard of passing		
			Internal marks out of 10 (theory) Out of 20 (practicals)	External marks out of 40 (theory) Out of 80 (practicals)	Total passing marks out of 50 (theory) and out of 100 (practicals)
Theory Paper I (CS- 211)	Data Structures using 'C'	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Theory Paper II (CS 212)	Relational Database Management System	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Theory Paper I (CS 221)	Object Oriented Concepts using C++	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Theory Paper II (CS 222)	Software Engineering	Four lectures/Week (Total 48 per Semester)	04	16	20 *
Practical paper I (CS 223) (First & Second Sem)	Data structures Practicals and C++ Practicals	Practicals of 4 lectures each 25 practicals/Yr.)	08	32	40 **
Practical paper II (CS 223) (First & Second Semester)	Database Practicals & Mini Project using Software Engineering techniques	Practicals of 4 lectures each 25 practicals/ Yr.)	08	32	40 **

* Subject to compulsory passing in external examination and getting minimum 20 marks out of 50

** Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

P.V.G.'s College of Science, Pune 9

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Notes:

1. Total marks: Theory for each semester (50 + 50) = 100 marks
2. Total marks per year 200 (Theory) + 100 marks (practicals)+Grade(practical) = 300 marks+Grade
3. Internal marks for theory papers given on the basis of Continuous internal assessment

Theory examination will be of two hours duration for each theory course. There shall be 4 questions carrying equal marks. The pattern of question papers shall be:

Question 1	10 questions, each of 1 marks	10 marks
Question 2 3	Sub-questions carrying 5 marks (2 out of 3)	10 marks each
Question 4	Sub-questions carrying marks depending on their complexity with options	10 marks

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each Semester. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain) There shall be 20 questions.

Practicals: Continuous assessment of practical performance

Practical Examination: Practical examination shall be conducted at the respective college at the end of the academic year. Practical examination will be of 3 hours duration. Certified journal is compulsory to appear for practical examination. There shall be one expert and two examiners per batch for the practical examination. One of the examiners will be external.

Third Year B. Sc. Computer Science

No	Paper	Title: Semester I	Title: Semester II
1	Computer Science Paper I	CS-331: System Programming	CS-341: Operating System
2	Computer Science Paper II	CS-332: Theoretical Computer Science	CS-342: Compiler Construction
3	Computer Science Paper III	CS-333: Computer Networks-I	CS-343: Computer Networks-II
4	Computer Science Paper IV	CS-334: Internet Programming- I	CS-344: Internet Programming- II
5	Computer Science Paper V	CS-335: Programming in Java-I	CS-345: Programming in Java-II

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

6	Computer Science Paper VI	CS-336:Object Oriented Software Engineering	CS-346:Computer Graphics
7	Computer Science Paper VII	CS-347:Practicals Based on CS-331 and CS341 – Sem I &Sem II	
8	Computer Science Paper VIII	CS-348:Practicals Based on CS-335 and CS-344 – Sem I &Sem II and Computer Graphics using Java	
9	Computer Science Paper IX	CS-349:Practicals Based on CS-334 and CS-344 – Sem I &Sem II andProject	

Subject: Computer Science

Pattern of examination: Semester

Theory courses:

(Sem III: CS-331-CS-336): Semester (Sem IV: CS-341-CS-346): Semester

Practical Course:

(CS-347-CS-349): Annual

Theory Papers					
Paper/Course No.	Title	Total Number of lectures Per Semester	Standard of passing		
			Internal marks out of 10 (theory) Out of 20 (practicals)	External marks out of 40 (theory) Out of 80 (practicals)	Total passing marks out of 50 (theory) and out of 100 (practicals)
SEM III					
CS-331	System Programming	48	4	16	20*
CS-332	Theoretical Computer Science	48	4	16	20*
CS-333	Computer Networks-I	48	4	16	20*
CS-334	Internet Programming- I	48	4	16	20*
CS-335	Programming in Java-I	48	4	16	20*
CS-336	Object Oriented Software Engineering	48	4	16	20*
SEM IV					

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

CS-341	Operating System	48	4	16	20*
CS-342	Compiler Construction	48	4	16	20*
CS-343	Computer Networks-II	48	4	16	20*
CS-344	Internet Programming- I	48	4	16	20*
CS-345	Programming in Java-I	48	4	16	20*
CS-346	Computer Graphics	48	4	16	20*
Practical Papers					
CS 347 (Semester III & IV)	Practicals Based on CS-331 and CS-341 – Sem I & Sem II	25 practicals/year	08	32	40 **
CS 348 (Semester III & IV)	CS-348:Practicals Based on CS-335 and Cs-344 – Sem I & Sem II and Computer Graphics using Java	25 practicals/year	08	32	40 **
CS 349 (Semester III & IV)	CS-349:Practicals Based on CS-334 and CS-344 – Sem I & Sem II and Project	25 practicals/year	08	32	40 **

* Subject to compulsory passing in external examination and getting minimum 20 marks out of 50

** Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Notes:

1. Total marks: Theory for each semester (50×6) = 300 marks
2. Total marks per year 600 (Theory) + 300 marks (practicals) = 900 marks
3. Internal marks for theory papers given on the basis of continuous internal assessment

Theory examination will be of two hours duration for each theory course. There shall be 4 questions carrying equal marks. The pattern of question papers shall be:

Question 1	10 questions, each of 1 marks	10 marks
Question 2 and 3	Sub-questions carrying 5 marks (2 out of 3)	10 marks each
Question 4	Sub-questions carrying marks depending on their complexity with options	10 marks

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each Semester. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain) There shall be 20 questions.

Practicals: one internal assessment test + practical journals + attendance + activity.

Practical Examination: Practical examination shall be conducted at the respective college at the end of the academic year. Practical examination will be of 3 hours duration. Certified journal is compulsory to appear for practical examination. There shall be one expert and two examiners per batch for the practical examination. One of the examiners will be external.

5 B) Standard of Passing:

- i. In order to pass in the first year theory examination, the candidate has to obtain 40 marks out of 100 in each course. (Minimum 32 marks out of 80 must be obtained in the University Theory Examination.)
- ii. In order to pass in the Second Year and Third Year theory examination, the candidate has to obtain 20 marks out of 50 in each course of each semester. (Minimum 16 marks out of 40 must be obtained in the University Theory Examination.)
- iii. In order to pass in practical examination, the candidate has to obtain 40 marks out of 100 in each course. (Minimum 32 marks out of 80 must be obtained in the University Examination.)

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

5 C) ATKT Rules:

While going from F.Y.B.Sc. to S.Y.B.Sc. at least 8 courses (out of total 13) should be passed; however all F.Y.B.Sc. courses should be passed while going to T.Y.B.Sc.

While going from S.Y.B.Sc. to T.Y.B.Sc., at least 12 courses (out of 22) should be passed (Practical Course at S.Y.B.Sc. will be equivalent to 2 courses).

5 D) Award of Class:

The class will be awarded to the student on the aggregate marks obtained during the second and third year in the principal subject only. The award of the class shall be as follows:

1	Aggregate 70% and above	First Class with Distinction
2	Aggregate 60% and more but less than 70%	First Class
3	Aggregate 55% and more but less than 60%	Higher Second Class
4	Aggregate 50% and more but less than 55%	Second Class
5	Aggregate 40% and more but less than 50%	Pass Class
6	Below 40%	Fail

5 E) External Students: There shall be no external students.

5 F) Setting question papers:

F.Y.B.Sc.: For theory papers I and II annual question papers shall be set by the University of Pune and assessment done at the respective colleges. Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject. For Practical Papers, the Question paper slips will be provided by the University of Pune and assessment done at the respective colleges.

S.Y.B.Sc. and T.Y.B.Sc.: For theory papers I and II for each semester and also for the annual practical examination question papers set by the University of Pune. Centralized assessment for theory papers done as per the University instructions. Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject. For Practical Papers: Papers shall be set by the University of Pune and assessment done by the internal examiner and external examiner appointed by University of Pune.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

5G) Verification and Revaluation Rules:

As per university Statues and rules for verification and revaluation of marks in stipulated time after declaration of the semester examination result.

6) Course Structure:

Duration: The duration of B.Sc. Computer Science Degree Program shall be three years.

a) All are Compulsory Papers:

F.Y.B.Sc. : 2 Theory + 2 Practical (Annual)

S .Y.B.Sc.: 2 Theory per semester + 2 Practical (Annual)

T.Y.B.Sc.: 6 Theory per semester + 3 Practical (Annual)

b) Question Papers :

F.Y.B.Sc.Theory paper:

University Examination – 80 marks (at the end of 2nd term)

Internal Examination – 20 marks

S.Y / T.Y. - B.Sc.Theory paper:

University Examination – 40 marks (at the end of each term)

Internal Examination – 10 marks

F.Y. / S.Y / T.Y. - B.Sc.Practical Paper:

University Examination – 80 marks (at the end of 2nd term)

Internal Examination – 20 marks

c) Medium of Instruction: The medium of instruction for the course shall be English.

7) Equivalence of Previous Syllabus:

Semester & Paper	Title of Paper (Old Pattern)(Implemented from theacademic year 2009-10)	Title of Paper (New Pattern)(to be implemented from the academic year 2014-15)
Semester-I, Paper-I	CS-211, Data Structures Using C	CS-211 Data Structures using 'C'
Semester-I, Paper-II	CS- 212, Relational Database Management System	CS-212 Relational Database Management System
Semester-II, Paper-I	CS-221, Object Oriented Concepts and Programming in C++	CS-221 Object Oriented Conceptsusing C++
Semester-II, Paper-II	CS-222, Software Engineering	CS-222Software Engineering
Practical paper II (CS 223) (First & Second	CS-224: Database Assignments and Mini Project using Software Engineering	CS-224: Database Practicals & Mini Project using Software

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Semester)	Techniques	Engineering techniques
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8) University Terms: Dates for commencement and conclusion for the first and second terms will be declared by the University authorities. Terms can be kept by only duly admitted students. The term shall be granted only on minimum 75 percent attendance at theory and practical course and satisfactory performance during the term.

9) Qualification of Teachers: M.Sc. Computer Science/M.C.A. or equivalent master degree in science with class/grades and NET/SET as per prevailing University/Government /UGC rules.

10) Detail Syllabus with Recommended Books:
S.Y.B.Sc. Computer Science Paper I

CS-211: Data Structures using 'C'
CS-221: Object Oriented Concepts using C++

S.Y.B.Sc. Computer Science Paper II

CS-212: Relational Database Management System
CS-222: Software Engineering

S.Y.B.Sc. Computer Science Paper III

CS-223: Data structures Practicals and C++ Practicals

S.Y.B.Sc. Computer Science Paper IV

CS-224: Database Practicals & Mini Project using Software Engineering techniques

**S.Y.B.Sc. Computer Science Theory Paper I
Semester – 1
CS 211- DATA STRUCTURES USING 'C'
(Compulsory Course)**

Total Lectures: 48

Objective:

1. To learn the systematic way of solving problem
2. To understand the different methods of organizing large amount of data
3. To efficiently implement the different data structures
4. To efficiently implement solutions for specific problems

Prerequisites: Knowledge of C Programming Language

1. Introduction to data structures [3]

- 1.1 Concept
- 1.2 Data type, Data object, ADT
 - 1.2.1 Data Type
- 1.2.2 Data Object
 - 1.2.3 ADT -Definition, Operation, examples on rational number
- 1.3 Need of Data Structure
- 1.4 Types of Data Structure

2. Algorithm analysis [2]

- 2.1 Algorithm – definition, characteristics
- 2.2 Space complexity, time complexity
- 2.3 Asymptotic notation (Big O, Omega Ω)

3. Linear data structures [6]

- 3.1 Introduction to Arrays - array representation
- 3.2 Sorting algorithms with efficiency
 - Bubble sort, Insertion sort, Merge sort, Quick Sort
- 3.3 Searching techniques –Linear Search, Binary search

4. Linked List [8]

- 4.1 Introduction to Linked List
- 4.2 Implementation of Linked List – Static & Dynamic representation,
- 4.3 Types of Linked List
- 4.4 Operations on Linked List
 - create, display, insert, delete, reverse, search, sort, concatenate &merge
- 4.5 Applications of Linked List – polynomial manipulation
- 4.6 Generalized linked list – Concept and Representation

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

5. Stacks [6]

- 5.1 Introduction
- 5.2 Representation- Static & Dynamic
- 5.3 Operations
- 5.4 Application - infix to postfix, infix to prefix, postfix evaluation,
- 5.5 Simulating recursion using stack

6. Queues [4]

- 6.1 Introduction
- 6.2 Representation - Static & Dynamic
- 6.3 Operations
- 6.4 Circular queue, priority queue (with implementation)
- 6.5 Concept of doubly ended queue

7. Trees [12]

- 7.1 Concept & Terminologies
- 7.2 Binary tree, binary search tree
- 7.3 Representation – Static and Dynamic
- 7.4 Operations on BST – create, Insert, delete, traversals (preorder, inorder, postorder), counting leaf, non-leaf & total nodes , non recursive inorder traversal
- 7.5 Application - Heap sort
- 7.6 Height balanced tree- AVL trees- Rotations, AVL tree examples.

8. Graph [7]

- 8.1 Concept & terminologies
- 8.2 Graph Representation – Adjacency matrix, adjacency list, inverse Adjacency list, adjacency multilist, orthogonal list
- 8.3 Traversals – BFS and DFS
- 8.4 Applications – AOV network – topological sort, AOE network – critical path

References:

1. Fundamentals of Data Structures ---- By Horowitz Sahani (Galgotia)
2. Data Structures using C and C++ --- By YedidyahLangsam, Aaron M. Tenenbaum, Moshe J. Augenstein
3. Introduction to Data Structures using C---By Ashok Kamthane
4. Data Structures using C --- Bandopadhyay&Dey (Pearson)
5. Data Structures using C ---By Srivastava BPB Publication.

**S.Y.B.Sc. Computer Science Theory paper-II
Semester – I**

**CS-212-Relational Database Management System
(Compulsory Course)**

Total Lectures: 48

Objective:-

- To teach fundamental concepts of RDBMS (PL/PgSQL)
- To teach principles of databases
- To teach database management operations
- To teach data security and its importance
- To teach client server architecture

Prerequisites: Knowledge of DBMS

1. Relational Database Design [14]

1.1 Preliminaries

Functional Dependencies

Basic concepts : Closure of a set of functional dependencies, Closure of attribute set, Canonical cover, Decomposition.

1.2 PL/PgSQL: Datatypes, Language structure

1.3 Controlling the program flow, conditional statements, loops

1.4 Views

1.5 Stored Functions, Stored Procedures

1.6 Handling errors and exceptions

1.7 Cursors

1.8 Triggers

2 Transaction Concepts and concurrency control [14]

2.1 Describe a transaction, properties of transaction, state of the transaction.

2.2 Executing transactions concurrently associated problem in concurrent execution.

2.3 Schedules, types of schedules, concept of Serializability, precedencegraph for Serializability.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

2.4 Ensuring Serializability by locks, different lock modes, 2PL and its variations.

2.5 Basic timestamp method for concurrency, Thomas Write Rule.

2.6 Locks with multiple granularity, dynamic database concurrency (Phantom Problem).

2.7 Timestamps versus locking.

2.8 Deadlock handling methods

2.8.1 Detection and Recovery (Wait for graph).

2.8.2 Prevention algorithms (Wound-wait, Wait-die)

3 Database Integrity and Security Concepts [8]

3.1 Domain constraints

3.2 Referential Integrity

3.3 Introduction to database security concepts

3.4 Methods for database security

3.4.1 Discretionary access control method

3.4.2 Mandatory access control and role base access control for multilevel security.

3.5 Use of views in security enforcement.

3.6 Overview of encryption technique for security.

3.7 Statistical database security.

4 Crash Recovery [8]

4.1 Failure classification

4.2 Recovery concepts

4.3 Log base recovery techniques (Deferred and Immediate update)

4.4 Checkpoints

4.5 Recovery with concurrent transactions (Rollback, checkpoints, commit)

4.6 Database backup and recovery from catastrophic failure.

5. Client-Server Technology [4]

5.1 Describe client-server computing.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

5.2 Evolution of Client - Server information systems.

5.3 Client – Server Architecture benefits.

5.4 Client Server Architecture

- Components, Principles, Client Components
- Communication middleware components
- Database middleware components
- Client Server Databases

References:-

1. Fundamentals of Database Systems (4th Ed) By: Elmasri and Navathe
2. Database System Concepts (4th Ed) By: Korth, Sudarshan, Silberschatz
3. Practical PostgreSQL O'REILLY
4. Beginning Databases with PostgreSQL, From Novice to Professional, 2nd Edition By Richard Stones , Neil Matthew, Apress

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

CS-223 : Data structures Practicals and C++ Practicals
(semester 1)

Objective:-

1. Design and implement Data structures and related algorithms
2. Understand several ways of solving the same problem.

S.Y.B.Sc.(Computer Science) : Paper III : Data Structures using C Assignments		
No	Topic	Lectures
1	Sorting Algorithms – Bubble sort, Insertion	4
2	Recursive Sorting Algorithms – Quick sort , Merge Sort	4
3	Searching Method-Linear search, Binary search	4
4	Static/Dynamic stack implementation, infix to postfix, infix to prefix and evaluation of Postfix.	8
5	Static and Dynamic Queue Implementation – Linear Queue, Circular queue	8
6	Dynamic implementation of Singly Linked List, Doubly Linked List and Circular Linked List.	8
7	Polynomial addition (Using Linked list).	4
8	Binary Search Tree Traversal: Create, add, delete, and display nodes.	8
9	Adjacency matrix to adjacency list conversion, in degree, out degree	4
10	Graph: DFS, BFS.	4

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

CS-224:Database Practicals & Mini Project using Software Engineering techniques (Semester 1)

Title: Database Assignments and Mini Project using Software Engineering techniques

Objective:-

- Understanding the use of cursors, triggers, views and stored procedures
- Understanding the steps of system analysis and design
- Understanding Data requirements for a specific problem domain
- Designing Data base as per the Data requirements
- Designing queries as per the functional requirements

No	Topic	Lectures
1	Simple Queries	4
2	Nested Queries, using aggregate functions	4
3	Queries using Views	8
4	Queries using loops and conditional statements	8
5	Stored Function	12
6	Exception Handling	4
7	Cursors and Triggers	12

**S.Y.B.Sc. Computer Science Theory Paper I
Semester II
CS 221 -Object Oriented Concepts using C++**

Total Lectures: 48

Objective:-

1. Acquire an understanding of basic object oriented concepts and the issues involved in effective class design
2. Write C++ programs that use object oriented concepts such as information hiding, constructors, destructors, inheritance etc.

