BHARATI VIDYAPEETH UNIVERSITY,PUNE(INDIA)

Bachelor of Computer Science B.Sc.(Computer Science)
(CBCS 2018 Course)
Under: Faculty of Science
(To be implemented from June 2018)

The B.Sc.(Computer Science) Degree Course is of three years duration divided into six semesters. The structure of the course and syllabus of the first year will come into effect from the academic year 2018-2019.The second and third year syllabus will be implemented from 2019-2020and 2020-2021 respectively.

Objectives : B.Sc(Computer Science) Course:

- 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

Learning Outcomes from the B.Sc (Computer Science)

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills and other attributes.The programme provides sufficient breadth for the students to support a wide range of future careers and sufficient exposure to theoretical and fundamental issues to support lifelong learning in the discipline. The theme of the programme is one of designing and developing programmed solutions to problems, recognizing the complexity of interaction between people and systems. Practice is used as a way of exploring theory through its application.

RULES & REGULATIONS FOR B.Sc (COMPUTER SCIENCE) COURSE

1. <u>ELIGIBILITY FOR ADMISSION TO B.Sc(COMPUTER SCIENCE) COURSE :</u>

i. A candidate who has passed the Higher Secondary School Certificate Examination of the Maharashtra State Board or Higher Secondary Examination of its equivalent of any other statutory Board or University and has passed in English and in two Science subjects (i) Physics (ii) Mathematics shall be eligible for admission to the First year B.Sc (Computer Science) Degree course.

ii. Candidate who has passed H.S.C. examination (10+2) with English , Mathematics and any one of the following vocational subjects is also eligible for admission to the F.Y.B.Sc. (Computer Science) course.

Subject code	Subject
97	Information Technology
D9	Computer Science
C2	Electronics
J1/J2/J3	Electronics Technology

iii. Also student who has completed Diploma course in Engineering (Polytechnic) Computer Science, Electronics and Information Technology or its equivalent examination recognized by MBTE, Mumbai or its equivalent of any other statutory Board or University.

Admission process:

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

2.INTAKE CAPACITY:

Intake capacity of the students for this course at the entry level will be 80 per year.

3. Course Structure of B.Sc.(Computer Science) Degree Programme and scheme of credits

Course Structure and Scheme of Credits :

Course	Semester	Credits	Total of Semester	Grant Total of the year
F.Y.B.Sc(Computer Science)	I	Theory (Core) - 18	30	62
		Practical – 06		
		Theory(Elective) – 06		
	II	Theory (Core) - 18	32	
		Practical – 06		
		Elective – 06		
		SEC-02		
S.Y.B.Sc(Computer Science)	III	Theory (Core) -24	36	70
		Practical – 06		
		Theory(Elective) – 04		
		SEC-02		
	IV	Theory (Core) – 24	34	
		Practical-06		
		Theory(Elective) -04		
T.Y.B.Sc(Computer Science)	V	Theory (Core) -20	34	66
		Practical-06		
		Theory(Elective) -04		
		AECC-02		
		Mini Project -02		
	VI	Theory (Core) -20	32	
		Practical-06		
		Theory(Elective) -04		
		Mini Project -02		
Grand Total of the Course (All Semesters)			**198 (192+6)**	**198**

F.Y.B.Sc(Computer Science): Semester I (From the Academic Year 2018-19)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -11	Introduction to RDBMS	03	03	03	40	60	100
	CS -12	Programming in C - I	03	03	03	40	60	100
	CS -13	Mathematical Foundation of Computer Science	03	03	03	40	60	100
	CS -14	Algebra -I	03	03	03	40	60	100
	CS -15	Principles of Analog Electronics - I	03	03	03	40	60	100
	CS-16	Principles of Digital Electronics -I	03	03	03	40	60	100
	CS PI	Computer Science Practical - I	04	02	03	40	60	100
	CS PII	Computer Science Practical - II	04	02	03	40	60	100
	CS EI	Electronics Practical -I	04	02	03	40	60	100
Elective Courses	**Any Two from the following:**							
	CS -17	Computer Oriented Statistical Techniques -I	03	03	03	40	60	100
	CS-18	Compulsory English -I	03	03	03	40	60	100
	CS-19	Elementary Algorithmics	03	03	03	40	60	100

