University of Pune

Three Year Degree Course in

B. Sc. Computer Science

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.

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' Programming	Three lectures/Week (Total 80 lectures)	08	32	40 *
Computer Science Paper II CS-102)	File Organization and Fundamental 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

65 and above	A
55 and above	B
50 and above 45 and above	C 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	

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	04	16	20 *

		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 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 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. 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*

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 **

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
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.)

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.

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.

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)
4.2Identifiers
4.3Variables
4.4Constants – character, integer, float, string, escape sequences
4.5Data 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

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]**

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

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

(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

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

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

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

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 fuidelines for each practical Assignment.

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

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.

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

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 6.1Discrete 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.....): 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

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: $b_{xy}.b_{yx} = r^2$, $b_{yx}.b_{xy} < 1$, $b_{yx} = r(\sigma_y/\sigma_x)$ 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 1st 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

2	Advanced Theory of Probability 2.1Concepts and definitions of conditional probability, multiplication theorem $P(A \cap B)=P(A).P(B\|A)$ 2.2 Bayes' theorem (without proof) 2.3 Concept of Posterior probability, problems on posterior probability. 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. 2.5 Concept and definition of independence of two events. 2.6 Numerical problems related to real life situations.	12
3	Continuous Random Variable 3.1 Definition of continuous random variable (r. v.), 3.2 Probability density function (p.d.f.), 3.3 Cumulative distribution function (c.d.f.), its properties. 3.4 Calculation of mean, mode, median, variance, standard deviation for continuous r. v. 3.5 Numerical problems related to real life situations.	6
4	Standard Continuous Probability Distributions 4.1 Uniform Distribution: statement of p.d.f., mean, variance, nature of probability curve. 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. 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. 4.4 Pareto Distribution: p.d.f. of the form $f(x) = \frac{\propto}{x^{\propto+1}}$, $x \geq 1, \propto > 0$, mean, variance, applications. 4.5 Numerical problems related to real life situations.	13
	End of First term.	
5	Concepts and definitions related to testing of hypothesis 5.1Definitions: population, statistic, SRSWR, SRSWOR, random sample from a probability distribution, parameter, statistic, standard error of estimator. 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.	5

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

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 form 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

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

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 innumerous 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.

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)Verifation/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

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.

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 delition, Edge delition.
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, Cutvetex : 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.

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).

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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.

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 are 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.

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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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.

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 Sclib, 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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University of Pune

Three Year B. Sc. Degree Course inComputer Science

Subject : Electronics

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 yearelectronics shall motivate and encourage the students for pursuing higher studies in Electronics and computer and for becoming an enterprenur.

3) Introduction:

At **first year of under-graduation:** The basic topics related to the fundamentals of electronicsare 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 yearshall be introduced. Analog and digital circuit design concepts will be introduced at this stage.

Objectives:

- To provide indepthknowledge of scientific and technological aspects of electronics
- To familiarize withcurrent and recent technological developments
- To enrich knowledge through programmessuch asindustrial visits, hobby projects, market survey, projects etc.
- To train students in skills related to electronics industry and market.
- To creat 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 Examinationas per the University of Pune eligibility norms.

2 Second Year B.Sc.:
Keeping terms of First Year of B.Sc. Computer Science,withelectronis as one of the subjects. Other sudents if they fulfill the conditions approved by the equivalence committee of Faculty of Science of the University of Pune are also eligible.

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 Exmination: 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:

1. Total marks: Theory (100 + 100) = 200 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 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 (SemI: 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 *

		(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.

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. toS.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 IIIpapers 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 IIIpapers shall be set by the University of Pune and assessment done by the inyernal examiner and external examiner appointed by University of Pune.

5F)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. 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
PaperIII: 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.

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, varactordiode, 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 JunctionTransistor and Circuits (14)

Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, I-V characteristics, parameters, specifications, Concept of amplification, voltage and current amplifer,Transitor amplifierconfiguarations - 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

and class C amplifiers, emitter follower amplifier, Single stage RC coupled CE amplifer, 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 Transitor (JFET), Metal Oxide Semiconductor FET (MOSFET), comparison of JFET, MOSFET and BJT

Appications: 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, volage follower, adder, substractor

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.

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, DeMorgen's theorem, Universal gates.
Min terms, Max terms , Boolean expression in SOP and POSform, conversion of SOP/POS expression to its standard SOP/POSform., Simplifications of Logic equations usingBoolean 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, halfadder, 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 tobinary, BCD to decimal, Encoder & decoder 3x4 matrix keyboard encoder, prority 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) withtiming 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: Logiclevels, switching speed, propagation delay, power dissipation, noise margins andfanout 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

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 tools

These 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 carriedout 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

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