Prerequisites: Knowledge of C Programming Language

1. Object oriented concepts [2]

- 1.1 Object oriented concepts
- 1.2 Features, advantages and Applications of OOPS

2. Introduction to C++ [6]

- 2.1 Data types, new operators and keywords, using namespace concept
- 2.2 Simple C++ Program
- 2.3 Introduction to Reference variables
- 2.4 Usage of 'this' pointer
- 2.5 Classes and Objects
- 2.6 Access specifiers
- 2.7 Defining Data members and Member functions
- 2.8 Array of objects

3. Function in C++ [8]

- 3.1 Call by reference, Return by reference
- 3.2 Function overloading and default arguments
- 3.3 Inline function
- 3.4 Static class members
- 3.5 Friend Concept – Function, Class

4. Constructors and destructor [4]

- 4.1 Types of constructors
- 4.2 Memory allocation (new and delete)
- 4.3 Destructor

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

5. Operator overloading [4]

- 5.1 Overloading Unary and Binary operators
- 5.2 Overloading using friend function
- 5.3 Type casting and Type conversion

6. Inheritance [8]

- 6.1 Types of inheritance with examples
- 6.2 Constructors and destructor in derived classes
- 6.3 Virtual base classes, Virtual functions and Pure virtual function
- 6.4 Abstract base classes

7. Managing Input and Output using C++ [4]

- 7.1 Managing console I/O
- 7.2 C++ stream classes
- 7.3 Formatted and unformatted console I/O
- 7.4 Usage of manipulators

8. Working with files [6]

- 8.1 File operations – Text files, Binary files
- 8.2 File stream class and methods
- 8.3 File updation with random access
- 8.4 Overloading insertion and extraction operator

9. Templates [4]

- 9.1 Introduction to templates
- 9.2 Class templates, function templates and overloading of function templates
- 9.3 Templates with multiple parameters

10. Exception Handling in C++ [2]

- 10.1 try, catch and throw primitives

Reference Books: -

- 1. Object Oriented Programming with C++ by Robert Lafore
- 2. Object Oriented Programming with C++ by E. Balagurusamy
- 3. Object Oriented Modeling and Design by James Rumbough
- 4. The Complete Reference C++ by Herbert Schildt
- 5. Let us C++ by – YashwantKanitkar
- 6. Mastering C++ by Venugopal, T Ravishankar, RajkumarTHM Pub.
- 7. Trouble free C++ by HarimohanPande, ANE publication

S.Y.B.Sc.Computer Science Theory paper-II

Semester – II

CS - 222: Software Engineering

Total Lectures : 48

Objectives:-

- To teach basics of System Analysis and Design.
- To teach principles of Software Engineering
- To teach various process models used in practice
- To know about the system engineering and requirement engineering
- To build analysis model

Prerequisites: Basic knowledge of DBMS

1. System Concepts [5] (R1 : Chapter 1 & R3 : Chapter 1)

- 1.1 System Definition
- 1.2 Characteristics of a System : Organization, Subsystem, Interaction, Interdependence, Integration, Central objective, Standards, Black-box
- 1.3 Elements of a system : Outputs, Inputs, Processor(s), Control, Feedback, Environment, Boundaries, Interface.
- 1.4 Types of Systems : Physical & Abstract Systems, Open & Closed Systems, Computer-based Systems (MIS : Management Information System & DSS : Decision Support System)

2. Software and Software Engineering [5] (R2 : Chapter 1)

- 2.1 The Nature of Software
 - 2.1.1 Defining Software
 - 2.1.2 Software Application Domains
 - 2.1.3 Legacy Software
- 2.2 Software Engineering
- 2.3 The Software Process

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- 2.4 Software Engineering Practice
 - 2.4.1 The Essence of Practice
 - 2.4.2 General Principles
- 2.5 Software Myths
- 3. **System Development Life Cycle (SDLC) [8] (R3 : Chapter 1)**
 - 3.1 Introduction
 - 3.2 Activities of SDLC
 - 3.2.1 Preliminary Investigation (Request Clarification, Feasibility Study, Request Approval)
 - 3.2.2 Determination of System Requirements
 - 3.2.3 Design of System
 - 3.2.4 Development of Software
 - 3.2.5 System Testing (Unit Testing, Integration testing, System Testing)
 - 3.2.6 System Implementation & Evaluation
 - 3.2.7 System Maintenance
- 4. **Process Models [6] (R2 : Chapter 2)**
 - 4.1 A Generic Process Model
 - 4.2 Prescriptive Process Models
 - 4.2.1 The Waterfall Model
 - 4.2.2 Incremental Process Models
 - 4.2.3 Evolutionary Process Models
 - 4.2.3.1 Prototyping
 - 4.2.3.2 Spiral Model
 - 4.2.4 Concurrent Models
- 5. **Requirements Engineering [8] (R2 : Chapter 5)**
 - 5.1 Introduction
 - 5.2 Requirements Engineering Tasks

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- 5.2.1 Inception
- 5.2.2 Elicitation
- 5.2.3 Elaboration
- 5.2.4 Negotiation
- 5.2.5 Specification
- 5.2.6 Validation
- 5.2.7 Requirements Management
- 5.3 Initiating the Requirements Engineering Process
 - 5.3.1 Identifying the Stakeholders
 - 5.3.2 Recognizing Multiple Viewpoints
 - 5.3.3 Working toward Collaboration
- 5.4 Fact Finding Techniques (R3 : Chapter 3)
 - 5.4.1 Interview
 - 5.4.2 Questionnaire
 - 5.4.3 Record Review
 - 5.4.4 Observation
- 6. Structured Analysis Development Strategy [10] (R3 : Chapter 4)
 - 6.1 Structured Analysis
 - 6.1.1 What is Structured Analysis?
 - 6.1.2 Components of Structured Analysis
 - 6.1.3 What is Data Flow Analysis?
 - 6.2 Features & Tools of Data Flow Analysis
 - 6.2.1 Logical Data Flow Diagram (Logical DFD)
 - 6.2.1.1 Notations
 - 6.2.1.2 Drawing a Context Diagram
 - 6.2.1.3 Exploding A Context diagram into Greater detail (1st level, 2nd Level DFD etc...)

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

6.2.1.4 Evaluating Data Flow Diagram for Correctness

6.2.2 A Data Dictionary

6.2.2.1 What is a Data Dictionary?

6.2.2.2 Why is a Data Dictionary Important?

6.2.2.3 What does a Data Dictionary Record?

7. **An Agile View of Process [6] (R2 : Chapter 3)**

7.1 What is an Agility?

7.2 What is an Agile Process?

7.2.1 The Politics of Agile Development

7.2.2 Human Factors

7.3 Agile Process Models

7.3.1 Extreme Programming (XP)

7.3.2 Adaptive Software Development (ASD)

7.3.3 Dynamic Systems Development Method (DSDM)

Reference Books :

R1 : System Analysis and Design (Second Edition) by Elias M. Awad, Galgotia Publications Pvt. Ltd.

R2 : Software Engineering : A Practitioner's Approach (Seventh Edition) by Roger S. Pressman, McGraw Hill International Edition.

R3 : Analysis and Design of Information Systems (Second Edition) by James A. Senn, McGraw Hill International Editions.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

CS-223 : Data structures Practicals and C++ Practicals
(semester 2)

C++ Lab Assignments

1	Class , Object and methods implementation	4
2	Constructor: Copy Constructor, Default Constructor, Parameterized Constructor	4
3	Memory Allocation: new and delete operators , dynamic constructor	4
4	Inline function, friend function, default argument,	4
5	Function Overloading.	4
6	Operator overloading.	8
7	Inheritance: Single, multiple, multilevel, hierarchy, Constructor and destructor in derived class	12
8	File Handling: Updation of files using random access	4

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

CS-224: Database Practicals & Mini Project using Software Engineering techniques
(Semester 2)

No	Topic	Lectures
1	Problem definition , scope	8
2	Feasibility study	4
3	Gathering Data Requirements and Functional Requirement	12
4	ERD	4
5	Designing the normalized Database	8
6	Designing queries related to Functional requirements	12

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

University of Pune
S.Y.B.Sc.(Computer Science) Practical Examination
Lab Course I
(Data Structures Using C & Object Oriented Programming Concepts Using C++)

Duration: 3 hours

Max. Marks: 80

Q 1. Data Structures using C

1. Simple program based on searching / sorting / ADT of Stack, Queue, operations on linked list [15]
2. Program based on applications of stack/queue/linked list, trees / graph [25]

OR

3. Program based on case study involving multiple data structures [40]

Q 2. Object Oriented Concepts and Programming in C++

1. Program based on different concepts in C++ [30]
- OR
2. Program based on different concepts in C++ [30]
 3. Viva [10]

University of Pune

Board of Studies in Mathematics

S. Y. B. Sc. (Comp. Sc.)

Syllabus of Mathematics

Introduction:

University of Pune has decided to change the syllabi of various faculties from June,2013.

Taking into consideration the rapid changes in science and technology and new approaches in different areas of mathematics and related subjects Board of studies in Mathematics with concern of teachers of Mathematics from different colleges affiliated to University of Pune has prepared the syllabus of S.Y.B.Sc. Comp.Sci. Mathematics. To develop the syllabus the U.G.C. Model curriculum is followed.

Aims:

- i) Give the students a sufficient knowledge of fundamental principles ,methods and a clear perception of innumerable power of mathematical ideas and tools and know how to use them by modeling ,solving and interpreting.
- ii) Reflecting the broad nature of the subject and developing mathematical tools for continuing further study in various fields of science.
- iii) Enhancing students' overall development and to equip them with mathematical modeling abilities, problem solving skills , creative talent and power of communication necessary for various kinds of employment .
- iv) Enabling students to develop a positive attitude towards mathematics as an interesting and valuable subject of study.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Objectives:

(i) A student should be able to recall basic facts about mathematics and should be able to display knowledge of conventions such as notations, terminology and recognize basic geometrical figures and graphical displays, state important facts resulting from their studies.

(ii) A student should get a relational understanding of mathematical concepts and concerned structures, and should be able to follow the patterns involved, mathematical reasoning.

(iii) A student should get adequate exposure to global and local concerns that explore them many aspects of Mathematical Sciences.

(iv) A student be able to apply their skills and knowledge, that is, translate information presented verbally into mathematical form, select and use appropriate mathematical formulae or techniques in order to process the information and draw the relevant conclusion.

(v) A student should be made aware of history of mathematics and hence of its past, present and future role as part of our culture.

Eligibility: F.Y.B.Sc. Comp.Sci., as per University rules

Structure of the course:

	Semester - I		Semester -II	
Paper I	Applied Algebra	(MTC :211)	Computational Geometry	(MTC:221)
Paper II	Numerical Analysis	(MTC:212)	Operations Research	(MTC:222)
Paper III	Practical			(MTC:223)

In paper I and II, each course is of 50 marks (40 marks theory and 10 marks internal examination)

Paper III is is of 100 marks

Medium of Instruction: English

Examination:

A) Pattern of examination: Paper I and II:Semester wise
PaperIII: Practical Annual

B) Standard of passing :For Paper I and II: 20 Marks out of 50 marks for eachcourse.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

But for passing a student should obtain minimum 16 marks out of 40 in the theory and oral examination and overall total marks for theory, oral and internal should be minimum 20.

C) Pattern of question papers: For Paper I and Paper II

Q1. Attempt any 05 out of 07 questions each of 02 marks. [10Marks]

Q2. Attempt any 02 out of 03 questions each of 05 marks. [10 Marks].

Q.3. Attempt any 02 out of 03 questions each of 05 marks. [10 Marks].

Q.4. Attempt any 01 out of 02 questions each of 10 marks. [10 Marks].

The pattern of question paper for Paper III : Given in details of Syllabus

D) External Students: Not allowed.

E) Variation / Revaluation: Allowed for Paper I and II.

F) Qualifications for Teacher: M.Sc. Mathematics (with NET /SET as per existing rules)

Equivalence of Previous syllabus along with new syllabus:

Semester I		Semester II	
New Course	Old Course	New Course	Old Course
(MTC :211) Applied Algebra	(MTC :211) Linear Algebra	(MTC:221) Computational Geometry	(MTC:221) Computational Geometry
(MTC:212) Numerical Analysis	(MTC:212) Numerical Analysis	(MTC:222) Operations Research	(MTC:222) Operations Research
MTC 223 Practical			

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Applied Algebra (MTC: 211)

1. General Vector Spaces: [14]
 - 1.1 Real vector spaces.
 - 1.2 Subspaces.
 - 1.3 Linear independence.
 - 1.4 Basis and dimensions.
 - 1.5 Row space, Column space and null space.
 - 1.6 Rank and Nullity.
2. Eigen values and Eigen vectors: [09]
 - 2.1 Eigen values and Eigen vectors.
 - 2.2 Diagonalization.
 - 2.3 Quadratic forms.
3. Linear Transformations: [10]
 - 3.1 General linear transformations.
 - 3.2 Kernel and range. (Rank nullity theorem without proof.)
 - 3.3 Inverse linear transformation.
 - 3.4 Matrix of general linear transformation.
4. Groups and Coding: [15]
 - 4.1 Cyclic group, normal subgroup.
 - 4.2 Products and quotients of groups.
 - 4.3 Coding of binary information and error detection.
 - 4.4 Decoding and error correction.
 - 4.5 Public key cryptology.

Note: All theorems in sections 1.5, 1.6, 2.2, 2.3, 2.4, 3.3, 3.4, 4.1, 4.2, 4.3, 4.4 are without proofs.

Text Book:

1. Elementary Linear Algebra (Applications Version) by Howard Anton, Chris Rorres. (Seventh Edition) John Wiley & Sons, Inc.
Sections: 5.1 to 5.6, 7.1, 7.2, 9.5, 9.6, 8.1 to 8.4

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

2. Discrete Mathematical Structures (sixth edition), Kolman, Busby and Ross. PHI.
Sections: 9.5, 11.1 to 11.3

Reference Books:

- (1) M. Artin, Algebra, Prentice Hall of India , New Delhi, (1994).
- (2) K. Hoffmann and R. Kunze Linear Algebra, Second Ed. Prentice Hall of India New Delhi, (1998).
- (3) S. Lang, Introduction to Linear Algebra, Second Ed. Springer-Verlag, New York, (1986).
- (4) A. Ramchandra Rao and P. Bhimasankaran, Linear Algebra, Tata McGraw Hill, New Delhi (1994).
- (5) G. Strang, Linear Algebra and its Applications. Third Ed. Harcourt Brace Jovanovich, Orlando, (1988).

Numerical Techniques (MTC: 212)

1. Errors [02]
 - 1.1 Accuracy of Numbers
 - 1.2 Errors
2. Algebraic and Transcendental Equation [05]
 - 2.1 False Position Method
 - 2.2 Newton-Raphson Method
3. Calculus of Finite Differences [10]
 - 3.1 Differences
 - 3.1.1 Forward Differences
 - 3.1.2 Backward Differences
 - 3.1.3 Central Differences
 - 3.1.4 Other Differences
 - 3.1.5 Properties of Operators
 - 3.1.6 Relation between Operators
 - 3.2 Fundamental Theorem on Differences of polynomial
 - 3.3 Estimation of Error by Difference Table
 - 3.4 Technique to determine the Missing Term

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- 4. Interpolation with Equal Interval [10]
 - 4.1 Newton's Gregory Formula for Forward Interpolation
 - 4.2 Newton's Gregory Formula for Backward Interpolation
 - 4.3 Central Difference Formulae
 - 4.3.1 Gauss Forward Difference Formula
 - 4.3.2 Gauss Backward Difference Formula
 - 4.3.3 Bessel's Interpolation Formula
- 5. Interpolation with Unequal Interval [08]
 - 5.1 Lagrange's Interpolation Formula
 - 5.2 Error in Lagrange's Interpolation Formula
 - 5.3 Divided Difference
 - 5.4 Newton's Divided Difference Formula
 - 5.5 Hermite's Interpolation Formula
- 6. Numerical Integration [06]
 - 6.1 General Quadrature Formula
 - 6.2 Trapezoidal Rule
 - 6.3 Simpson's one-Third Rule
 - 6.4 Simpson's Three-Eight Rule
 - 6.5 Euler-Maclaurin's Formula
- 7. Numerical Solution of Ordinary Differential Equation [07]
 - 7.1 Euler's Method
 - 7.2 Euler's Modified Method
 - 7.3 Runge-Kutta Method
 - 7.4 Milne's Predictor-Corrector Method

Text Book:-

A textbook of Computer Based Numerical and Statistical Techniques, by A. K. Jaiswal and Anju Khandelwal. New Age International Publishers.

Sections: 1.2, 1.3, 1.3, 2.1, 2.5, 2.7, 3.1, 3.2, 3.4, 3.5, 3.6, 3.7, 4.1, 4.2, 4.3, 4.4.1, 4.4.2, 4.4.4, 4.5, 5.1, 5.2, 5.3.1, 5.4, 5.5, 5.6, 6.1, 6.3, 6.4, 6.5, 6.6, 6.7, 6.10, 7.1, 7.4, 7.5, 7.6, 7.7

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Reference Books:-

1. S.S. Sastry; Introductory Methods of Numerical Analysis, 3rd edition, Prentice Hall of India, 1999.
2. H.C. Saxena; Finite differences and Numerical Analysis, S. Chand and Company.
3. K.E. Atkinson; An Introduction to Numerical Analysis, Wiley Publications.
4. Balguruswamy; Numerical Analysis.

Computational Geometry (MTC : 221)

1. Two dimensional transformations:

[16]

- 1.1 Introduction.
- 1.2 Representation of points.
- 1.3 Transformations and matrices.
- 1.4 Transformation of points.
- 1.5 Transformation of straight lines.
- 1.6 Midpoint transformation.
- 1.7 Transformation of parallel lines.
- 1.8 Transformation of intersecting lines.
- 1.9 Transformation: rotations, reflections, scaling, shearing.
- 1.10 Combined transformations.
- 1.11 Transformation of a unit square.
- 1.12 Solid body transformations.
- 1.13 Transformation and homogeneous coordinates. Translation.
- 1.14 Rotation about an arbitrary point.
- 1.15 Reflection through an arbitrary line.
- 1.16 Projection – a geometric interpretation of homogeneous coordinates.
- 1.17 Overall Scaling.
- 1.18 Point at infinity.

2. Three dimensional transformations:

[16]

- 2.1 Introduction.
- 2.2 Three dimensional – Scaling, shearing, rotation, reflection, translation.
- 2.3 Multiple transformations.
- 2.4 Rotation about – an axis parallel to coordinate axes, an arbitrary axis in space.
- 2.5 Reflection through – coordinate planes, planes parallel to coordinate planes, arbitrary planes.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- 2.6 Affine and perspective transformations.
- 2.7 Orthographic projections.
- 2.8 Axonometric projections.
- 2.9 Oblique projections.
- 2.10 Single point perspective transformations.
- 2.11 Vanishing points.

3. Plane Curves:

[10]

- 3.1 Introduction.
- 3.2 Curve representation.
- 3.3 Non – parametric curves.
- 3.4 Parametric curves.
- 3.5 Parametric representation of a circle and generation of circle.
- 3.6 Parametric representation of an ellipse and generation of ellipse.
- 3.7 Parametric representation of a parabola and generation of parabolic Segment.
- 3.8 Parametric representation of a hyperbola and generation of hyperbolic segment.