F.Y.B.Sc(Computer Science): Semester II (From the Academic Year 2018-19)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -21	RDBMS using oracle	03	03	03	40	60	100
	CS -22	Programming in C - II.	03	03	03	40	60	100
	CS -23	Graph Theory	03	03	03	40	60	100
	CS -24	Algebra-II	03	03	03	40	60	100
	CS -25	Principles of Analog Electronics - II	03	03	03	40	60	100
	CS -26	Principles of Digital Electronics -II	03	03	03	40	60	100
	CS PIII	Computer Science Practical - III	04	02	03	40	60	100
	CS PIV	Computer Science Practical - IV	04	02	03	40	60	100
	CS EII	Electronics Practical -II	04	02	03	40	60	100
Elective Courses	**Any Two from the following:**							
	CS -27	Computer Oriented Statistical Techniques -II	03	03	03	40	60	100
	CS-28	Compulsory English -II	03	03	03	40	60	100
	CS-29	Operating Environment	03	03	03	40	60	100
		This paper is compulsory for all the students:						
Skill Enhancement course	UGSEC-21	HTML Programming	02	02	03	20	30	50

S.Y.B.Sc(Computer Science): Semester III(From the Academic Year 2019-20)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -31	Object Oriented Programming with C++	04	04	03	40	60	100
	CS -32	Introduction to .Net using C#	04	04	03	40	60	100
	CS -33	Linear Algebra	04	04	03	40	60	100
	CS -34	Computer Oriented Numerical Methods	04	04	03	40	60	100
	CS -35	Digital systems and Microprocessors	04	04	03	40	60	100
	CS -36	Principles of Communication	04	04	03	40	60	100
	CS PV	Computer Science Practical - V	04	02	03	40	60	100
	CS PVI	Computer Science Practical - VI	04	02	03	40	60	100
	CS EIII	Electronics Practical -III	04	02	03	40	60	100
Elective Courses	**Any One from the following:**							
	CS -37	Cloud Computing - I	04	04	03	40	60	100
	CS -38	Data warehousing and data mining-I	04	04	03	40	60	100
Skill Enhancement Course	**This paper is compulsory for all the students:**							
	UGSEC-31	Programming in Python	02	02	02	20	30	50

S.Y.B.Sc(Computer Science): Semester IV (From the Academic Year 2019-20)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -41	Data Structures using C++	04	04	03	40	60	100
	CS -42	ASP.Net	04	04	03	40	60	100
	CS -43	Computational Geometry	04	04	03	40	60	100
	CS -44	Optimization Techniques	04	04	03	40	60	100
	CS -45	8051 Microcontroller	04	04	03	40	60	100
	CS -46	Analog Systems	04	04	03	40	60	100
	CS PVII	Computer Science Practical - VII	04	02	03	40	60	100
	CS PVIII	Computer Science Practical - VIII	04	02	03	40	60	100
	CS EIV	Electronics Practical -IV	04	02	03	40	60	100
Elective Courses	**Any One from the following:**							
	CS -47	Cloud Computing -II	04	04	03	40	60	100
	CS -48	Data warehousing and data mining-II	04	04	03	40	60	100

Environment Studies

As per the order of Honourable Supreme Court of India, this course is compulsory for every undergraduate student. The college is implementing this module course in Environment Studies in the second year of all degree courses. There will be 50 lectures for this course. The examination will be conducted at the end of Semester IV and will carry 50 marks. These marks will be converted into the grades accordingly. These grades will be mentioned in the degree marksheet. If any student fails in this course, the result of his/her degree course will be withheld by the university.