4. Space curves:

[6]

- 4.1 Bezier Curves – Introduction, definition, properties (without proof), Curve fitting (up to $n = 3$), equation of the curve in matrix form (upto $n = 3$)

Textbook:

D. F. Rogers, J. A. Adams, Mathematical elements for Computer graphics, Mc Graw Hill Intl Edition.

Reference books:

- Schaum Series, Computer Graphics.
- M. E. Mortenson, Computer Graphics Handbook, Industrial Pres Inc

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Operations Research (MTC:222)

1. **Modeling with Linear Programming** [06]
 - 1.1 Two-Variable LP Model
 - 1.2 Graphical LP Solution
 - 1.3 Linear Programming Applications
 - 1.3.1 Production Planning and Inventory Control
2. **The Simplex Method** [12]
 - 2.1 LP Model in Equation Form
 - 2.2 Transition from Graphical to Algebraic Solution
 - 2.3 The Simplex Method
 - 2.4 Artificial Starting Solution
 - 2.4.1 M-Method
 - 2.5 Special Cases in Simplex Method
3. **Duality** [08]
 - 3.1 Definition of the dual problem
 - 3.2 Primal dual relationships
4. **Transportation Model and Its Variants** [12]
 - 4.1 Definition of the Transportation problem
 - 4.2 The Transportation Algorithm
 - 4.3 The Assignment Model
5. **Decision Analysis and Games** [10]
 - 5.1 Optimal solution of two person zero sum games
 - 5.2 Solution of mixed strategy games

Text Book:-

Operation Research (An Introduction) Ninth Edition, by Hamdy A. Taha.

Sections: 2.1, 2.2, 2.4.2, 3.1, 3.2, 3.3, 3.4, 3.5, 4.1, 4.2, 5.1, 5.3, 5.4, 15.4

Reference Books:-

1. Operations Research by S. D. Sharma
2. Operations Research by R. Panneerselvam, Prentice Hall of India.
3. Principles of Operations Research by H. M. Wagner, Prentice Hall of India.
4. Operations Research by Gupta and Hira.
5. Operation Research by J.K. Sharma

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Paper III : Mathematics practical (MTC:223)

(Semester – I)

1. Using scilab

- i. Revision of scilab with some basic commands
e.g. size,length,eye,ones,rand,zeros etc.
- ii. Use of ' deff ' command for one and two variables functions.
- iii. Draw 2-D and 3-D graph for some standard functions.
e.g. x^2 , $\sin(x)$, $\exp(x)$, x^3+y^3 etc .

2. Using scilab

- i. basic operations on matrices .
e.g. addition , subtraction, multiplication ,square etc.
- ii. solution for system of linear equation .

3. Scilab programming :

- i. Regula-Falsi Metho.
- ii. Newton-Raphson Method.

4 . Using scilab .

- i. Eigen values and Eigen vectors.
- ii. Diagonalization.

5. Scilab programming :

- i. Newton's forward interpolation formula.
- ii. Newton's backward interpolation formula.

6. Scilab programming :

- i. Lagranges interpolation for unequal interval.
- ii. Newton's divided difference formula.

7. Scilab programming :

- i. Numerical Integration by Trapezoidal method.
- ii. Numerical Integration by Simpson's (1/3)rd rule.
- iii. Numerical Integration by Simpson's (3/8)th rule.

8. Scilab programming :

- i. Euler's Method
- ii. Runge-Kutta Method

9. Written practical : Coding Theory and cryptology.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Semester II

10. C-programming

- i. Sorting a set of points with respect to a line.
- ii. Sorting a set of points with respect to a rectangle.

11. C-programming

- i. Find a pair of points with least mutual distance from the given set
- ii. Find a pair of points with farthest mutual distance from the given set

12. **Written practical** : Solution of L. P. P. by simplex method
Verification by TORA

13. **Written practical** : 2 -D transformations

14. **Written practical** : Transportation and assignment problem
Verification by TORA

15. **Written practical** : 3 -D transformations.

16. C-programming

- i. Generation of uniformly n- points on standard Circle
- ii. Generation of uniformly n- points on standard Ellipse

17. C-programming

- i. Sorting a set of points with respect to a polygon
- ii. Sorting a set of points with respect to a rectangular block

18. **Written practical** : Be'ziers curve

Instructions:

1. The annual examination is of 80 marks and 20 marks are based on internal evaluation (journal, attendance ,vivo-voce etc).
2. The annual examination of 80 marks having 3 hours duration and has two parts
 - i. Question paper solving
 - ii. Computer Session
3. The maximum marks for the question paper is 30 and is of 1 hr duration. there will be 5 questions ; each of 10 marks and student has to solve any three questions .
4. Computer session is of 2 hrs duration . It consist of two questions with first on C' programming of 20 marks .and second on scilab of 30 marks with internal options .
5. The slips for the questions on c-programming and problems solving by scilab should be prepared and can be use in annual examination at least for 3 years.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

S.Y.B.Sc. Computer Science (Electronics)
Revised Syllabus
To be implemented from A.Y. 2014-15

Structure of S. Y. B. Sc. (Computer Science) Course

Sem-I	Paper-I : Digital System Hardware (ELC 211)	Paper-II: Analog Systems (ELC 212)
Sem-II	Paper-I:The 8051 Architecture, Interfacing & Programming (ELC 221)	Paper-II:Communication Principles (ELC 222)
Sem-I & II	Paper- III: Practical Course (ELC 203)	

Equivalence Subject/Paper and Transitory Provision

Semester	Old Syllabus	New Syllabus
Semester I	Paper-I: Microprocessor and programming (ELC211)	Paper-I: Digital System Hardware (ELC 211)
	Paper- II: Communication Principles (ELC 212)	Paper-II: Communication Principles (ELC 222)
Semester II	Paper-I: 8051 Microcontroller and Embedded Systems (ELC 221)	Paper-I: The 8051 Architecture,Interfacing and Programming (ELC 221)
	Paper-II: Digital Signal processing (ELC 222)	Paper-II: Analog Systems (ELC 212)
Semester I and II	Practical course	Paper- III: Practical Course (ELC 203)

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

S.Y.B.Sc. (Computer Science) Electronics -Semester I

Paper - I: Digital System Hardware (ELC 211)

Objectives:

1. To study the applications of logic gates.
2. To use K-maps for digital circuit design.
3. To study and understand basics of microprocessors
4. To understand fundamentals of multicore technology

UNIT- 1: Digital circuit design

[12]

Introduction to digital circuit design, Circuit design using logic gates: Binary to gray converter, Gray to Binary converter, Decimal to BCD encoder
Circuit design using state table/K-map: Design of Full adder, full subtractor, BCD to seven segment decoder, Concept of excitation table, Design of 3 bit synchronous up counter , 3 bit random sequence generator .

UNIT- 2: Memory

[12]

Memory Architecture, Memory Hierarchy, Introduction to USB storage device, Memory parameters (Access time, speed, capacity, cost), Vertical & horizontal Memory expansion (increasing the capacity, increasing word size), Associative Memory, Cache memory, cache mapping techniques, virtual memory, virtual memory mapping (paging and segmentation).

UNIT- 3: Computer Organization

[14]

Concept of Address Bus, Data Bus, Control Bus. Register based CPU organization, stack organization, I/O organization: need of interface, block diagram of general I/O interface. Working concepts like polling, interrupt initiated data transfer. Concept of DMA , DMA transfer, DMA Controller Serial communication: Synchronous, asynchronous and their data transmission formats, RS-232, General block diagram of UART.

UNIT- 4: Microprocessor

[10]

Evolution of Microprocessor (8086 to Pentium 4), Features like address, data, bus size, speed, cache capacity, number of parallel instructions executed. Concept of RISC & CISC, Von-Neumann & Harvard Architecture, Concept of pipeline. Architecture of basic microprocessor:

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Course Catalog for B. Sc. (Computer Science) Program

8086 & Pentium (Basic Version), Introduction to multicore processors, its development and impact on Hardware, Software.

Recommended Books:

1. Fundamental of Digital electronics : R.P. Jain ,
2. Digital design : M. Morris Mano, Prentice-Hall of India
3. Computer System Architecture : Morris Mano, Prentice-Hall of India
4. The Pentium Microprocessor : James Antonakos
5. Microprocessors and Interfacing Programming and Hardware: Douglas V. Hall- TATA McGRAW-HILL EDITION
6. The Intel Microprocessors : Barry B. Brey- Pearson Education Asia

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

S.Y.B.Sc. (Computer Science) Electronics-Semester I

Paper-II: Analog Systems (ELC 212)

Objectives:

- 1) To understand basics of analog electronics
- 2) To study different types of sensors
- 3) To understand different types of signal conditioning circuits
- 4) To learn data conversion techniques
- 5) To apply knowledge of analog systems in different applications

UNIT -1: Analog Electronic System

[14]

Introduction of analog electronic systems. Definition of sensors and transducers. Classification of sensors: Active and passive sensors. Specifications of sensors: Accuracy, range, linearity, sensitivity, resolution, reproducibility. Temperature sensors (LM-35 and AD590), pH sensor, piezoelectric humidity sensor, optical sensor (LDR), displacement sensor (LVDT), Passive Infrared sensor (PIR), tilt sensor, touch sensor, ultrasonic sensor

UNIT- 2: Signal Conditioning

[14]

Introduction to signal conditioning, Signal conditioning of passive sensors using bridge circuit: Wheatstone 's bridge, Level Shifter, Amplifier, Three OP-amp instrumentation amplifier, Filters; active and passive filters, Concept of Order of filters. Working principle of Single order Op-Amp based Low Pass Filter, High Pass Filter, Band Pass Filter, Notch Filter, Band reject filter; Working of Voltage to frequency Converter using OpAmp.

UNIT- 3: Data Converters

[12]

Digital to Analog Converter (DAC): Resistive divider, R-2R ladder. Parameters: Linearity, resolution, accuracy, Analog to Digital Converter (ADC): Types of ADC- Flash, Successive approximation, dual slope. Parameters of ADC: Linearity, resolution, conversion time, accuracy. Applications of DAC and ADC.

UNIT – 4: Case studies

[08]

Temperature monitoring system using LM35, Intruder detector system using PIR sensor, Water Level Indicator system using float switch, Electrocardiography (ECG).

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Recommended Books:

1. Sensors & Transducers : Dr. A. D. Shaligram: CTC publications
2. Op-Amps and Linear Integrated Circuits: Ramakant Gaikwad: PHI: 4th Ed.
3. Electronic Instrumentation: H. S. Kalsi: TMH: 2nd Ed.
4. Modern Electronic Instrumentation and Measurement Techniques: Albert D. Helfrick, William D. Cooper: PHI publications
5. Electronic measurements : K.A. Bakshi, A. V. Bakshi and U. A. Bakshi, Technical publications.
6. A Course in Electrical and Electronic measurements and Instrumentation: A.K. Sawhney: Dhanpat Rai & Sons Educational & technical publishers
7. Handbook of Biomedical instrumentation: R. Khandpur, Tata McGraw Hill Publications 2003.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

S.Y.B.Sc(Computer Science) Electronics- Semester II

Paper-I: The 8051 Architecture, Interfacing & Programming (ELC 221)

Objectives:

1. To study the basics of 8051 microcontroller
2. To study the Programming and interfacing techniques of 8051
3. To apply knowledge of 8051 to design different application circuits
4. To introduce the basic concepts of advanced Microcontrollers

UNIT- 1: Basics of Microcontroller & Intel 8051 architecture [12]

Introduction to microcontrollers, difference in controller and processor. Architecture of 8051, Internal block diagram, Internal RAM organization, SFRS, pin diagram of 8051, I/O ports and specifications of I/O Ports, External Memory Interface.

UNIT-2: Programming model of 8051 [12]

Instruction classification, Instruction set, Addressing Modes: Immediate, register, direct, indirect and relative, assembler directives (org, end), features with example, I/O Bit & Byte programming using assembly language for LED and seven segment display (SSD) interfacing. Introduction to 8051 programming in C.

UNIT- 3: Timer / counter, serial communication, Interrupts & Programs using 'C' [12]

TMOD, TCON, SCON, SBUF, PCON Registers, Timer modes, programming for time delay using mode 1 and mode 2. Introduction to interrupt .Interrupt types and their vector addresses, Interrupt enable register and interrupt priority register(IE,IP), Synchronous and asynchronous serial communication , Programming serial port without interrupt, Use of timer to select baud rate for serial communication.

UNIT- 4: Interfacing, programming using 'C' & Applications of 8051 [12]

Interfacing ADC, DAC, LCD, stepper motor. Study of advance micro controllers (ARM & PIC): Features and applications

Recommended books:

1. 8051 microcontroller and Embedded system using assembly and C : Mazidi, Mazidi and McKinley, Pearson publications
2. The 8051 microcontroller – Architecture, programming and applications: K.Uma Rao and AndhePallavi, Pearson publications.
3. ARM System Developers guide: Sloss, Andrew n. Symes.
4. Design with PIC microcontrollers: Peatman, Pearson publications.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

**S.Y.B.Sc(Computer Science) Electronics-Semester II
Paper- II: Communication Principles (ELC 222)**

Objectives:

1. To understand basics of communication systems.
2. To understand modulation, demodulation and multiplexing of signals.
3. To understand digital communication techniques
4. To introduce concepts in advanced wireless communication.

UNIT-1: Introduction to Electronic Communication

[12]

Importance of Communication, Elements of Communication system, Electromagnetic spectrum, types of communication, serial communication, Concepts of communication system: Signal bandwidth, channel bandwidth, data rate, baud rate, Nyquist theorem, Signal to noise ratio, and channel capacity, error handling code- Hamming code, Shannon theorem, and concept of companding.

UNIT-2: Modulation and Demodulation

[14]

Introduction to concepts of modulation and demodulation. Modulation techniques: Analog modulation: Amplitude, Phase and Frequency modulation. Circuit diagram and working of transistorized amplitude modulator and diode demodulator. Equation of amplitude modulated wave, modulation index and frequency spectrum. (Phase and frequency modulation circuits are not expected).

Digital modulation: Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Block diagram and working, delta modulation circuit, MODEM - concept of ASK, FSK, BPSK, QPSK and block diagram of MODEM using FSK.

UNIT-3: Multiplexing and Multiple Access Techniques

[14]

Study of multiplexing and multiple access techniques: Space division multiplexing, Time division multiplexing, Frequency Division Multiplexing, Code division multiplexing, spread spectrum techniques: DSSS, FHSS, Introduction to multiple access and corresponding access types: FDMA, TDMA, CDMA.

UNIT- 4: Wireless Communication system

[10]

Introduction to wireless communication system. Need of wireless communication systems. Antenna – Introduction, Need, working Principle, Parameters of antenna: Gain, directivity, Radiation pattern, Beam width, Bandwidth, front to back ratio (FBR).

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Course Catalog for B. Sc. (Computer Science) Program

Introduction to mobile communication, Cellular concept, Working of GSM, Hand over, Introduction to GPRS. Introduction to RFID, Zigbee, Bluetooth and Wi-Fi (Comparison based on range, data rate, frequency, Power).

Recommended Books:

1. Communication Electronics : Principles and Applications. L.E.Frenzel 3rd Edition.
2. Modern Electronic Communication. G.M. Miller 7th Edition.
3. Mobile Communication Jochen Schiller 2nd Edition.
4. Wireless Communications: Principles and Practice. Rappaport
5. Wireless Communications and Networks. William Stallings

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

S. Y .B. Sc. (Computer Science) Electronics Paper- III: Practical Course (ELC-203)

Objectives:

1. To use basic concepts for building various applications in electronics.
 2. To understand design procedures of different electronic circuits as per requirement.
 3. To build experimental setup and test the circuits.
 4. To develop skills of analyzing test results of given experiments.
- Total Practical to be conducted 20.
 - 16 experiments compulsory: At least four practical from each of the A B C D groups.
 - One activity equivalent to 2 experiments by the student.
 - a. Continuation of F. Y. activity.
 - b. Electronics project
 - c. Documentation type experiments
 - d. Presentation/Seminar on Electronics /advanced topic/research topics.
 - One activity equivalent to 2 experiments to be arranged by the teacher – Arrange atleast two practical demonstrations / Workshops /Industrial visit which will enhance quality and skills of the student.
 - Examination will be conducted on 16 experiments as well as on activities.

Practical Examination –

A) Internal Marks 20: 16 marks for experiments and 04 marks for activities

B) Annual examination: 80 Marks **in Two sessions of 3 Hrs each as usual practice.**

Session I- 40 marks: Practical work 32 marks , Oral based on the student's own activities 8 marks

Session II -40 marks: Practical work 32 marks, Oral based on common activities arranged by teachers 8 marks

32 Marks can be divided as -Circuit diagram / flowchart and algorithm	10
Connection / program	05
Demonstration and working explanation	10
Results	05
Result analysis / conclusion / comments	02

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Group A: List of Practicals (Digital System Hardware): Any Four

1. Build and test code converter using logic gates – binary to gray , gray to binary .
2. Build and test Decimal to BCD encoder using logic gates.
3. Build and test 3 bit synchronous counter using JK flip flops.
4. Build and test 4 bit sequence generator for counting sequence 0,2,4, 6, 8, 1, 3, 5, 7, 9, 0
5. Study of read and write action of RAM (using IC 2112/4 or equivalent).
6. Serial communication using RS 232 and ZigBee

Group B: List of Practicals (Analog Systems): Any Four

1. LM-35 based temperature sensing system/Optocoupler /opto-isolator based system.
2. Low Pass Filter and High Pass Filter using IC-741 Op Amp.
3. Build and test DAC using R-2R Ladder network.
4. Flash ADC using discrete components.
5. Build and test LDR based light control system.
6. Study of Linear Variable Differential Transformer.
7. Build and test Instrumentation Amplifier.

Group C :List of Practicals (Microcontroller): Any Four

1. Arithmetic, logical & code conversion problems using assembly/C programming
2. Interfacing the thumbwheel & seven segment display.
3. Traffic light controller using microcontroller.
4. Interfacing LCD to Microcontroller.
5. Waveform generation using DAC Interface.
6. Event counters using opto- coupler using seven segment display / LCD.
7. Speed Controller of stepper motor using microcontroller.

Group D: List of Practicals (Principles of Communication): Any Four

List of Practicals (Principles of Communication): Any Four

1. Build and test Amplitude Modulator and Demodulator.
2. Build and test Time Division Multiplexing circuit.
3. Build and test Frequency Shift Keying.
4. Build and test Delta Modulation circuit using IC.
5. Build and test Pulse Amplitude Modulation.
6. Study of radiation pattern of antenna.
7. Build and test Hamming Code generator and detector circuit.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Syllabus of Physical Education

(Course code – 11777)

To be implemented from 2015 for F.Y.B.Sc. (CS)

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

SAVITRIBAI PHULE PUNE UNIVERSITY



PHYSICAL EDUCATION SCHEME SYLLABUS

For First Year Students of All the Faculties

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Aim of the Scheme:

The aim of the scheme is to make Physical Education as an integral part of Educational System. Students studying in the colleges should have the benefit of Physical Education to improve their health during the course of college education. It is designed to ensure that on completion of this training they would attain the minimum prescribed standard.

Object of the scheme:

The object of the scheme is to enhance physical efficiency and maintain fitness of mind, body and character, which would help the student to be mentally alert and physically efficient to withstand the strain and fatigue of daily life. It would prepare them for the strenuous training which will help them to be fit to face the different barriers in life.

The students will undergo this scheme for the first year of his/her under graduate course education.

Participation in the scheme:

1. **Optional Activities:**

Under this category, a student shall have to choose at least two activities in the year, one from the team and another from Individual activities enlisted above and have to participate in them throughout the year. Whatever may be the choices according to the availability, a student shall have to show sufficient skill and achieve at least minimum score as per the prescribed tests at the end of year.

2. **Compulsory Activities:**

Under this category, a student shall have to choose total three activities, at least one from each part of group B (Running, Jumping, Endurance and Strength) during the year, and have to participate in them throughout the year. Whatever may be choices according to the availability, students shall have to show sufficient skill and have to achieve minimum prescribed target at the end of the year.

3. **Other Activities:**

At least one seminar to be conducted by the college in the academic year especially in the field of Health Sciences, Sports Medicine, Psychological parameters in sports, Food and Nutrition etc.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

The Scheme:

A student shall have to participate in two types of physical activities viz.

Group (A) - Optional Activities (Opt any Two, out of which one from individual event and one from team event)

Group A - Optional Activities: (Both for Male and Female)

Name of Individual Event	Individual Events Test for Evaluation
Badminton	Lockhart and McPherson Test
Gymnastics	Flex arm Hang Test for Girls Vertical Reach Test for Boys
Judo	Pushups and 12 Minutes run and walk test
Malkhamb/Rope Malkhamb	Flex arm Hang Test for Girls Vertical Reach Test for Boys
Swimming	Jackson et al. 12 Minutes Swim test
Table Tennis	Eye-hand Coordination Test
Tennis	Dyer's Tennis Test
Weight Lifting and Power Lifting	Sit ups, Pushups, Standing Vertical Jump
Wrestling	Pushups and 12 Minutes run and walk test
Yoga	Sit and Reach Test
Name of Team Event	Team Events Test for Evaluation
Basketball	Johnson's Basketball Test
Football	Mc Donald's Soccer Skill Test
Hockey	SAI Hockey Skill test
Kabaddi	6X10 M. Shuttle Run Test
Kho -Kho	6X10 M. Shuttle Run Test
Volleyball	SAI Volleyball Skill test

**** Administration of Test: As per published in the Manual for Physical Efficiency Drive published by Savitribai Phule Pune University.**

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Evaluation Pattern

- Badminton : Test for Administration – (Maximum 20 Marks)

Lockhart and McPherson Test

Scoring	Marking
Within 30 Seconds number of hits	Each Hit - 1 mark each

- Gymnastics (Men and Women), Malkhamb (Men) and Rope Malkhamb (women) : (Maximum 20 Marks)

Vertical Arm Pull Test (Male)

Sr. No	Performance in Cms	Performance Level	Marks
01	73.0 – 76.8 Cms	Advanced	20
02	66.7 – 72.4 Cms	Advanced Intermediate	16
03	48.9 – 66.0 Cms	Intermediate	12
04	39.4 – 48.3 Cms	Advanced beginners	08
05	0.0 – 38.7 Cms	Beginners	04

Courtesy: Barry L. Johnson and Jack K. Nelson, "Practical Measurements for Evaluation in Physical Education" Surjeet Publications, (1982): P. 206

Flexed Arm Hang Test (Female)

Sr. No.	Percentile	Performance in Seconds	Marking
1	100 th	73	20
2	95 th	34	19
3	90 th	28	18
4	85 th	22	17
5	80 th	19	16
7	75 th	17	15
8	70 th	14	14
9	65 th	12	13
10	60 th	10	12
11	55 th	09	11
12	50 th	08	10
13	45 th	07	09
14	40 th	06	08
15	35 th	05	07
16	30 th	04	06
17	25 th	03	05
18	20 th	02	04
19	15 th	02	03
20	10 th	01	02

Courtesy: Barry L. Johnson and Jack K. Nelson, "Practical Measurements for Evaluation in Physical Education" Surjeet Publications, (1982): P. 123

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- **Wrestling and Judo : Test for Administration – (Maximum 20 Marks)**
Push Ups and 12 Minutes Cooper's Walk and Run Test

Push Ups (Men) (number of pushups)

Scores Men Under 30 Years	Scale Points	Marks
60	100	20
58	95	19
56	90	18
54	85	17
53	80	16
50	75	15
48	70	14
46	65	13
44	60	12
42	55	11
40	50	10
38	45	09
36	40	08
34	35	07
32	30	06
30	25	05
28	20	04

Courtesy: Barry L. Johnson, Jack K. Nelson, Practical Measurements for Evaluation in Physical Education, Surjeet Publications (1982), Pp 129-130

Bent Knee Push-Ups (Modified Push-ups) (Women) (number of pushups)

Raw Scores	Performance Level	Marks
31- and above	Advanced	20
25-30	Advanced Intermediate	16
13-24	Intermediate	12
7-12	Advance Beginners	08
0-6	Beginners	04

Courtesy: Barry L. Johnson, Jack K. Nelson, Practical Measurements for Evaluation in Physical Education, Surjeet Publications (1982), Pp 129-130

12 Minutes Run and Walk Test (1 mile = 1.609 Kms.)

Male		Female		Fitness Class	Marks
13-19 years	20-29 years	13-19 years	20-29 years		
0-1.29 miles	0-1.22 miles	0.99 miles	0.95 miles	Very poor	00
1.3-1.37	1.22-1.31	1.0-1.18	0.96-1.11	poor	04
1.38-1.56	1.32-1.49	1.19-1.29	1.12-1.22	fair	08
1.57-1.72	1.50-1.64	1.30-1.43	1.23-1.34	good	12
1.73-1.86	1.65-1.76	1.44-1.51	1.35-1.45	excellent	16
1.87 & above	1.77 & above	1.52 & above	1.46 & above	superior	20

Courtesy: The Aerobics Way by Kenneth H. Cooper, M. D. , M. P. H. copyright (c) 1977 Kenneth H. Cooper, inc., New York, New York 100017. Reprinted by permission

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Course Catalog for B. Sc. (Computer Science) Program

- Note : After completion of all the test items the achieved score should be divided by two for final score

Swimming: Test for Administration – (Maximum 20 Marks)

Jackson et al. 12 Minutes Swim test

Sr. No.	Total distance covered in prescribed time in Mtrs	Marks
1	800	20
2	780	19
3	760	18
4	740	17
5	720	16
6	700	15
7	680	14
8	660	13
9	640	12
10	620	11
11	600	10
12	580	09
13	560	08
14	540	07
15	520	06
16	500	05
17	480	04
18	460	03
19	440	02
20	420	01

- Table Tennis : Test for Administration – (Maximum 20 Marks)

Eye hand Co-Ordination Test (Ball Transfer)

Scoring	Marking
Per ball transfer	2 marks each

- Tennis : Test for Administration – (Maximum 20 Marks)

Dyer's Tennis Test

Scoring	Marking
Within 30 Seconds number of hits	Each Hit - 1 mark each

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- **Weight Lifting, Power Lifting : Test for Administration – (Maximum 20 Marks)**
Push Ups, Sit Ups and Standing Vertical Jump

Push-Ups (Men) (number of pushups)

Scores Men Under 30 Years	Scale Points	Marks
60	100	20
58	95	19
56	90	18
54	85	17
53	80	16
50	75	15
48	70	14
46	65	13
44	60	12
42	55	11
40	50	10
38	45	09
36	40	08
34	35	07
32	30	06
30	25	05
28	20	04

Courtesy: Barry L. Johnson, Jack K. Nelson. Practical Measurements for Evaluation in Physical Education, Surjeet Publications (1982), Pp 129-130

Raw Score Norms of Modified Push-Ups (women) (number of pushups)

Raw Scores	Performance Level	Marks
31- and above	Advanced	20
25-30	Advanced Intermediate	16
13-24	Intermediate	12
7-12	Advance Beginners	08
0-6	Beginners	04

Courtesy: Barry L. Johnson, Jack K. Nelson. Practical Measurements for Evaluation in Physical Education, Surjeet Publications (1982), Pp 129-130

Raw score norms for sit-ups (bent knees)

College Men Repetitions	College Women Repetitions	Performance level	Marks
66 and above	49 and above	Advanced	20
53 to 65	37 to 48	Advance intermediate	16
34 to 52	21 to 36	Intermediate	12
25 to 33	13 to 20	Advanced beginner	08
0 to 24	0 to 12	Beginner	04

Courtesy: Practical measurement for evaluation in physical education, Third edition- Barry L. Johnson and Jack K. Nelson. Published by S.S. Chhabra for Surjeet Publication, India 1988 with permission from Burgess Publishing Company U.S.A.; Page number 120, 121, and 122.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Standing Vertical Jump

College Men Cms	Performance level	College Women Cms	Marks
66 and above	Advanced	49 and above	20
53 to 65	Advance intermediate	37 to 48	16
34 to 52	Intermediate	21 to 36	12
25 to 33	Advanced beginner	13 to 20	08
0 to 24	Beginner	0 to 12	04

Reference: Harold T. Friermood, 'volleyball skill contest for Olympic development' in United States Volleyball Rules and Reference guide of the U.S. Volleyball Association, Berne, Ind.: USVBA printer, 1967, pp 134-135.

Note: After completion of all the test items the achieved score should be divided by three for final score

- **Yoga : Test for Administration – (Maximum 20 Marks)**

Sit and Reach Test

Men (in Cms.)	Women (in Cms.)	Level	Marks
23 ¼ and above	25 ¼ and above	Advanced	20
21 ¼ to 23 ½	22 ½ to 25 ½	Advanced Intermediate	16
18 ¾ to 21	20 to 22 ¼	Intermediate	12
17 to 18 ½	18 to 19 ¾	Advanced Beginner	08
Below 16 ¾	Below 17 ¾	Beginner	04

TEAM EVENTS

- **Basketball : Test for Administration - Johnson's Basketball Test (Maximum 20 Marks)**

Scoring	Marking
3 points	20 Marks
2 points	13 Marks
1 point	07 Marks

- **Football : Test for Administration - Mc Donald's Soccer Skill Test (Maximum 20 Marks)**

Scoring	Marking
30 Seconds	1 Mark per hit

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- **Hockey : Test for Administration – SAI Hockey Skill Test (Maximum 20 Marks)**

Age Group (years)	Shooting Target (Accurate hits)		Balancing Ball (seconds)		Moving with the ball (seconds)		Score	Marks
	Boys	Girls	Boys	Girls	Boys	Girls		
14 years & above	11	10	25 & more	20 & more	4.20 & less	5.00 & less	3	20
	10	9	20-24	15-19	4.21-4.29	5.10-5.10	2	13
	9	8	15-19	10-14	4.30-4.37	5.11-5.19	1	07

Courtesy: D. K. Kansal, Textbook of Applied Measurement Evaluation and Sports Selection, Sports and Spiritual Science Publications, New Delhi (2008), Pp. 369-370

Note: After completion of all the test items the achieved score should be divided by three for final score

- **Kabaddi and Kho–Kho : Test for Administration - 6X10 Mts. Shuttle Run (Maximum 20 Marks)**

Age	Boys			Girls		
	Satisfactory	Good	Very Good	Satisfactory	Good	Very Good
14 yrs & above	16.3-15.8	15.7-15.0	14.9 & less	16.4-16.0	15.9-15.5	15.4 & less
Marks	20	13	07	20	13	07

Reference: Prospectus of Andhra Pradesh Sports School, Hakim pet, Secunderabad, Page no. 10 and Sports medicine center, Pune.

- **Volleyball: Test for Administration – SAI Volleyball Skill Test (Maximum 20 Marks)**

Age Group	Accuracy of Services		Wall Volley Test		Medicine Ball Throw		Points	Marks
	Number of correct services		Number of Cycles		Meters			
	Boys	Girls	Boys	Girls	Boys	Girls		
14 years & above	10	9	6	4.0	19.00 & more	16.00 & more	3	20
	9	8	5	3.0	17.00-18.90	14.00-15.90	2	13
	8	7	4	2.0	15.00-16.90	12.00-13.90	1	07

Courtesy: D. K. Kansal, Textbook of Applied Measurement Evaluation and Sports Selection, Sports and Spiritual Science Publications, New Delhi (2008), Pp. 381-382

Note: After completion of all the test items the achieved score should be divided by three for final score

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Group B - Choices for Compulsory Activities and tests for its evaluation: (Opt any three activities, out of which one from each selected parts i.e. Part A/B/C/D/)

PART	EVENT	STUDENT	TESTS FOR EVALUATION
Part A	100 m. Run	(Male and Female)	50 yard dash (150 feet)
	400 m. Run	(Male and Female)	
Part B	High Jump or Pole Vault	(Male and Female)	Standing Vertical Jump
	Long Jump	(Male and Female)	
	Triple Jump	(Male and Female)	
Part C	12.5 Km. Cross Country	(Male)	Cooper's Test (12 minutes run and walk test)
	5 Km. Cross Country	(Female)	
	1500 m. Run	(Male)	
Part D	Rope Climbing	(Male)	Medicine Ball put for male and Sit Ups test for female
	Chin Ups/Flex Arm hang	(Male and Female)	
	Sit Ups	(Male and Female)	
	Push Ups and Modified push ups	(Male and Female)	

Evaluation Scheme (Scoring Conversions) 50 meters Dash (Maximum 20 Marks)

Boys 17 yrs and above Seconds	Girls 17 yrs and above Seconds	Percentile	Marks
5.6	6.4	100 th	20
6.0	7.1	95 th	19
6.0	7.3	90 th	18
6.1	7.5	85 th	17
6.2	7.6	80 th	16
6.3	7.8	75 th	15
6.3	7.9	70 th	14
6.4	8.0	65 th	13
6.5	8.0	60 th	12
6.5	8.1	55 th	11
6.6	8.2	50 th	10
6.7	8.3	45 th	09
6.7	8.5	40 th	08
6.8	8.6	35 th	07
6.9	8.8	30 th	06
7.0	9.0	25 th	05
7.0	9.0	20 th	04
7.1	9.1	15 th	03
7.3	9.5	10 th	02
7.7	10.4	5 th	01
10.6	12.0	0 th	00

Reference: Practical measurement for evaluation in physical education, Third edition- Barry L. Johnson and Jack K. Nelson, Published by S.S. Chhabra for Surjeet Publication India 1988 with permission from Burgess Publishing Company U.S.A.; Page number 250 and 251.

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Vertical jump scoring table (in Cms)

GENDER AND AGE	100	90	80	70	60	50	40	30	20	10
Boys 15 to 17	25	24	23	21	19	16	12	8	5	2
Girls 15 to 17	17	16	15	14	13	11	8	6	3	2
Men 18 to 34	26	25	24	23	19	16	13	9	8	2
Women 18 to 34	14	13	13	12	10	8	6	4	2	1
Marks	20	18	19	14	12	10	08	06	04	02

Reference: Harold T. Friermood, 'volleyball skill contest for Olympic development' in United States Volleyball Rules and Reference guide of the U.S. Volleyball Association. Berne, Ind.: USVBA printer. 1967, pp 134-135.

Raw scores are located in the chart in accordance with age and sex, and percentile scores are located across the top.

Cooper's Test (12 Minute Run and Walk) (1 mile = 1.609 Kms)

Male		Female		Fitness	Marks
13-19	20-29	13-19	20-29	Class	
0-1.29 miles	0-1.22 miles	0.99 miles	0.95 miles	Very poor	00
1.3-1.37	1.22-1.31	1.0-1.18	0.96-1.11	poor	04
1.38-1.56	1.32-1.49	1.19-1.29	1.12-1.22	fair	08
1.57-1.72	1.50-1.64	1.30-1.43	1.23-1.34	good	12
1.73-1.86	1.65-1.76	1.44-1.51	1.35-1.45	excellent	16
1.87 & above	1.77 & above	1.52 & above	1.46 & above	superior	20

Courtesy: The Aerobics Way by Kenneth H. Cooper, M. D., M. P. H. copyright (c) 1977 Kenneth H. Cooper, inc., New York, New York 100017. Reprinted by permission

Medicine ball of 1 kg for up to 10 years, 2 kg for 11 years and above for Boys

Reference: Sports medicine centre, Pune, India.

Age	Boys (Mts)			Girls (Mts)		
	Satisfactory	Good	Very Good	Satisfactory	Good	Very Good
14 years & above	3.19 to 3.80	3.81 to 4.41	4.42 or more	2.61 to 3.09	3.10 to 3.59	3.60 or more
Marks	07	13	20	07	13	20

Reference: Practical measurement for evaluation in physical education. Third edition- Barry L. Johnson and Jack K. Nelson, Published by S.S. Chhabra for Surjeet Publication, India 1988 with permission from Burgess Publishing Company U.S.A.; Page number 208, 209

Raw score norms for sit-ups (bent knees) for Girls (repetitions)

College Men	Performance level	College Women
66 and above	Advanced	49 and above
53 to 65	Advance intermediate	37 to 48
34 to 52	Intermediate	21 to 36
25 to 33	Advanced beginner	13 to 20
0 to 24	Beginner	0 to 12

Courtesy: Practical measurement for evaluation in physical education. Third edition- Barry L. Johnson and Jack K. Nelson, Published by S.S. Chhabra for Surjeet Publication, India 1988 with permission from Burgess Publishing Company U.S.A.; Page number 120, 121, and 122

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

References:

1. Health and Physical Education; Manual cum Journal of Standard IX Navneet Publication;p-143
2. A Practical Approach to Test Measurement and Evaluation, D. K. Kansal, S S S Publications New Delhi, 2012
3. Manual for Physical Efficiency Drive Test, Savitribai Phule Pune University, 2015
4. Practical measurement for evaluation in physical education, Third edition- Barry L. Johnson and Jack K. Nelson, Published by S.S. Chhabra for Surjeet Publication, India 1988 with permission from Burgess Publishing Company U.S.A.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Evaluation of student's performance in Optional and Compulsory Physical Activities:

- **Record of Student Achievement:** The student's achievement in a particular activity shall be noted in the prescribed achievement card (App. I).
- **Grades:** The grades shall be given according to the achievement of the students.
- **Chances for appearance:** A student may, if he/she so desires to complete the tests during the first term so as to be able to concentrate on another activity during the second term. He/she shall, however, have to do so with the consent of the teacher in charge. However, till the end of the year he or she will have to complete all the tests for achieving grades.
- **Conditional and Motor Ability exercises:** In order to improve the standard of attainment of students, they should be given conditioning exercises. The teacher in charge of the activities is advised to select for this purpose suitable lead up activities and physical training exercises. Such exercises shall enable students to acquire adequate skill and motor abilities necessary for the activity selected. The conditioning exercises shall pertain to motor abilities.
- **Achievement card:** A copy of the achievement card should be given to students to record their performance and know their achievements in different activities during the course of the year. Yearly records should be noted by the teachers concerned and the cards should be signed by student and teacher both. (Specimen of the Achievement card App. I)
- **Records:** The record of the Student's achievement should be maintained and the copy of the same should be handed over to the student after the final exam.
- **Operation of the scheme:** The activities of the session shall be conducted as per the convenience of the teacher and time table of the same should be made according to the convenience of the college and College Director Physical Education in consultation with the head of the institution.
- **Examination:** The examination will be conducted for compulsory as well as for optional activities and the same will be conducted as per the convenience of the college. The grades will be given after the end of the Academic year.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Allocation of Marks:

• Optional Event: Total 40 Marks.

Out of which 20 marks each for Team and Individual event opted by the candidate. The marks will be recorded on the basis of the performance given by the candidate in the prescribed tests.

• Compulsory activities: Total 60 Marks.