T.Y.B.Sc(Computer Science): Semester V (From the Academic Year 2020-21)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -51	System Programming	04	04	03	40	60	100
	CS -52	Internet Technologies-I	04	04	03	40	60	100
	CS -53	Theoretical Computer Science	04	04	03	40	60	100
	CS -54	Programming in JAVA-I	04	04	03	40	60	100
	CS -55	Software Engineering	04	04	03	40	60	100
	CS PIX	Computer Science Practical - IX	04	02	03	40	60	100
	CS PX	Computer Science Practical -X	04	02	03	40	60	100
	CS PXI	Computer Science Practical -XI	04	02	03	40	60	100
	CS MI	Mini Project –I	04	02	03	40	60	100
Elective Courses	**Any One from the following:**							
	CS -56	Data Communication and Networking -I	04	04	03	40	60	100
	CS -57	Data Analytics -I	04	04	03	40	60	100
	CS -58	Research in Computer Science –I	04	04	03	40	60	100
Ability enhancement Compulsory Course	**This paper is compulsory for all the students:**							
	UGAEC C-51	Soft Skills	02	02	02	20	30	50

T.Y.B.Sc(Computer Science): Semester VI (From the Academic Year 2020-21)

Subject Type	Code	Title of the paper	Hrs/ Week	Credits	Exam Hrs	Maximum Marks		
						Continuous Internal Assessment	University Examination	Total
Core Courses	CS -61	Linux Programming	04	04	03	40	60	100
	CS -62	Internet Technologies-II	04	04	03	40	60	100
	CS -63	Compiler Construction	04	04	03	40	60	100
	CS -64	Programming in JAVA-II	04	04	03	40	60	100
	CS -65	Unified Modeling Language	04	04	03	40	60	100
	CS PXII	Computer Science Practical - XII	04	02	03	40	60	100
	CS PXIII	Computer Science Practical -XIII	04	02	03	40	60	100
	CS PXIV	Computer Science Practical -XIV	04	02	03	40	60	100
	CS MII	Mini Project -II	04	02	03	40	60	100
Elective Courses	**Any One from the following:**							
	CS -66	Data Communication and Networking-II	04	04	03	40	60	100
	CS -67	Data Analytics -II	04	04	03	40	60	100
	CS -68	Research in Computer Science –II	04	04	03	40	60	100

4. SCHEME OF TEACHING:

Semester	Subject	Work Load / Week			
		Theory	Tutorial	Total	Practical
F.Y.B.Sc(Computer Science) Semester – I & II	Each subject	2	1	03	04
S.Y.B.Sc(Computer Science) Semester – III & IV	Each subject	3	1	04	04
T.Y.B.Sc(Computer Science) Semester – V & VI	Each subject	3	1	04	04

5. MEDIUM OF INSTRUCTION:

The medium of instruction and examination shall be English.

6. CHANGE OF COURSE

As all the heads of the course are compulsory change of course is not allowed.

7. SCHEME OF EXAMINATION:

The Assessment of Regular students of Bachelor of Science (B.Sc.) course in the academic session 2018-19 and thereafter shall be based on

(a) University Examinations (UE),
(b) Internal Assessment (IA),
(c) Choice Based Credit System (CBCS), and
(d) Semester Grade Point Average (SGPA) and Cumulative Grade Point Average system (CGPA)

For each core and elective paper of 100 marks, there will be Internal Assessment of 40 marks and the University Examination of 60 marks/3 hours duration at the end of each semester. The 04 credit will be given to a student who secures at least 40% of marks allotted to each paper. A candidate who does not pass the examination in any subject or subjects in one semester will be permitted to reappear in such failed subject or subjects along with the papers of following semesters.

The Internal Assessment (IA) for each paper will be of 40 marks. The Internal Assessment may be in the forms as follows:

a) Attendance	10 Marks
b) Home Assignment/Tutorial/Test/Presentation	15 Marks
c) Mid Semester Examination	15 Marks

Each practical examination for laboratory course is of 100 marks and three hour duration. The mini project included in the in Semesters V and VI will be evaluated for 100 marks for the allotted credits by a panel consisting of one internal and one external examiner .For both laboratory course and mini project , there will be internal assessment of 40 marks and the university examination of 60 marks.