Out of which 20 marks will be given for any of the three selected Part A/B/C/D.

i) The maximum marks to be awarded will not be more than 100. The distribution of these marks would be as under:

The student obtaining the prescribed standard will be awarded maximum 40 marks (20x2=40) for optional activity and maximum 20 marks for each of the three compulsory activities (20x3 =60) and these marks will be converted in to Grade and added to the mark list of the student obtained by him/her in the final examination.

ii) The grading of marks will be given by adding the performances of optional and compulsory activities as follows:

Grade	Marks	Remarks
O	100	Outstanding
A+	90	Excellent
A	80	Very Good
B+	70	Good
B	60	Above Average
C	50	Average
P	40	Pass
F	Below 40	Fail
Ex	0	Exempted
Ab	0	Absent

• Medically unfit/ Differently able students : Medically unfit/ Differently able students will have to forego the benefit of grades, if they seek the exemption from the practice and tests in the Physical education subject. This is not depriving them from the equality of opportunity with other students. Though the grades obtained by the physically fit students are to be added to their final mark lists every year. The subject of Physical education is not a separate head of passing.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Organizational Guidelines

1) **Staff:**

The colleges are expected to have qualified teachers in Physical Education and Sports. The scheme can be managed with the help of other teachers also but the regular teacher in-charge of sports and physical education will have to be appointed to streamline the working of the department.

The colleges those have not appointed College Director of Physical Education may appoint contributory staff for the smooth implementation of the scheme.

For facilitating the smooth working of the scheme, every class should be divided in to different groups, and should be placed under a leader who should help the staff member in the organization of the work of physical education and sports. Orientation course/s for leaders should be organized in the college.

The evaluation of students should be done by Director of Physical Education and External Expert.

2) **Facilities and Equipment:**

a) **Playground:**

The sports facilities available at the college should be maintained for the regular practices and should be made available to conduct the tests.

b) **Equipment:**

According to the playing facilities available in the college, the required equipment for the same needs to be made available to the students.

3) **Financial Provision:**

- a) **Fees** : For the conduct of this scheme fees of Rs. 20/- (per student) should be collected by college and the amount collected thereof should be strictly utilized for the conduct of these activities.
- b) **Remuneration to External Examiner** : The external examiner shall be paid according to the University guidelines given from time to time for conducting the exam.
- c) **Supporting Staff** : College may appoint at least 2 supporting staff to assists the College Director of Physical Education to conduct of test. The remuneration should be paid from the fees collected.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

General Guidelines to implement the scheme

1. **Appointment of Student Leaders:** To run the program throughout the year effectively, every college shall appoint student leaders amongst the students as per their requirement.
2. **Number of Student leaders:** Normally after every 25 students, the college may appoint 01 student leader who shall extend his/her help to conduct the program under the supervision or as per the guidelines given by the college Director of Physical Education.
3. **Training to Student Leaders:** The College Director of Physical Education at the beginning of the academic session selects the student leaders as per his/her requirement and shall train them to conduct the decided program. Normally, following training shall be given to the student leaders.
 - Method of taking attendance
 - Preparation of weekly program
 - Record keeping
 - Preparation of test sheets
 - Marking of play grounds
 - Checking of equipment specifications
 - Class Controlling
- **Program and Activities to be arranged during orientation of Student Leaders :**
 - Warming up Exercises
 - Conditioning Exercises
 - Introduction of scheme
 - Demonstration of Various Tests
 - Imparting of training schedule
 - Group dynamics
 - Various methods of testing
 - Introduction and operational use of the equipments
 - Method of extension of help during the tests
4. **Requirement of financial assistance to conduct the student leaders' orientation program:** The head of the institution shall make available the required financial assistance to the College Director of Physical Education to conduct the student leaders' orientation program.
5. **Submission of Budget for orientation of Student leaders program:** Every year at the beginning of the session the College Director of Physical Education shall submit the required budget to the Head of the College. The expenditure on the same shall be incurred from the fees collected for this program.

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

6. **Information about the Scheme:** The College Director of Physical Education at the beginning of the academic session shall inform and explain the program to the admitted students.
7. **Application form:** The College Director of Physical Education at the beginning of the academic session shall issue and collect the duly filled prescribed application form from the students admitted to First year of the Courses. (Appendix –II)
8. **Sorting of the received Applications:** The College Director of Physical Education at the beginning of the academic session shall sort the duly filled in application forms and accordingly make the required arrangements.
9. **Student Leaders Orientation Program:** The College Director of Physical Education at the beginning of the academic session shall organize at least three days orientation program for the selected student leaders. It is expected that the entire scheme related important responsibilities shall be conveyed to the student leaders, if possible with the required demonstrations.
10. **Administration in absentia:** The College Director of Physical Education normally shall have to supervise, guide, control and has to visit various places during the conduct of intercollegiate programs. Hence, in his/her absence the student leaders shall conduct the decided programs as per the guidelines issued by the Director from time to time.
11. **Appointment of External Examiner:** The College will appoint the External Examiner for the conduct of semester wise test in consultation with the approved teachers from the nearby affiliated colleges. The remuneration and other allowances shall be paid to them in accordance with the latest norms adopted by the University from time to time.
12. **Classes of the Activities:** Minimum one period per day of the decided time shall be conducted either by the College Director of Physical Education or by the Student leader appointed. If the Director of the college has been shouldered with another responsibility by the college, in that case student leader shall conduct the classes as instructed by the College Director of Physical Education.
13. **Certificate to Students Leader:** Every year at the end of the academic year the director of Physical Education of the college shall award certificate to the student leader as per the appendix number III. The certificates will be provided by the university.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

APPENDIX – I

Achievement Card for

Group – A and Group - B

Name of the Student _____

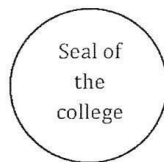
College _____

NAME OF ACTIVITY		MAXIMUM MARKS	PERFORMANCE	MARKS	GRADE
Optional Group - A	1 Team Game -	20			
	2 Individual Game -	20			
Compulsory Group - B	1	20			
	2	20			
	3	20			
TOTAL		100			

Signature of the student

Signature of teacher in- charge -----

Signature of Principal -----



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Course Catalog for B. Sc. (Computer Science) Program

APPENDIX - II

Application Form
Physical Education Scheme

Paste latest
passport size
photograph

Name of Student	
Address for Correspondence	
Class	
Section	
Sex	Male / Female
Date of Birth	
Age	
Blood Group	
Height	
Weight	

Group A - Optional Activities: (Both for Male and Female)

Team Event for Male/ Female	Select and (√) any one	Individual Event for Male/ Female	Select and (√) any one
Basketball		Athletics	
Football		Badminton	
Hockey		Gymnastics	
Kabaddi		Mallkhamb / Rope Mallkhamb	
Kho -Kho		Swimming	
Volleyball		Weight Lifting and Power Lifting	
		Wrestling	
		Yoga	
		Judo	
		Table Tennis	
		Tennis	

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Course Catalog for B. Sc. (Computer Science) Program

Group B - Choices for Compulsory Activities and tests for its evaluation: (Any three parts, one from each selected part)

*

PART	EVENT	STUDENT	Please (√) the selected event
Part A	100 m. Run	(Male and Female)	
	400 m. Run	(Male and Female)	
Part B	High Jump or Pole Vault	(Male and Female)	
	Long Jump	(Male and Female)	
	Triple Jump	(Male and Female)	
Part C	12.5 Km. Cross Country	(Male)	
	5 Km. Cross Country	(Female)	
	1500 m. Run	(Male)	
Part D	Rope Climbing	(Male)	
	Chin Ups/Flex Arm hang	(Male and Female)	
	Sit Ups	(Male and Female)	
	Push Ups and Modified push ups	(Male and Female)	
	Chin Ups/Flex Arm hang	(Male and Female)	

** The Student shall have to choose the events as per the availability of the infrastructure and equipments in the college. For his/her convenience they may consult the College Director of Physical Education.

I, the undersigned declare that, I shall practice the selected events as per the instructions given by the College Director of Physical Education and abide by the rules made thereof. Further, I certify that, I shall not change or switch over to any other event in the mid of the session and appear the final test in the events selected under this form.

Signature of the Student

Date :-----

Place :-----

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Important Note: Every student shall have to submit medical fitness certificate at the time of admission from the registered doctors else he/she will not be allowed to participate.

APPENDIX – III

<i>Certificate of Appreciation</i>		
This is to certify that Shri/ Smt/ Kum. _____		
Of _____		
Has successfully rendered his/her valuable services for the smooth conduct of the physical education scheme designed by the University for the Academic Year _____		
Date: _____		
Director of Physical Education of the College	Principal of the College	Director Sports of the University

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Course Catalog for B. Sc. (Computer Science) Program

Syllabus of T. Y. B. Sc. (Computer Science)

2015-16

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Course Catalog for B. Sc. (Computer Science) Program

Savitribai Phule Pune University

**Three Year Degree Course in
B. Sc. Computer Science**

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Course Catalog for B. Sc. (Computer Science) Program

1) Title of the Course : B. Sc. Computer Science

T. Y. B. Sc. Computer Science Syllabus in the Subject Computer Science
(To be implemented from Academic Year 2015-16)

2) Preamble:

B. Sc. Computer Science is a systematically designed three year course that prepares the student for a career in Software Industry. The syllabus of Computer Science subject along with that of the three allied subjects (Mathematics, Electronics and Statistics) forms the required basics for pursuing higher studies in Computer Science. The Syllabus also develops requisite professional skills and problem solving abilities for pursuing a career in Software Industry.

3) Introduction:

At **first year of under-graduation** basic foundation of two important skills required for software development is laid. A course in programming and a course in database fundamentals forms the preliminary skill set for solving computational problems. Simultaneously two practical courses are designed to supplement the theoretical training. The second practical course also includes a preliminary preparation for website designing in the form of HTML programming.

Along with Computer Science two theories and one practical course each in Statistics, Mathematics and Electronics help in building a strong foundation.

At **second year under-graduation**: The programming skills are further strengthened by a course in Data structures and Object oriented programming. The advanced topics in Databases and preliminary software engineering form the second course. Two practical courses alongside help in hands-on training. Students also undertake a mini project using software engineering principles to solve a real world problem. Simultaneously two theories and one practical course each in Mathematics and Electronics help in strengthening problem solving abilities.

At **third year under-graduation**: Six theory papers in each semester and practical courses cover the entire spectrum of topics necessary to build knowledge base and requisite skill set. Third practical course also includes project work which gives students hands on experience in solving a real world problem.

Objectives:

- To develop problem solving abilities using a computer
- To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
- To imbibe quality software development practices.
- To create awareness about process and product standards
- To train students in professional skills related to Software Industry.
- To prepare necessary knowledge base for research and development in Computer Science
- To help students build-up a successful career in Computer Science

4) Eligibility:

Higher Secondary School Certificate (10+2) Science with Mathematics or its equivalent Examination as per Savitribai Phule Pune University eligibility norms.

Note: Admissions will be given as per the selection procedure / policies adopted by the respective college, in accordance with conditions laid down by Savitribai Phule Pune University. Reservation and relaxation will be as per the Government rules.

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Course Catalog for B. Sc. (Computer Science) Program

5 A) Examination Pattern:

First Year B. Sc. Computer Science

Subject : Computer Science

Pattern of Examination: Annual for both Theory and Practical Courses

Paper/ Course No.	Title	Total Number of lectures/practicals per Term	Standard of passing		
			Internal marks out of 20	External marks out of 80	Total marks out of 100
Computer Science Paper I (CS-101)	Problem Solving Using Computers and 'C' Programmin g	Three lectures/Week (Total 80 lectures)	08	32	40 *
Computer Science Paper II CS-102)	File Organizatio n and Fundament al of Databases	Three lectures/Week (Total 80 lectures)	08	32	40 *
Computer Science Practical Paper I (CS-103)	Computer Science Practical Paper I	25 Practical slots of 4 lectures each	08	32	40 *
Computer Science Practical Paper II (CS-104)	Computer Science Practical Paper II	25 Practical slots of 4 lectures each	08	32	40 *

* Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Notes:

- Total marks: Theory (100 + 100) = 200 marks
- Total marks per year 200 (Theory) + 100 marks (practical)+ Grade(practical) = 300 marks +Grade
- Internal marks for theory papers given on the basis of internal assessment tests and for practicals on continuous assessment of lab work.
- In case of Computer Science Practical Paper II, marks out of 100 will be converted to grades

Marks	Grade
75 And Above	O
65 And Above	A
55 and above	B
50 And above	C

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

45 And Above	D
40 And Above	E
Below 40 (indicates Failure)	F

Theory examination will be of three hours duration for each theory course. There shall be 5 questions each carrying equal marks. The pattern of question papers shall be:

Question 1	8 sub-questions, each of 2 marks; answerable in 2 -3 lines and based on entire syllabus
Question 2, 3 ,4 and 5	4 out of 5/6– short answer type questions; answerable in 8 – 10 lines mix of theory and problems

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each term. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain). There shall be 20 questions. Practical: Continuous assessment of Lab work and mini project.

Practical Examination: Practical examination shall be conducted by the respective college at the end of the academic year. Practical examination will be of 3 hours duration for each practical course. Certified journal is compulsory to appear for practical examination. There shall be two expert and two examiners per batch for the practical examination.

Second Year B. Sc. (Computer Science)

Subject : Computer Science

No	Paper	Title: Semester I	Title: Semester II
1	Computer Science Paper I	CS-211:Data Structures using 'C'	CS-221:Object Oriented Concepts using C++
2	Computer Science Paper II	CS-212: Relational Database Management System	CS-222:Software Engineering
3	Computer Science Paper III	CS-223:Data structures Practicals and C++ Practicals	
4	Computer Science Paper IV	CS-224:Database Practicals & Mini Project using Software Engineering techniques	

Pattern of examination: Semester

Theory courses (Sem I: CS-211 and CS212): Semester
(Sem II: CS-221 and CS-222): Semester
Practical Course (CS-223 and CS-224): Annual

Paper/Course No.	Title	Total Number of Lectures/Practicals Per Week	Standard Of Passing		
			Internal marks out of 10 (theory) Out of 20 (practicals)	External marks out of 40 (theory) Out of 80 (practicals)	Total passing marks out of 50 (theory) and out of 100

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						(practicals)
Theory Paper I (CS-211)	Data Structures using 'C'	Four Lectures/per Week (Total 48 per Semester)	04	16	20*	
Theory Paper II (CS-212)	Relational Database Management System	Four Lectures/per Week (Total 48 per Semester)	04	16	20*	
Theory Paper I (CS-221)	Object Oriented Concepts using C++	Four Lectures/per Week (Total 48 per Semester)	04	16	20*	
Theory Paper II (CS-222)	Software Engineering	Four Lectures/per Week (Total 48 per Semester)	04	16	20*	
Practical paper I (CS 223) (First & Second Semester)	Data structures Practicals and C++ Practicals	Practicals of 4 lectures each 25 practicals / year)	08	32	40*	
Practical paper II (CS 224) (First & Second Semester)	Database Practicals & Mini Project using Software Engineering techniques	Practicals of 4 lectures each 25 practicals / year)	08	32	40**	

* Subject to compulsory passing in external examination and getting minimum 20 marks out of 50

** Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Notes:

1. Total marks: Theory for each semester (50 + 50) = 100 marks
2. Total marks per year 200 (Theory) + 100 marks (practicals)+Grade(practical) = 300 marks+Grade
3. Internal marks for theory papers given on the basis of Continuous internal Assessment

Theory examination will be of two hours duration for each theory course. There

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

shall be 4 questions carrying equal marks. The pattern of question papers shall be:

Question 1	10 sub-questions, each of 1 mark; answerable in 2 -3 lines and based on entire syllabus	10 Marks
Question 2, 3	Sub-questions carrying 5 marks (2 out of 3)	10 Marks
Question 4	Sub-questions carrying marks depending on their complexity with options	10 Marks

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each Semester. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions. Answer in Two or three line question (Describe/Explain) There shall be 20 questions.

Practicals: Continuous assessment of practical performance

Practical Examination: Practical examination shall be conducted at the respective college at the end of the academic year. Practical examination will be of 3 hours duration. Continuous assessment of practical performance should be using a Lab Book specifically designed for the purpose. Certified Lab book is compulsory to appear for practical examination. There is no need of attaching program printouts to the Lab Book. There shall be two experts and two examiners per batch for the practical examination. One of the examiners will be external.

Third Year B. Sc. (Computer Science)

No	Paper	Title: Semester I	Title: Semester II
1	Computer Science Paper I	CS-331: System Programming	CS-341: Operating System
2	Computer Science Paper II	CS-332: Theoretical Computer Science	CS-342: Compiler Construction
3	Computer Science Paper III	CS-333: Computer Networks-I	CS-343: Computer Networks-II
4	Computer Science Paper IV	CS-334: Internet Programming- I	CS-344: Internet Programming- II
5	Computer Science Paper V	CS-335: Programming in Java-I	CS-345: Programming in Java-II
6	Computer Science Paper VI	CS-336: Object Oriented Software Engineering	CS-346: Computer Graphics
7	Computer Science Paper VII	CS-347: Practicals Based on CS-331 and CS341 – Sem I & Sem II	
8	Computer Science Paper VIII	CS-348: Practicals Based on CS-335 and CS-344 – Sem I & Sem II and Computer Graphics using Java	
9	Computer Science Paper IX	CS-349: Practicals Based on CS-334 and CS-344 – Sem I & Sem II and Project	

Pattern of examination: Semester

Theory courses:

(Sem III: CS-331-CS-336): Semester (Sem IV: CS-341-CS-346): Semester

Practical Course:

(CS-347-CS-349): Annual

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Theory Papers					
Paper/Course No.	Title	Total Number of Lectures/Practicals Per Week	Standard Of Passing		
			Internal marks out of 10 (theory) Out of 20 (practicals)	External marks out of 40 (theory) Out of 80 (practicals)	Total passing marks out of 50 (theory) and out of 100 (practicals)
SEM III					
Theory Paper I (CS-331)	System Programming	48	04	16	20*
Theory Paper II (CS-332)	Theoretical Computer Science	48	04	16	20*
Theory Paper III (CS-333)	Computer Networks-I	48	04	16	20*
Theory Paper IV (CS-334)	Internet Programming I	48	04	16	20*
Theory Paper V (CS-335)	Programming in Java-I	48	04	16	20*
Theory Paper V (CS-336)	Object Oriented Software Engineering	48	04	16	20*
SEM IV					
Theory Paper I (CS-341)	Operating System	48	04	16	20*
Theory Paper II (CS-342)	Compiler Construction	48	04	16	20*
Theory Paper III (CS-343)	Computer Networks-II	48	04	16	20*
Theory Paper IV (CS-344)	Internet Programming II	48	04	16	20*
Theory Paper V	Programmin				

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

(CS-345)	g in Java-II	48	04	16	20*
Theory Paper V (CS-346)	Computer Graphics	48	04	16	20*
Practical Papers					
Practical paper I CS 347 (Semester III & IV)	Practicals Based on CS-331 and CS-341 – Sem I & Sem II	Practicals of 4 lectures each 25 practicals / year)	08	32	40**
Practical paper II CS 348 (Semester III & IV)	CS-348:Practicals Based on CS-335 and CS-345 – Sem I & Sem II and Computer Graphics using OpenGL	Practicals of 4 lectures each 25 practicals / year)	08	32	40**
Practical paper I CS 349 (Semester III & IV)	CS-349:Practicals Based on CS-334 and CS-344 – Sem I & Sem II and Project	Practicals of 4 lectures each 25 practicals / year)	08	32	40**

* Subject to compulsory passing in external examination and getting minimum 20 marks out of 50

** Subject to compulsory passing in external examination and getting minimum 40 marks out of 100

Notes:

1. Total marks: Theory for each semester (50 x 6) = 300 marks
2. Total marks per year 600 (Theory) + 300 marks (practicals) = 900 marks
3. Internal marks for theory papers given on the basis of continuous internal assessment

Theory examination will be of two hours duration for each theory course. There shall be 4 questions carrying equal marks. The pattern of question papers shall be:

Theory examination will be of two hours duration for each theory course. There

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

shall be 4 questions carrying equal marks. The pattern of question papers shall be:

Question 1	10 sub-questions, each of 1 mark; answerable in 2 -3 lines and based on entire syllabus	10 Marks
Question 2, 3	Sub-questions carrying 5 marks (2 out of 3)	10 Marks
Question 4	Sub-questions carrying marks depending on their complexity with options	10 Marks

Internal examination: Internal assessment of the student by respective teacher will be based on written test, 10 marks each Semester. The written test shall comprise of objective type questions – Multiple Type Questions, True / False, Definitions, Answer in Two or three line question (Describe/Explain) There shall be 20 questions.

Practicals: Continuous assessment of practical performance

Practical Examination: Practical examination shall be conducted at the respective college at the end of the academic year. Practical examination will be of 3 hours duration. Continuous assessment of practical performance should be using a Lab Book specifically designed for the purpose. Certified Lab book is compulsory to appear for practical examination. There shall be one expert and two examiners per batch for the practical examination. One of the examiners will be external.

5 B) Standard of Passing:

- In order to pass in the first year theory examination, the candidate has to obtain 40 marks out of 100 in each course. (Minimum 32 marks out of 80 must be obtained in the University Theory Examination.)
- In order to pass in the Second Year and Third Year theory examination, the candidate has to obtain 20 marks out of 50 in each course of each semester.

5 C) ATKT Rules:

While going from F.Y.B.Sc. to S.Y.B.Sc. at least 8 courses (out of total 13) should be passed; however all F.Y.B.Sc. courses should be passed while going to T.Y.B.Sc.

While going from S.Y.B.Sc. to T.Y.B.Sc., at least 12 courses (out of 22) should be passed (Practical Course at S.Y.B.Sc. will be equivalent to 2 courses).

5 D) Award of Class:

The class will be awarded to the student on the aggregate marks obtained during the second and third year in the principal subject only. The award of the class shall be as follows:

1	Aggregate 70% and above	First Class with Distinction
2	Aggregate 60% and more but less than 70%	First Class
3	Aggregate 55% and more but less than 60%	Higher Second Class
4	Aggregate 50% and more but less than 55%	Second Class
5	Aggregate 40% and more but less than 50%	Pass Class
6	Below 40%	Fail

5 E) External Students: There shall be no external students.

5 F) Setting question papers:

F.Y.B.Sc.: For theory papers I and II annual question papers shall be set by the University of Pune and assessment done at the respective colleges. Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject. For Practical Papers, the Question paper slips will be provided by the University of Pune and assessment done at the respective colleges.

S.Y.B.Sc. and T.Y.B.Sc.: For theory papers I and II for each semester and also for the annual practical examination question papers set by the University of Pune.

P.V.G.'s College of Science, Pune 9

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

Centralized assessment for theory papers done as per the University instructions. Questions should be designed to test the conceptual knowledge and understanding of the basic concepts of the subject. For Practical Papers: Papers shall be set by the University of Pune and assessment done by the internal examiner and external examiner appointed by University of Pune.

5G) Verification and Revaluation Rules:

As per university Statutes and rules for verification and revaluation of marks in stipulated time after declaration of the semester examination result.

6) Course Structure:

Duration: The duration of B.Sc. Computer Science Degree Program shall be three years.

a) All are Compulsory Papers:

F.Y.B.Sc. : 2 Theory + 2 Practical (Annual)

S .Y.B.Sc.: 2 Theory per semester + 2 Practical (Annual)

T.Y.B.Sc.: 6 Theory per semester + 3 Practical (Annual)

b) Question Papers :

F.Y.B.Sc. Theory paper:

University Examination – 80 marks (at the end of 2nd term)

Internal Examination – 20 marks

S.Y / T.Y. - B.Sc.Theory paper:

University Examination – 40 marks (at the end of each term)

Internal Examination – 10 marks

F.Y. / S.Y / T.Y. - B.Sc. Practical Paper:

University Examination – 80 marks (at the end of 2nd term)

Internal Examination – 20 marks

c) Medium of Instruction: The medium of instruction for the course shall be **English**.

7) Equivalence of Previous Syllabus:

Old Course (2008 Pattern)	New Course (2013 Pattern)
CS 331: System Programming & Operating System I	CS 331 : System Programming
CS 341: System Programming & Operating System II	CS 341 : Operating System
CS 332 : Theoretical Computer Science & Compiler Construction I	CS 332 : Theoretical Computer Science
CS 342 : Theoretical Computer Science & Compiler Construction II	CS 342 : Compiler Construction
CS 333 :Computer Networks I	CS 333 :Computer Networks I
CS 343 :Computer Networks II	CS 343 :Computer Networks II
CS 334 :Web development and PHP programming I	CS 334 :Internet Programming I
CS 344 : Web development and PHP programming II	CS 344 :Internet Programming II
CS 335 :Programming in Java I	CS 335 :Programming in Java I
CS 345 :Programming in Java II	CS 345 :Programming in Java II
CS 336 :Object Oriented Software Engineering	CS 336 :Object Oriented Software Engineering

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

CS 346 :Business Applications	CS 346 :Computer Graphics
CS 347: Lab Course I	CS 347: Lab Course I
CS 348:Lab Course II	CS 348:Lab Course II
CS 349: Lab Course III	CS 349: Lab Course III

8) University Terms: Dates for commencement and conclusion for the first and second terms will be declared by the University authorities. Terms can be kept by only duly admitted students. The term shall be granted only on minimum 75 percent attendance at theory and practical course and satisfactory performance during the term.

9) Qualification of Teachers: M.Sc. Computer Science/M.C.A. or equivalent master degree in science with class/grades and NET/SET as per prevailing University/Government /UGC rules.

10) Detail Syllabus with Recommended Books:

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER : Systems Programming
Code No. : CS-331

Semester III

Total Lectures : 48

Aim : To understand the design and implementation issues of System programs that play an important role in program development.

Objectives :

- To understand the design structure of a simple editor.
- To understand the design structure of Assembler and macro processor for an hypothetical simulated computer.
- To understand the working of linkers and loaders and other development utilities.
- To understand Complexity of Operating system as a software.

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- Examples ed, sed, VIM & emacs
- 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 Advanced assembler directives (LTORG, ORIGIN, EQU),
- 3.6 Design of assembler – Analysis Phase and Synthesis Phase.
- 3.7 Overview of assembling process
- 3.8 Pass Structure of Assembler – One pass, Two pass assembler.
- 3.9 Problems of 1-pass assembler - forward reference, efficiency, Table of Incomplete Instructions.
- 3.10 Design of 2-pass Assembler – Pass-I and Pass-II
- 3.11 Data structure of 2-pass assembler.
- 3.12. Intermediate Code – Need, Forms-variant I and Variant II

4. Macros and Macro Processors

[10]

- 4.1 Definition
- 4.2 Macro definition and call
- 4.3 Macro expansion – positional and keyword parameters
- 4.4 Design of Data structures to be used for Macro definition and use
- 4.5 Nested macro calls
- 4.6 Advanced macro facilities – alteration of flow of control during expansion, expansion time variable, conditional expansion, expansion time loops. (with examples)
- 4.7 Design of macro preprocessor – Design overview, data structure, processing of macro definition and macro expansion (Except algorithms)

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

4.8 Macro assembler – Comparison of macro preprocessor and macro assembler. Pass structure of macro assembler.

5. Compiler Design options [2]

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

5.2 P-code compiler

6. Linker and Loader [6]

6.1 Introduction

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

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

6.4 Relocatability - nonrelocatable, relocatable, and self relocating programs (no algorithms), Linking for Overlays.

6.5 Object file formats: a.out, ELF, COFF, EXE, PE and COM

7. Debuggers & Development utilities [6]

7.1 Debugging functions and capabilities

7.2 Types of debuggers: visual & console -Case study of ddd(visual) and gdb(console)

7.3 Development utilities on UNIX/Linux strip, make, nm, objdump, intermediate files in compilation process etc.

8. Operating System as System Software [6]

8.1 What Operating Systems Do – User View, System View, Defining OS

8.2 Computer System Architecture – Single processor system, Multiprocessor systems, Clustered Systems

8.3 Operating System Operations – Dual mode operation, Timer

8.4 Process Management

8.5 Memory Management

8.6 Storage Management – File system management, Mass storage management, Caching, I/O systems

8.7 Protection and Security

8.8 Distributed Systems

8.9 Special Purpose System – Real time embedded systems, Multimedia systems, Handheld systems,

8.10 Computer Environment – Traditional computing, Client server computing, Peer to peer Computing

9. System Structure [2]

9.1 Operating System Services

9.2 User Operating-System Interface – Command interpreter, GUI

9.3 System Calls

9.4 Types of System Calls – Process control, File management, Device management, Information maintenance, Communication, Protection

Reference Books:

1. Systems Programming and Operating Systems by D.M.Dhamdhare (Second Revised Edition). [Chapters: 2, 3, 4, 5, 7]

2. System Software - An introduction to Systems Programming - Leland L. Beck (Pearson Education) [Chapter: 1]

3. Linkers and Loaders – John R. Levine, Elsevier Morgan Kaufmann[chapter 6]

4. Operating System Concepts - Siberchatz, Galvin, Gagne (8th Edition).[chapter 8, 9]

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER : Operating Systems
Code No. : CS-341

Semester IV

Total Lectures : 48

Aim : To understand the design and implementation issues of Operating System.

Objectives :

- To understand design issues related to process management and various related algorithms
- To understand design issues related to memory management and various related algorithms
- To understand design issues related to File management and various related algorithms

1. Introduction	[2]
1.1 Operating System Structure – Simple structure, Layered approach, Micro kernels, Modules	
1.2 Virtual Machines – Introduction, Benefits	
1.3 System Boot	
2. Process Management	[4]
2.1 Process Concept – The process, Process states, Process control block.	
2.2 Process Scheduling – Scheduling queues, Schedulers, context switch	
2.3 Operations on Process – Process creation with program using fork(), Process termination	
2.4 Interprocess Communication – Shared memory system, Message passing systems.	
3. Multithreaded Programming	[2]
3.1 Overview	
3.2 Multithreading Models	
4. Process Scheduling	[8]
4.1 Basic Concept – CPU-I/O burst cycle, CPU scheduler, Preemptive scheduling, Dispatcher	
4.2 Scheduling Criteria	
4.3 Scheduling Algorithms – FCFS, SJF, Priority scheduling, Round-robin scheduling, Multiple queue scheduling, Multilevel feedback queue scheduling	
4.4 Thread Scheduling	
5. Process Synchronization	[6]
5.1 Background	
5.2 Critical Section Problem	
5.3 Semaphores: Usage, Implementation	
5.4 Classic Problems of Synchronization – The bounded buffer problem, The reader writer problem, The dining philosopher problem	
6. Deadlocks	[8]
6.1 System model	
6.2 Deadlock Characterization – Necessary conditions, Resource allocation graph	
6.3 Deadlock Prevention	
6.4 Deadlock Avoidance - Safe state, Resource allocation graph algorithm, Banker's Algorithm	
6.5 Deadlock Detection	
6.6 Recovery from Deadlock – Process termination, Resource preemption	
7. Memory Management	[11]
7.1. Background – Basic hardware, Address binding, Logical versus physical address space, Dynamic loading, Dynamic linking and shared libraries	

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

7.2 Swapping
7.3 Contiguous Memory Allocation – Memory mapping and protection, Memory allocation, Fragmentation
7.4 Paging – Basic Method, Hardware support, Protection, Shared Pages
7.5 Segmentation – Basic concept, Hardware
7.6 Virtual Memory Management – Background, Demand paging, Performance of demand paging, Page replacement – FIFO, OPT, LRU, Second chance page replacement

8. File System

[7]

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

Reference Books:

1. Operating System Concepts - Silberchatz, Galvin, Gagne (8th Edition).
 2. Operating Systems : Principles and Design – Pabitra Pal Choudhary (PHI Learning Private Limited)
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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER : Theoretical Computer Science
Code No. : CS-332

Semester III

Total Lectures : 48

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.

Prerequisite:

- Sets, Operations on sets, Finite & infinite sets Formal Language
- Relation, Equivalence Relation,(reflexive, transitive and symmetric closures)

1. Introduction

[3]

- 1.1 Symbol, Alphabet, String, Prefix & Suffix of Strings, Formal Language, Operations on Languages.
- 1.2 Regular Expressions (RE) : Definition & Example
- 1.3 Regular Expressions Identities.

2. Finite Automata

[12]

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

3. Regular Languages

[5]

- 3.1 Regular language-Definition and Examples.
- 3.2 Conversion of RE To FA-Examples.
- 3.3 Pumping lemma for regular languages and applications.
- 3.4 Closure properties of regular Languages
(Union, Concatenation, Complement, Intersection and Kleene closure)

4. Context Free Grammar and Languages

[12]

- 4.1 Grammar - Definition and Examples.
- 4.2 Derivation-Reduction - Definition and Examples.
- 4.3 Chomsky Hierarchy.
- 4.4 CFG : Definition & Examples. LMD, RMD, Parse Tree
- 4.5 Ambiguous Grammar : Concept & Examples.
- 4.6 Simplification of CFG :
 - 4.6.1 Removing Useless Symbols,
 - 4.6.2 Removing unit productions
 - 4.6.3 Removing ϵ productions & Nullable symbols
- 4.7 Normal Forms :
 - 4.7.1 Chomsky Normal Form (CNF) Method & Problem

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- 4.7.2 Greibach Normal form (GNF) Method & Problem
- 4.8 Regular Grammar : Definition.
 - 4.8.1 Left linear and Right Linear Grammar-Definition and Example.
 - 4.8.2 Equivalence of FA & Regular Grammar
 - 4.8.2.1 Construction of regular grammar equivalent to a given DFA
 - 4.8.2.2 Construction of a FA from the given right linear grammar
- 4.9 Closure Properties of CFL's(Union, concatenation and Kleen closure) Method and examples

- 5. Push Down Automaton** [6]
 - 5.1 Definition of PDA and examples
 - 5.2 Construction of PDA using empty stack and final State method : Examples using stack method
 - 5.3 Definition DPDA & NPDA, their correlation and Examples of NPDA
 - 5.4 CFG (in GNF) to PDA : Method and examples

- 6. Turing Machine** [10]
 - 6.1 The Turing Machine Model and Definition of TM
 - 6.2 Design of Turing Machines
 - 6.3 Problems on language recognizers.
 - 6.4 Language accepted by TM
 - 6.5 Types of Turing Machines(Multitrack TM,Two way TM, Multitape TM,Non-deterministic TM)
 - 6.6 Introduction to LBA (Basic Model) &CSG.(Without Problems)
 - 6.7 Computing TM, Enumerating TM, Universal TM
 - 6.8 Recursive Languages
 - 6.5.1. Recursive and Recursively enumerable Languages.
 - 6.5.2. Difference between recursive and recursively enumerable language.
 - 6.9 Turing Machine Limitations
 - 6.10 Decision Problem, Undecidable Problem, Halting Problem of TM

References :-

- 1 Introduction to Automata theory, Languages and computation By John E. Hopcroft and Jeffrey Ullman – Narosa Publishing House.
2. Introduction to Automata theory, Languages and computation By John Hopcroft, Rajeev Motwani and Jeffrey Ullman –Third edition Pearson Education
3. Introduction to Computer Theory Daniel I. A. Cohen – 2nd edition – John Wiley & Sons
4. Theory of Computer Science (Automata, Language & Computation) K. L. P. Mishra & N. Chandrasekaran, PHI Second Edition
5. Introduction to Languages and The Theory of Computation John C. Martin TMH, Second Edition

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
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 issues of a lexical analyzer and use of Lex tool
- To understand design issues of a parser and use of Yacc tool
- To understand issues related to memory allocation
- To understand and design code generation schemes

1. Introduction

[5]

- 1.1 Definition of Compiler, Aspects of compilation.
- 1.2 The structure of Compiler.
- 1.3 Phases of Compiler – Lexical Analysis, Syntax Analysis, Semantic Analysis, Intermediate Code generation, code optimization, code generation.
- 1.4 Error Handling
- 1.5 Introduction to one pass & Multipass compilers, cross compiler, Bootstrapping.

2. Lexical Analysis(Scanner)

[5]

- 2.1 Review of Finite automata as a lexical analyzer.
- 2.2 Applications of Regular Expressions and Finite Automata (lexical analyzer, searching using RE), Input buffering, Recognition of tokens
- 2.3 LEX: A Lexical analyzer generator (Simple Lex Program)

3. Syntax Analysis(Parser)

[20]

- 3.1 Definition , Types of Parsers
- 3.2 Top-Down Parser –
 - 3.2.1 Top-Down Parsing with Backtracking: Method & Problems
 - 3.2.2 Drawbacks of Top-Down parsing with backtracking.
 - 3.2.3 Elimination of Left Recursion(direct & indirect)
 - 3.2.4 Need for Left Factoring & examples
- 3.3 Recursive Descent Parsing : Definition
 - 3.3.1 Implementation of Recursive Descent Parser Using Recursive Procedures
- 3.4 Predictive [LL(1)]Parser(Definition, Model)
 - 3.4.1 Implementation of Predictive Parser[LL(1)]
 - 3.4.2 FIRST & FOLLOW
 - 3.4.3 Construction of LL(1) Parsing Table
 - 3.4.4 Parsing of a String using LL(1) Table
- 3.5 Bottom-Up Parsers
- 3.6 Operator Precedence Parser -Basic Concepts
 - 3.6.1 Operator Precedence Relations form Associativity & Precedence
 - 3.6.2 Operator Precedence Grammar
 - 3.6.3 Algorithm for LEADING & TRAILING(with ex.)
 - 3.6.4 Algorithm for Operator Precedence Parsing (with ex.)
 - 3.6.5 Precedence Functions
- 3.7 Shift Reduce Parser
 - 3.7.1 Reduction, Handle, Handle Pruning
 - 3.7.2 Stack Implementation of Shift Reduce Parser (with examples)

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- 3.8 LR Parser
 - 3.8.1 Model
 - 3.8.2 Types [SLR(1), Canonical LR, LALR] Method & examples.
- 3.9 YACC (from Book 3) –program sections, simple YACC program for expression evaluation

- 4. Syntax Directed Definition** [8]
 - 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
 - 4.3 Application of SDT
 - 4.3.1 Construction of syntax trees,
 - 4.3.2 The Structure of a Type
 - 4.4 Translation Schemes
 - 4.4.1 Definition, Postfix Translation Scheme

- 5. Memory Allocation** [2]
 - 5.1 Memory allocation – static and dynamic memory allocation,
 - 5.2 Memory allocation in block structure languages, Array allocation and access.