A candidate shall be permitted to proceed further from the first semester upto Fourth Semester Irrespective of his/her failure in any of the semester Examinations subject to the condition that the candidates should register for all the arrear subjects of earlier semesters along with current (Subsequent)semester subject. However he/she should have cleared all the papers at F.Y.B.Sc(Comp.sci)I and II when He/She gets admission to T.Y.B.Sc.(Comp.Sci) Sem V.

8. GRACING:

The gracing shall be done as per existing rules of the University.

9. VERIFICATION AND REVALUATION:

There is provision for verification and revaluation of the result. A student can apply for the verification and revaluation of the result within the two weeks from the declaration of the results with the prescribed fee. The verification and revaluation shall be done as per the existing rules of the University.

10. STANDARD OF PASSING:

For all courses, both UE and IA constitute separate heads of passing. In order to pass in such courses and to earn the assigned credits, the learner must obtain a minimum grade point of 5.0 (40% marks) at UE and also a minimum grade point of 5.0 (40% marks) at IA.

If a student fails in IA, the learner passes in the course provided he/she obtains a minimum of 25% in IA and GPA for the course is at least 6.0 (50% in aggregate). The GPA for a course will be calculated only if the learner passes at the UE.

A student who fails at UE in a course has to reappear only at UE as a backlog candidate and clear the head of passing. Similarly, a student who fails in a course at IA has to reappear only at IA as a backlog candidate and clear the head of passing.

The 10-point scale Grades and Grade Points according to the following table.

Range of Marks (Out of 100)	Grade	Grade Point
80 ≤ Marks ≤ 100	O	10
70 ≤ Marks < 80	A+	9
60 ≤ Marks < 70	A	8
55 ≤ Marks < 60	B+	7
50 ≤ Marks < 55	B	6
40 ≤ Marks < 50	C	5
Marks < 40	D	0

The performances at UE and IA will be combined to obtain the Grade Point Average (GPA) for the course. The weights for performance at UE and IA shall respectively be 60% and 40%.

GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to grade point, which will be the GPA

Formula to calculate Grade Points (GP)

Suppose that '*Max*' is the maximum marks assigned for an examination or evaluation based on which GP will be computed. In order to determine the GP, Set $x = Max / 10$ (since we have adapted 10-point system). Then GP is calculated by the formulas shown as below.

Range of Marks at the evaluation	Formula for the Grade Point
$8x \le$ Marks $\le 10x$	10
$5.5x \le$ Marks $< 8x$	Truncate (Marks/x) +2
$4x \le$ Marks $< 5.5x$	Truncate (Marks/x) +1

Two kinds of performance indicators, namely, the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA) shall be computed at the end of each term. The SGPA measures the cumulative performance of a learner in all the courses in a particular semester, while the CGPA measures the cumulative performance in all courses since his/her enrolment. The CGPA of learner when he/she completes the programme is the final result of the learner.

The SGPA is calculated by the formula SGPA=$\frac{\sum Ck \times GPk}{\sum Ck}$, where C_k is the credit-value assigned to a course and $GP_k$is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study during the semester, including those in which he/she might have failed or those for which he/ she remained absent. **The SGPA shall be calculated up to two decimal place accuracy.**

The CGPA is calculated by the formula CGPA=$\frac{\sum Ck \times GPk}{\sum Ck}$,where C_k is the credit-value assigned to a course and GP_k is the GPA obtained by the learner in the course. In the above, the sum is taken over all the courses that the learner has undertaken for the study from the time of his/her enrolment and also the during the semester for which CGPA is calculated, including those in which he/she might have failed or those for which he/she remained absent. **The CGPA shall be calculated up to two decimal place accuracy.**

The Formula to compute equivalent percentage marks for specified CGPA:

% Marks (CGPA) =	10 × CGPA – 10	if 5.00 ≤ CGPA ≤ 6.00
	5 × CGPA+ 20	if 6.00 ≤ CGPA ≤ 8.00
	10 × CGPA – 20	if 8.00 ≤ CGPA ≤ 9.00
	20 × CGPA – 110	if 9.00 ≤ CGPA ≤ 9.50
	40 × CGPA – 300	if 9.50 ≤ CGPA ≤ 10.00

<u>Award of Honours</u> :

A student who has completed the minimum credits specified for the programme shall be declared to have passed in the programme. The final result will be in terms of letter grade only and is based on the CGPA of all courses studied and passed. The criteria for the award of honours are given below.

Range of CGPA	Final Grade	Performance Descriptor	Equivalent Range of Marks (%)
9.50 ≤CGPA≤ 10.00	O	Outstanding	80 ≤ Marks ≤ 100
9.00 ≤CGPA≤ 9.49	A+	Excellent	70 ≤ Marks < 80
8.00 ≤CGPA≤ 8.99	A	Very Good	60 ≤ Marks < 70
7.00 ≤CGPA≤ 7.99	B+	Good	55 ≤ Marks < 60
6.00 ≤CGPA≤ 6.99	B	Average	50 ≤ Marks < 55
5.00 ≤CGPA≤ 5.99	C	Satisfactory	40 ≤ Marks < 50
CGPA Below 5.00	F	Fail	Marks Below 40

11. Format of the transcript:

The student will be given a transcript indicating his/her performance at the end of every semester examination. The transcript shall be given as per the following table along with other necessary details:

Course No.	Course Name	No. of Credits	University Examination		Internal Assessment		Grade Point Average	Result
			Grade	Grade Point	Grade	Grade Point		
1								
2								
3								
4								
5								
Total Cumulative Credits Completed			SGPA		CGPA		Equivalent Marks (%)	
Note: GPA is calculated by adding the UE marks out of 60 and IA marks out of 40. The total marks out of 100 are converted to Grade Point, which will be the GPA.								

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F.Y.B.Sc. (COMPUTER SCIENCE)(CBCS 2018 Course)

SEMESTER –I

CS- 11 : INTRODUCTION TO RDBMS

Total credits: 03 **Total lectures: 45**

Course content

Objectives:

1. To introduce the fundamental concepts of RDBMS
2. To understand principles of databases
3. To learn database management operations
4. To learn client server architecture

Chapter 1 File Organization

1.1 Introduction
1.2 Physical / logical files
1.3 Types of file organization
1.4 Choosing a file organization

Chapter 2 Introduction to RDBMS

2.1Structure of Relational Databases (table, row, relation, Tuple)
2.2 keys in a relational database

Chapter 3 Database Architecture

3.1 Data models (relational, hierarchical, network)
3.2 Data abstraction
3.3 Data independence
3.4 Classification of DBMS

Chapter 4 Conceptual Design (E-R model)

4.1 Overview of DB design
4.2 ER data model (entities , attributes, entity sets, relations, relationship sets)
4.3 constraints (Key constraints, Mapping constraints, Strong & Weak entities, aggregation / generalization)
4.4 Conceptual design using ER modeling (entities VS attributes, Entity Vs relationship, binary Vs ternary, constraints beyond ER)
4.5 Case studies

Chapter 5 structure Query Language

5.1 Introduction DDL (create, drop, alter), DML Statements(Insert, Update, Delete)
5.2 Forms of Basic SQL Query
5.3 union, intersection, nested queries
5.4 Aggregate Operator (group by, having), Aggregate functions

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References

1. Database System Concepts, Henry F. Korth, Abraham Silberschatz, S.Sudarshan,
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

F.Y.B.Sc. (COMPUTER SCIENCE))(CBCS 2018 Course)

SEMESTER –I

CS-12 : PROGRAMMING IN C - I

Total credits: 03 **Total lectures: 45**

Course content

Objectives:

1. To develop problem solving abilities using structured programming language features using C.
2. To build the necessary skill set and analytical abilities for developing computer based solutions for real life problems.
3. To imbibe quality software development practices.
4. To create awareness about process and product standards.