- 6. Code Generation and Optimization** [8]
 - 6.1 Compilation of expression –
 - 6.1.1 Concepts of operand descriptors and register descriptors with example.
 - 6.1.2 Intermediate code for expressions – postfix notations,
 - 6.1.3 triples and quadruples, expression trees.
 - 6.2 Code Optimization – Optimizing transformations – compile time evaluation, elimination of common sub expressions, dead code elimination, frequency reduction, strength reduction
 - 6.3 Three address code
 - 6.3.1 DAG for Three address code
 - 6.3.2 The Value-number method for constructing DAG's.
 - 6.4 Definition of basic block, Basic blocks And flow graphs
 - 6.5 Directed acyclic graph (DAG) representation of basic block
 - 6.6 Issues in design of code generator

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)

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER : Computer Networks -I
Code No. : CS-333

Semester III

Total Lectures : 48

Pre-requisites: Basics of computer, Knowledge of 'C' for assignment.

Objectives: This course will prepare students in Basic networking concepts.

1. Understand different types of networks, various topologies and application of networks.
2. Understand types of addresses, data communication.
3. Understand the concept of networking models, protocols, functionality of each layer.
4. Learn basic networking hardware and tools.

Ch.No.	Name of Chapter	Reference Book
1	Chapter 1 Introduction to Computer Networks	[Lectures 8]
1.1	Computer Networks- Goals and applications – Business Application , Home Application, Mobile User, Social Issues	Book 1 CH1 (Pg. No.3 -14)
1.2	Network Hardware - Broadcast and point-to-point	Book 1 CH1 (Pg. No.14-16)
1.3	topologies – star, bus, mesh, ring etc.	Book 2 CH1 (Pg. No. 9-13)
1.4	Network Types-LAN, MAN, WAN, Wireless Networks, Home Networks, Internetwork	Book 1 CH1 (Pg. No.16-26)
1.5	Data Communication-Definition, components, data representation, Data Flow	Book 2 CH1 (Pg. No. 3-7)
1.6	Protocols & Standards De facto and De jure standard,	Book 2 CH1 (Pg. No. 19-20)
1.7	Network Software - Protocol Hierarchies -layers, protocols, peers, interfaces Network architecture, protocol stack, Design issues of the layers –addressing, error control, flow control, multiplexing and demultiplexing, routing Connection-oriented and connectionless service, Service Primitives – listen, connect, receive, send, disconnect and Berkley Socket ,the relationships of services to protocols.	Book 1 CH1 (Pg. No.26-37)
2.	Network Models	[Lectures 5]
2.1	OSI Reference Model - Functionality of each layer	Book 2 CH2 (Pg. No 29-42)

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2.2	TCP/IP Reference Model, Comparison of OSI and TCP/IP model	Book 1 CH1 (Pg. No. 41-46)
2.3	TCP/IP Protocol Suite	Book 2 CH2 (Pg. No. 42-45)
2.4	Addressing - Physical, Logical and Port addresses (No examples)	Book 2 CH2 (Pg. No.45-50)
3.	Transmission Media	[Lectures 5]
3.1	Twisted pair cable – UTP Vs STP, categories connectors & applications , Coaxial cable – standards, connectors & applications Fiber Optic cable – propagation modes, connectors & applications(No diagrams will be asked in examination)	Book 2 CH7 (Pg. No.192,193, 195-202)
3.2	Unguided Media – Wireless- Radio Waves,- Microwaves, Infrared	Book 2 CH7 (Pg. No. 203-208)
3.3	Light wave transmission	Book 1 CH2 (Pg. No. 107-108)
3.4	Types of cabling and Networking Tool - CAT5 and CAT6 Cable Color Code, Crossover Cabling and Straight Through Cable, Crimping and Line testing tool	Book 3
4.	The Physical Layer	[Lectures 14]
4.1	Analog and Digital data, Analog and Digital signals, Periodic & Non-periodic signals Digital Signals- Bit rate, bit length, baseband Transmission (no cases)	Book 2 CH3 (Pg. No. 57-58) Book 2 CH3 (Pg. No. 71-75)
4.2	Transmission Impairments –attenuation, distortion and noise, Data Rate Limits – Noiseless channel: Nyquist's bit rate, noisy channel : Shannon's law (Enough problems should be covered on every topic.)	Book 2 CH3 (Pg. No. 80-88)
4.3	Performance of the Network Bandwidth, Throughput, Latency(Delay), Bandwidth –Delay Product, Jitter	Book 2 CH3 (Pg. No. 89-94)
4.4	Line Coding Characteristics, Line Coding Schemes – Unipolar - NRZ, Polar-NRZ-I, NRZ-L, RZ, Manchester and Differential Manchester (Enough problems should be covered on every topic.)	Book 2 CH4 (Pg. No. 101-109)
4.5	Transmission Modes, Parallel Transmission and Serial Transmission –Asynchronous and Synchronous and Isochronous	Book 2 CH4 (Pg. No. 131-135)
4.6	Trunks & Multiplexing FDM and TDM	Book 1 CH2 (Pg. No. 137,138 140-143)

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4.7	Switching - Circuit Switching, Message Switching and Packet Switching, comparison of circuit & packet switching	Book 1 CH2 (Pg. No. 146-151)
4.8	Physical Layer Devices Repeaters, Hubs- active hub Passive hub	Book 2 CH15 (pg. No. 445-447)
5.	The Data Link Layer	[Lectures 9]
5.1	Design Issues – Services provided to the Network Layer , Framing – Concept, Methods - Character Count, Flag bytes with Byte Stuffing, Starting & ending Flags with Bit Stuffing and Physical Layer Coding Violations, Error Control, Flow Control	Book 1 CH3 (pg. No. 184-192)
5.2	Error detection code CRC (Enough problems should be covered on every topic.)	Book 1 CH3 (pg. No. 196-199)
5.3	Data Link Layer Protocols –Noiseless channel -A Simplex, Stop-And-Wait protocol, noisy channel –stop & wait, ARR, Pipelining, Go –back –N ARR & ARQ, selective repeat ARR(No examples & no algorithms)	Book 1 CH3 (pg. No. 312-338)
5.4	Sliding Window Protocols Piggybacking-Need, Advantages/Disadvantages, 1-bit sliding window protocols,	Book 1 CH3 (pg. No. 211-216)
5.5	Data Link Layer Protocols-HDLC – frame format, all frame types PPP – Use, Frame Format, Use of PPP in the Internet	Book 1 CH3 (pg. No. 234-242)
5.6	Data Link Layer Devices - Bridges – Filtering, Transparent Bridges, spanning tree and Source Routing Bridges, Bridges Connecting Different LANs	Book 2 CH15 (pg. No. 447-454)
5.7	Remote bridges	Book 1 CH4 (pg. No. 325-326)
6.	The Medium Access Sublayer	[Lectures 7]
6.1	Random Access Protocols ALOHA – pure and slotted	Book 2 CH12 (pg. No. 364-390)
6.2	CSMA – 1-persistent, p-persistent and non-persistent CSMA/CD,CSMA/CA	
6.3	Controlled Access Reservation, Polling and Token Passing	
6.4	Channelization FDMA, TDMA and CDMA-Analogy, Idea, Chips, Data Representation, Encoding and Decoding, Signal Level, Sequence Generation(Enough problems should be covered on every topic.)	

Reference Books:

- 1) Computer Networks by Andrew Tanenbaum, Pearson Education.[4th Edition]
- 2) Data Communication and Networking by Behrouz Forouzan, TATA McGraw Hill. [4th Edition]
- 3) Networking All In One Dummies Wiley Publication.[5th Edition]

Guidelines For Examination:

- 1) Frame and Packet formats should be asked.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- 2) Problems should be asked at least for 8 marks.
- 3) Page no listed above may vary according to year of publication of 4th edition but topics remain same.
- 4) All sub topics listed pages of respective reference books should be covered.

P.V.G.'s College of Science, Pune 9

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER : Computer Networks -II
Code No. : CS-343
Semester IV Total Lectures: 48

Pre-requisites: Basics of computer networks covered last semester, Knowledge of 'C'.

Objectives: This course will prepare students in

1. Basic networking concepts.
2. Understand wired and wireless networks, its types, functionality of layer.
3. Understand importance of network security and cryptography.

Ch. No.	Name of Chapter	Reference Book
1.	Wired LANs	[Lectures 9]
1.1	IEEE Standards Data Link Layer, Physical Layer	Book 2 CH13 (Pg. No 395-397)
1.2	Standard Ethernet MAC Sublayer – Frame Format, Frame Length, Addressing, Access Method	Book 2 CH13 (Pg. No 397-402)
1.3	Physical Layer – Encoding and Decoding, 10Base5, 10Base2, 10Base-T, 10Base-F,	Book 2 CH13 (Pg. No 402-405)
1.4	Changes In The Standard – Bridged Ethernet, Switched Ethernet, Full Duplex Ethernet	Book 2 CH13 (Pg. No 406-409)
1.5	Fast Ethernet – Goals, MAC Sublayer, Topology, Implementation	Book 2 CH13 (Pg. No.409-410)
1.6	Gigabit Ethernet – goals, MAC Sublayer, Topology, Implementation	Book 2 CH13 (Pg. No 412-414)
1.7	Ten-Gigabit Ethernet – goals, MAC Sublayer, Physical Layer	Book 2 CH13 (Pg. No 416)
1.8	Backbone Networks Bus Backbone, Star Backbone, Connecting Remote LANs	Book 2 CH15 (Pg. No 456-458)
1.9	Virtual LANs Membership, Configuration, Communication between Switches, IEEE standards Advantages	Book 1 CH1 (Pg. No 458-463)
2.	Wireless LAN	[Lectures 2]
2.1	IEEE 802.11 Architecture – Basic Service Set, Extended Service Set, Station Types	Book 2 CH14 (Pg. No421-422)

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

2.2	Bluetooth Architecture – Piconet, scatternet	Book 2 CH14 (Pg. No 434-436)
3.	The Network Layer	[Lectures 10]
3.1	Design Issues 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 subnets	Book 1 CH5 (Pg. No 343-349)
3.2	Logical Addressing IPV4 Addresses – Address Space, Notations, Classful Addressing, Subnetting, Supernetting, Classless Addressing, Network Address Translation(NAT), (Enough problems should be covered on Addressing),	Book 2 CH19 (Pg. No 549-566)
3.3	IPV4 Protocol Datagram Format, Fragmentation, Checksum, Options	Book 2 CH20 (Pg. No 582-596)
3.4	Routing Properties of routing algorithm, Comparison of Adaptive and Non- Adaptive Routing Algorithms	Book 1 CH5 (Pg. No 350-352)
3.5	Congestion Control – Definition, Factors of Congestion, Difference between congestion control and flow control, General Principles of Congestion Control, Congestion Prevention Policies	Book 1 CH5 (Pg. No 384-389)
3.6	Network Layer Devices –Routers	Book 2 CH15 (Pg. No. 455)
4.	Address Mapping	[Lectures 4]
4.1	Protocol(ARP)-Cache Memory, Packet Format, Encapsulation, Operation, Four Different Cases, Proxy ARP, RARP , BOOTP, DHCP – Static Address Allocation, Dynamic Address Allocation, Manual and automatic Configuration	Book 2 CH21 (Pg. No 611-620)
5.	The Transport Layer	[Lectures 6]
5.1	Process-to-Process Delivery Client Server Paradigm, Multiplexing and De-multiplexing, Connectionless Vs Connection-Oriented Service, Reliable Vs Unreliable	Book 2 CH23 (Pg. No 703-708)
5.2	User Datagram Protocol(UDP) Datagram Format, Checksum, UDP operations, Use of UDP	Book 2 CH23 (Pg. No709-715)
5.3	Transmission Control Protocol (TCP) TCP Services – Process to-Process Communication, Stream Delivery Service, sending and Receiving Buffers, Segments, Full –Duplex Communication, Connection oriented service, Reliable service	Book 2 CH23 (Pg. No 715-719)
5.4	TCP Features –Numbering System, Byte Number, Sequence Number, Acknowledgement Number, Flow Control, Error Control, Congestion Control	Book 2 CH23 (Pg. No 719-720)
5.5	TCP Segment – Format	Book 2 CH23

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

		(Pg. No 721-723)
6.	The Application Layer	[Lectures 7]
6.1	Domain Name System (DNS) Name Space, Domain, Name Space, Distribution of Name Space, DNS in the Internet, Resolution	Book 2 CH25 (Pg. No 797-809)
6.2	E-MAIL Architecture, User Agent, Message Transfer Agent-SMTP, Message Access Agent-POP3, IMAP4, Web Based Mail	Book 2 CH26 (Pg. No 824-840)
6.3	File Transfer Protocol (FTP) Communication over control connection, Communication over Data Connection, Anonymous FTP	Book 2 CH26 (Pg. No 840-844)
6.4	WWW Architecture, WEB Documents	Book 2 CH27 (Pg. No 851-861)
6.5	HTTP - HTTP Transaction, Persistent and Non persistent Connection, Proxy Server	Book 2 CH27 (Pg. No 861-868)
6.6	Devices- Gateways –Transport & Application Gateways	Book 1 CH4 (Pg. No 328)
7.	Network Security	[Lectures 10]
7.1	Introduction – Security Services- Message-Confidentiality, Integrity, Authentication, Non repudiation. Entity (User)- Authentication.	Book 2 CH31 (Pg. No 961-962)
7.2	Message confidentiality –Confidentiality with Asymmetric-Key Cryptography, Confidentiality with Symmetric-Key Cryptography	Book 2 CH31 (Pg. No 962-964)
7.3	Cryptography Encryption Model, Substitution Cipher and Transposition Cipher (Problems should be covered.)	Book 1 CH8 (Pg. No 724-730)
7.4	Two Fundamental Cryptographic Principles	Book 1 CH8 (Pg. No 735-736)
7.5	Communication Security Firewalls	Book 1 CH8 (Pg. No776-779)
7.6	Web Security Threats, Secure Naming,DNS Spoofing, Secure DNS, Self Certifying names	Book 1 CH8 (Pg. No 805-813)
7.7	Mobile Code Security Java Applet Security, Activex, JavaScript, Viruses	Book 1 CH8 (Pg. No 816-819)
7.8	Social Issues Privacy, Anonymous Remailers, Freedom of Speech, Stegnography, Copyright	Book 1 CH8 (Pg. No 819-828)

Reference Books:

1. Computer Networks by Andrew Tanenbaum, Pearson Education.[4th Edition]
2. Data Communication and Networking by Behrouz Forouzan, TATA McGraw Hill. [4th Edition]

Guidelines For Examination:

1. Frame and Packet formats should be asked.
2. Problems should be asked at least for 8 marks.

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

3. Page no listed above may vary according to year of publication of 4th edition but topics remain same.
4. All sub topics listed pages of respective reference books should be covered.

SAVITRIBAI PHULE PUNE UNIVERSITY

T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER : Internet Programming I
Code No. : CS-334

Semester III

Total Lectures: 48

Aim: To Design dynamic and interactive Web pages.

Objective:

- Learn Core-PHP, Server Side Scripting Language
- Learn PHP-Database handling.

Prerequisite: HTML.

1. Introduction to web techniques

[8]

- 1.1 HTTP basics, Introduction to Web server and Web browser
 - 1.2 Introduction to PHP
 - 1.3 What does PHP do?
 - 1.4 Lexical structure
 - 1.5 Language basics
- Book 1 chapter 2

2. Function and String

[10]

- 2.1 Defining and calling a function
 - 2.2 Default parameters
 - 2.3 Variable parameters, Missing parameters
 - 2.4 Variable function, Anonymous function
 - 2.5 Types of strings in PHP
 - 2.6 Printing functions
 - 2.7 Encoding and escaping
 - 2.8 Comparing strings
 - 2.9 Manipulating and searching strings
 - 2.10 Regular expressions
- Book 1 chapter 3 and 4

3. Arrays

[6]

- 3.1 Indexed Vs Associative arrays
 - 3.2 Identifying elements of an array
 - 3.3 Storing data in arrays
 - 3.4 Multidimensional arrays
 - 3.4 Extracting multiple values
 - 3.5 Converting between arrays and variables
 - 3.6 Traversing arrays
 - 3.7 Sorting
 - 3.8 Action on entire arrays
 - 3.9 Using arrays
- Book 1 chapter 5

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

4. Introduction to Object Oriented Programming	[8]
4.1 Classes	
4.2 Objects	
4.3 Introspection	
4.4 Serialization	
4.5 Inheritance	
4.6 Interfaces	
4.7 Encapsulation	
Book 1 , 2 chapter 12	
5. Files and directories	[6]
5.1 Working with files and directories	
5.2 Opening and Closing, Getting information about file, Read/write to file, Splitting name and path from file, Rename and delete files	
5.3 Reading and writing characters in file	
5.4 Reading entire file	
5.5 Random access to file data	
5.6 Getting information on file	
5.7 Ownership and permissions	
Book 2 chapter 7	
6. Databases (PHP-PostgreSQL)	[10]
6.1 Using PHP to access a database	
6.2 Relational databases and SQL	
6.3 PEAR DB basics	
6.4 Advanced database techniques	
6.5 Sample application (Mini project)	
Book 1 chapter 9	

References

1. Programming PHP By 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. PHP for Beginners, SPD publication
8. Programming the World Wide Web , Robert W Sebesta(3rd Edition)
9. Check out Joomla!press
Pearson (*Addison-Wesley Professional*).
10. www.php.net.in
11. www.W3schools.com
12. www.wrox.com
13. <https://api.drupal.org>

P.V.G.'s College of Science, Pune 9

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER : Internet Programming II
Code No. : CS-344

Semester IV	Total Lectures: 48
Aim: To Design dynamic and interactive Web pages.	
Objective:	
<ul style="list-style-type: none">• Learn different technologies used at client Side Scripting Language• Learn XML,CSS and XML parsers.• One PHP framework for effective design of web application.• Learn JavaScript to program the behavior of web pages.• Learn AJAX to make our application more dynamic.	
1. Web Techniques	[10]
1.1 Variables	
1.2 Server information	
1.3 Processing forms	
1.4 Setting response headers	
1.5 Maintaining state	
1.6 SSL	
Book 1 chapter 7	
2. Handling email with php	[8]
2.1 Email background	
2.2 Internet mail protocol	
2.3 Structure of an email message	
2.4 Sending email with php	
2.5 Email attachments.	
2.6 Email id validation and verification	
2.7 PHP error handling.	
Book 2 chapter 15	
3. PHP framework	[4]
3.1 Introduction to PHP framework.	
3.2 Features, Applications.	
3.3 One example like JOOMLA,DRUPAL.	
Book 11, https://api.drupal.org	
4. XML	[8]
4.1 What is XML?	
4.2 XML document Structure	
4.3 PHP and XML	
4.4 XML parser	
4.5 The document object model	
4.6 The simple XML extension	
4.7 Changing a value with simple XML	
Book 2 chapter 8	
5. WEB DESIGNING TECHNOLOGIES(JavaScript-DHTML)	[10]
5.1 Overview of JavaScript, DHTML	
5.2 Object Orientation and JavaScript	

Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

- 5.3 Basic Syntax(JS datatypes, JS variables)
- 5.4 Primitives, Operations and Expressions
- 5.5 Screen Output and keyboard input(Verification and Validation)
- 5.6 JS Control statements
- 5.7 JS Functions
- 5.8 JavaScript HTML DOM Events(onmouseup, onmousedown, onclick, onload,onmouseover,onmouseout).
- 5.9 JS Strings.
- 5.10 JS String methods
- 5.11 JS popup boxes(alert, confirm, prompt).
- 5.12 Changing property value of different tags using DHTML
(ex. adding innerhtml for DIV tag, changing source of image etc.).

Book 10, www.w3schools.com.

6. AJAX

- 6.1 Introduction of AJAX
 - 6.2 AJAX web application model
 - 6.3 AJAX –PHP framework
 - 6.4 Performing AJAX validation
 - 6.5 Handling XML data using php and AJAX
 - 6.6 Connecting database using php and AJAX
- Book 4 chapter 1,2 and 9

[8]

References

1. Programming PHP By 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. Programming the World Wide Web , Robert W Sebesta(3rd Edition)
11. Check out Joomla!press Pearson (*Addison-Wesley Professional*).
12. www.php.net.in
13. www.W3schools.com
14. www.wrox.com
15. <https://api.drupal.org>

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B.Sc. COMPUTER SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER : Programming in Java-I
Code No. : CS-335

	Semester IV	Total Lectures: 48
Prerequisite:		
	<ul style="list-style-type: none">Knowledge of C Programming language	
Objective:		
	<ul style="list-style-type: none">To learn Object Oriented Programming languageTo handle abnormal termination of a program using exception handlingTo create flat filesTo design User Interface using Swing and AWT	
1. An Introduction to Java		[4]
1.1 A Short History of Java		
1.2 Features or buzzwords of Java		
1.3 Comparison of Java and C++		
1.4 Java Environment		
1.5 Simple java program		
1.6 Java Tools – jdb, javap, javadoc		
1.7 Java IDE – Eclipse/NetBeans (Note: Only for Lab Demonstration)		
2. An Overview of Java		[4]
2.1 Types of Comments		
2.2 Data Types		
2.3 Final Variable		
2.4 Declaring 1D, 2D array		
2.5 Accepting input using Command line argument		
2.6 Accepting input from console (Using BufferedReader class)		
3. Objects and Classes		[8]
3.1 Defining Your Own Classes		
3.2 Access Specifiers (public, protected, private, default)		
3.3 Array of Objects		
3.4 Constructor, Overloading Constructors and use of 'this' Keyword		
3.5 static block, static Fields and methods		
3.6 Predefined class – Object class methods (equals(), toString(), hashCode(), getClass())		
3.7 Inner class		
3.8 Creating, Accessing and using Packages		
3.9 Creating jar file and manifest file		
3.10 Wrapper Classes		
3.11 Garbage Collection (finalize() Method)		
3.12 Date and time processing		
4. Inheritance and Interface		[7]
4.1 Inheritance Basics (extends Keyword) and Types of Inheritance		
4.2 Superclass, Subclass and use of Super Keyword		
4.3 Method Overriding and runtime polymorphism		

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

4.4 Use of final keyword related to method and class	
4.5 Use of abstract class and abstract methods	
4.6 Defining and Implementing Interfaces	
4.7 Runtime polymorphism using interface	
4.7 Object Cloning	
5. Exception Handling	[4]
5.1 Dealing Errors	
5.2 Exception class, Checked and Unchecked exception	
5.3 Catching exception and exception handling	
5.4 Creating user defined exception	
5.5 Assertions	
6. Strings, Streams and Files	[7]
6.1 String class and StringBuffer Class	
6.2 Formatting string data using format() method	
6.2 Using the File class	
6.3 Stream classes	
Byte Stream classes	
Character Stream Classes	
6.4 Creation of files	
6.5 Reading/Writing characters and bytes	
6.6 Handling primitive data types	
6.7 Random Access files	
7. User Interface Components with AWT and Swing	[10]
7.1 What is AWT ? What is Swing? Difference between AWT and Swing.	
7.2 The MVC Architecture and Swing	
7.3 Layout Manager and Layouts, The JComponent class	
7.4 Components –	
JButton, JLabel, JText, JTextArea, JCheckBox and JRadioButton,	
JList, JComboBox, JMenu and JPopupMenu Class, JMenuItem and JCheckBoxMenuItem,	
JRadioButtonMenuItem, JScrollBar	
7.5 Dialogs (Message, confirmation, input), JFileChooser, JColorChooser	
7.6 Event Handling: Event sources, Listeners	
7.7 Mouse and Keyboard Event Handling	
7.8 Adapters	
7.9 Anonymous inner class	
8. Applet	[4]
8.1 Applet Life Cycle	
8.2 appletviewer tool	
8.3 Applet HTML Tags	
8.4 Passing parameters to Applet	
8.5 repaint() and update() method	

References:

- 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) Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press

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Clarification for Extended Profile- 1.1 List of Courses offered across all programs during last five years.

Course Catalog for B. Sc. (Computer Science) Program

SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B.Sc. COMPUTER SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER : Programming in Java-II
Code No. : CS-345

	Semester IV	Total Lectures : 48
Prerequisite:		
<ul style="list-style-type: none">• Knowledge of Core Java (CS – 345)		
Objectives:		
<ul style="list-style-type: none">• To learn database programming using Java• To study web development concept using Servlet and JSP• To develop a game application using multithreading• To learn socket programming concept		
1. Collection		[6]
1.1 Introduction to the Collection framework		
1.2 List – ArrayList, LinkedList and Vector, Stack, Queue		
1.3 Set - HashSet, TreeSet, and LinkedHashMap		
1.4 Map – HashMap, LinkedHashMap, Hashtable and TreeMap		
1.5 Interfaces such as Comparator, Iterator, ListIterator, Enumeration		
2. Database Programming		[10]
2.1 The design of jdbc, jdbc configuration		
2.2 Types of drivers		
2.3 Executing sql statements, query execution		
2.4 Scrollable and updatable result sets		
2.5 Metadata – DatabaseMetadata, ResultSetMetadata		
2.6 Transactions – commit(), rollback(), SavePoint (Database : PostgreSQL)		
3. Servlet		[12]
3.1 Introduction to Servlet and Hierarchy of Servlet		
3.2 Life cycle of servlet		
3.3 Tomcat configuration (Note: Only for Lab Demonstration)		
3.4 Handling get and post request (HTTP)		
3.5 Handling a data from HTML to servlet		
3.6 Retriving a data from database to servlet		
3.7 Session tracking – User Authorization, URL rewriting, Hidden form fields, Cookies and HttpSession		
4. JSP		[10]
4.1 Simple first JSP program		
4.2 Life cycle of JSP		
4.2 Implicit Objects		
4.3 Scripting elements – Declarations, Expressions, Scriptlets, Comments		
4.4 JSP Directives – Page Directive, include directive		
4.5 Mixing Scriptlets and HTML		
4.6 Example of forwarding contents from database to servlet, servlet to JSP and displaying it using JSP scriptlet tag		

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5. Multithreading

[6]

- 5.1 What are threads?
- 5.2 Life cycle of thread
- 5.3 Running and starting thread using Thread class
- 5.4 Thread priorities
- 5.5 Running multiple threads
- 5.6 The Runnable interface
- 5.7 Synchronization and interthread communication

6. Networking

[4]

- 6.1 Networking basics – Protocol, Addressing, DNS, URL, Socket, Port
- 6.2 The java.net package – InetAddress, URL, URLConnection class
- 6.3 SocketServer and Socket class
- 6.4 Creating a Socket to a remote host on a port (creating TCP client and server)
- 6.5 Simple Socket Program Example

References:

- 1) Complete reference Java by Herbert Schildt(5th edition)
- 2) Java 2 programming black books, Steven Horlznner
- 3) Programming with Java , A primer ,Forth edition , By E. Balagurusamy
- 4) Core Java Volume-I-Fundamentals, Eighth Edition, Cay S. Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press
- 5) Core Java Volume-II-Advanced Features, Eighth Edition, Cay S. Horstmann, Gary Cornell, Prentice Hall, Sun Microsystems Press

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Course Catalog for B. Sc. (Computer Science) Program

SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER : Object Oriented Software Engineering
Code No. : CS-336

Semester III

Total Lectures: 48

Prerequisites

- Knowledge of Object Oriented Concepts
- Knowledge of Classical Software Engineering

Aim

To Understand Object Oriented Modeling techniques and their applicability.

Objectives

- Understanding importance of Object Orientation in Software engineering
- Understand the components of Unified Modeling Language
- Understand techniques and diagrams related to structural modeling
- Understand techniques and diagrams related to behavioral modeling
- Understand techniques of Object Oriented analysis, design and testing

1. Object Oriented Concepts and Principles

[4]

- 1.1 What is Object Orientation ? - Introduction , Object , Classes and Instance , Polymorphism, Inheritance
- 1.2 Object Oriented System Development- Introduction, Function/Data Methods (With Visibility), Object Oriented Analysis, Object Oriented Construction
- 1.3 Identifying the Elements of an Object Model
- 1.4 Identifying Classes and Objects
- 1.5 Specifying the Attributes (With Visibility)
- 1.6 Defining Operations
- 1.7 Finalizing the Object Definition

2. Introduction to UML

[2]

- 2.1 Concept of UML
- 2.2 Advantages of UML

3. Basic Structural Modeling

[5]

- 3.1 Classes
- 3.2 Relationship
- 3.3 Common Mechanism
- 3.4 Class Diagram (Minimum three examples should be covered)

4. Advanced Structural Modeling

[7]

- 4.1 Advanced Classes
- 4.2 Advanced Relationship
- 4.3 Interface
- 4.4 Types and Roles
- 4.5 Packages
- 4.6 Object Diagram (Minimum three examples should be covered)

5. Basic Behavioral Modeling

[9]

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- 5.1 Interactions
- 5.2 Use Cases and Use Case Diagram with stereo types (Minimum three examples should be covered)
- 5.3 Interaction Diagram (Minimum two examples should be covered)
- 5.4 Sequence Diagram (Minimum two examples should be covered)
- 5.6 Activity Diagram (Minimum two examples should be covered)
- 5.6 State Chart Diagram (Minimum two examples should be covered)

- 6. Object Oriented Analysis** [6]
- 6.1 Iterative Development and the Rational Unified Process
- 6.2 Inception
- 6.3 Understanding Requirements
- 6.4 Use Case Model From Inception to Elaboration
- 6.5 Elaboration

- 7. Object Oriented Design** [4]
- 7.1 The Booch Method, The Coad and Yourdon Method and Jacobson Method and Raumbaugh Method
- 7.2 The Generic Components of the OO Design Model
- 7.3 The System Design Process - Partitioning the Analysis Model, Concurrency and Sub System Allocation, Task Management Component, The Data Management Component, The Resource Management Component, Inter Sub System Communication
- 7.4 Object Design Process

- 8. Architectural modeling** [6]
- 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** [5]
- 9.1 Object Oriented Testing Strategies
- 9.2 Test Case Design for Object Oriented Software
- 9.3 Inter Class Test Case Design
(Use of any freeware designing tool)

- References.**
- 1. Grady Booch, James Rumbaugh, The Unified Modeling Language User/Reference Guide, Pearson Education INC
- 2. Ivar Jacobson, Object Oriented Software Engineering, Pearson Education INC
- 3. Craig Larman, Applying UML and Patterns Pearson Education INC
- 4. Bennett, Simon, Object Oriented Analysis and Design McGraw Hill

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SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER :Computer Graphics
Code No. : CS-346

Semester IV

Total Lectures: 48

Pre – Requisites

- Computer programming skills in C programming language
- Basic understanding of use of data structures
- Basic Mathematical concepts related to matrices and geometry

Objectives

- To study how graphics objects are represented in Computer
- To study how graphics system in a computer supports presentation of graphics information
- To study how interaction is handled in a graphics system
- To study how to manipulate graphics object by applying different transformations
- To provide the programmer's perspective of working of computer graphics

1. Introduction to Computer graphics

[4]

- 1.1 Introduction to computer graphics & graphics systems
- 1.2 Components of Computer Graphics Representation, Presentation , Interaction and Transformations
- 1.3 Applications of Computer Graphics
- 1.3 Pixel/Point ,Raster v/s Vector ,RGB color model, intensity
- 1.4 Programming essentials – event driven programming. OpenGL library

2. Input devices and Interaction tasks

[4]

- 2.1 Logical Interaction – Locator, valuator , pick and choice;
- 2.2 Physical devices used for interaction – keyboard, mouse, trackball,spaceball, tablets, light pen, joy stick, touch panel, data glove;
- 2.4 Keyboard , Mouse interaction in OpenGL
- 2.5 Graphical User Interfaces- cursors , radio buttons, scroll bars, menus, icons
- 2.6 Implementing GUI in open GL

3. Presentation and Output devices

[4]

- 3.1 Presentation Graphics - frame buffer, display file, lookup table;
- 3.2 Display devices, Random and Raster scan display devices; CRT,
- 3.3 Hardcopy devices - Plotters and Printers

4. Raster Scan Graphics

[10]

- 4.1 Line drawing algorithms; DDA algorithm, Bresenham's line drawing algorithm, Circle generation algorithm;
- 4.2 Scan conversions- Generation of the Display, Image compression
- 4.3 Displaying Lines and characters
- 4.3 Polygon filling -Scan converting polygons, fill algorithms, Boundary fill algorithm, flood fill algorithm

5. Transformations

[7]

- 5.1 Basic transformations: translation, rotation, scaling; Matrix representations & homogeneous coordinates, Reflection, shear
- 5.2 Transformation of points, lines, parallel lines, intersecting lines. Viewing pipeline
- 5.3 Window to viewport co-ordinate transformation. Setting window and viewport in OpenGL.

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- 6 Clipping** [7]
- 6.1 clipping operations , point clipping ,
 - 6.2 Line clipping; Cohen Sutherland algorithm, Midpoint subdivision algorithm, Cyrus beek algorithm;
 - 6.3 Polygon clipping , Sutherland Hodgman algorithm, Weiler-Atherton Algorithm
- 7 3D transformation & viewing** [6]
- 7.1 3D transformations: translation, rotation, scaling & other transformations;
 - 7.2 Three dimensional viewing, Parallel and Perspective projections,
 - 7.3 View Volumes and General Projection Transformations.
 - 7.4 3 D clipping
- 8 Hidden surfaces Elimination** [4]
- 8.1 Depth comparison, A-buffer algorithm, Back face detection; Depth -Buffer
 - 8.2 Scan-line Method - BSP tree method, the Painter's algorithm, Area-subdivision algorithm;

Text Books:

1. Hearn, Baker – “ Computer Graphics (C version 2nd Ed.)” – Pearson education
2. F. S. Hill, Stephen Kelly, Computer Graphics using OpenGL, PHI Learning
3. David F. Rogers - Procedural Elements of Computer Graphics, Tata McGRAw Hill

Reference Books:

4. Foley, Vandam, Feiner, Hughes – “Computer Graphics principles (2nd Ed.) – Pearson Education.
5. W. M. Newman, R. F. Sproull – “Principles of Interactive computer Graphics” – TMH.
6. D. F. Rogers, J. A. Adams – “ Mathematical Elements for Computer Graphics (2nd Ed.)” – TMH
7. Z. Xiang, R. Plastock – “ Schaum's outlines Computer Graphics (2nd Ed.)” – TMH

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SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER : System Programming & Operating System
Code No. : CS-347

Aim:

To understand the process of designing and implementing System programs and operating system components.

Objective :-

1. Design and implement System programs with minimal features to understand their complexity.
2. Design and implement simulations of operating system level procedures.

Syllabus

Sr. No	Topic	Lectures
1	Line Editor	8 lectures
2	SMAC0 simulator	8 lectures
3	Assembler	12 Lectures
4	Macro processor	12 lectures
5	DFA driver	8 lectures
6	Development Utilities	8 lectures
7	Toy shell	8 Lectures
8	CPU Scheduler	12 lectures
9	Deadlock detection	8 lectures
10	Page Replacement Algorithms	12 lectures
11	File Allocation methods	12 Lectures

Examination

Internal Marks : Activity + Labbook(10+10)

External Marks : two programs(35each) oral(5) Activity(5)

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SAVITRIBAI PHULE PUNE UNIVERSITY
T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER :Lab Course II – Programming in Java
Code No. : CS-348

Aim:

To understand the process of designing and implementing Core and Advanced Java programs.

Objective :-

1. Implement core Java programs to solve simple problems
2. Implement Client and Server end Java programs

Syllabus

Sr. No	Topic	Lectures
Core and Advanced Java		
1	Simple Java programs	8 Lectures
2	Arrays and Packages	8 Lectures
3	Inheritance and Interfaces	8 Lectures
4	Exception Handling	8 Lectures
5	File Handling	8 Lectures
6	GUI designing & Event Handling	8 Lectures
7	Database Programming	8 Lectures
8	Multithreading	4 Lectures
9	Collection	8 Lectures
10	Servlets	8 Lectures
11	JSP	8 Lectures
12	Socket Programming	4 Lectures
Computer Graphics		
1	Simple Graphics program using OpenGL	4 Lectures
2	Using graphics primitives to display graphics	4 Lectures
3	Window to viewport transformations and other transformations	4 Lectures
4	Using simple Keyboard and Mouse interaction	4 Lectures
5	Graphics Mini project	16 Lectures

Examination

Internal Marks : Activity(CG) + Seminar(Enhanced java+ listening) (10+10)

External Marks : two programs(30each) oral(5) Activity(5)+ Labbook(10)

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SAVITRIBAI PHULE PUNE UNIVERSITY
Proposed Draft of
T.Y. B. Sc. COMPUTER SCIENCE SYLLABUS
TO BE IMPLEMENTED FROM ACADEMIC YEAR 2015-16
TITLE OF PAPER :Lab Course III – Programming in PHP & Project
Code No. : CS-349

Aim:

To understand the process of designing and implementing Web applications, using PHP.

Objective :-

1. Implement Simple PHP programs to solve simple problems

Syllabus

Sr. No	Topic	Lectures
PHP		
1	String manipulation	8 Lectures
2	Arrays	8 Lectures
3	Inheritance	8 Lectures
4	File Handling	8 Lectures
5	Form designing	8 Lectures
6	Database Connectivity	8 Lectures
7	Sessions and cookies	8 Lectures
8	Java script with AJAX	8 Lectures
Networking		
1	Setting a LAN Environment	4 Lectures
2	Configuring the Server	4 Lectures
3	Use of Service Primitives	4 Lectures
4	Use of Networking Tools	12 Lectures
Project		
1	Choose Project topic and Prepare problem description	
2	Study of Existing System	
3	Identifying users and functionalities of proposed system	
4	Preparing the Design of the proposed system- Data Design Screen and Report Designs	
5	Implementation	

Examination

Internal Marks: Project (20) Continuous Evaluation.

External Marks: One programs (30) (large program on PHP + small program PHP), networking(10)

– Internal, Lab book(10), Project(30) -20 Marks External + 10 Marks Internal for Project Demo before Final Practical Exam