1. Introduction

Introduction to problem solving, Program development process, algorithms, Flowchart , Introduction to programming languages (High level,low level , machine)compiler, interpreter, assembler, linker, loader.

2. Introduction to C language

Structured programming concept, benefits of structured programming, History of C language, Importance of C, Basic Structure of C program, scope, features, objectives and application areas, writing and executing a C program, benefits of structured programming.

3. C fundamentals

C character set, C tokens, keywords, identifiers**,** variables, constants, operators(arithmetic, relational, logical ,special and other), expressions, data types, statements, Managing I/O operations.

4. Control structures

Introduction, Basic control structures (sequence, selection/decision making

Statement, Iterative statements, jump statements. etc.)

5. Functions

Introduction, Standard functions, need for user defined functions , advantages of functions, how to write function, calling a function, Passing parameters, methods of passing arguments, recursion, storage Classes and its scope rules**.**

References

- Programming in C by S . Kohan
- Born to code in C by H. Schildt
- The art of C by H. Schildt
- C programming by Kerninghan & Richie by 2 nd edition
- Let us C by Yashwant Kanetkar
- C programming by E. Balaguruswami

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F.Y.B.Sc.(COMPUTER SCIENCE))(CBCS 2018 Course)

SEMESTER -I

CS-13: MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

Total credits: 03 **Total lectures: 45**

Course content

OBJECTIVES:

The main objective of this course is to introduce students to some basic concepts in logic, lattices and Boolean algebra, recurrence relation and counting principles.

At the end of this course student are expected to be able to.

(i) know tautology, predicates and quantifiers.

(ii) draw Hasse diagrams, example of lattices and it's types.

(iii) use counting principles, applications of Pigeonhole principle, permutation and combination.

(iv) solve recurrence relation for finding total solution with the help of homogeneous solution and particular solution.

Unit 1: Logic

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

2.1 Poset, Hasse diagram.

2.2 Lattice, 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

3.1 Cardinality of a Set : finite set, countable and uncountable sets.

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

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.

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) S.R. Patil, R.S.Bhamare, M.D.Bhagat, D.M.Pandhare, S.M Waingade, N.M Phatangare; Discrete Mathematics; Nirali Prakashan, 1998

F.Y.B.Sc.(COMPUTER SCIENCE))(CBCS 2018 Course)

SEMESTER-I

CS-14 : ALGEBRA-I

Total credits: 03 **Total lectures: 45**

Course content

Objectives:

The main objective of this course is to introduce students to some basic concepts relations and functions, binary operations and groups, divisibility in intergers.

At the end of this course student are expected to be able to.

(1) study the sets, relations, and equivalence class, find transitive closure with the help of Warshall's algorithm, types of function.

(2) study the groups and various examples and types of groups.

(3) solve the examples on mathematical induction, to solve the examples with the help of Fermat's theorem.

Unit 1: Relations and functions

(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: Divisibility in Integers

(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: $(Z_n, +, X)$, Z_n is a field iff n is prime, addition and multiplication modulo n and composition tables

(3.9) Euler's and Fermat's Theorems. (Without proof).Examples

Unit 3: Coding Theory,Automata Theory and Languages,Group Codes

(3.1) Coding of binary information and error detection
(3.2) Decoding and error correction
(3.3) Linear codes,parity check
(3.4) Generator matrix ,examples of coset leader

Unit 4: Complex Numbers

(4.1) Revision: Addition, Subtraction, Multiplication, Conjugate, Division
(4.2) Modulus and Argument of Complex number, Geometric Representation
(4.3) Polar form and it's properties
(4.4) DeMoivre's theorem and it's applications
(4.5) Solution of equations by using DeMoivre's theorem

Text Books:

1) S.R. Patil, R.S.Bhamare, M.D.Bhagat, D.M.Pandhare, S.M Waingade, N.M Phatangare; Discrete Mathematics; Nirali Prakashan, 1998
2) Prof .Mrs. M.D.Bhopatkar, Prof. C.S.Nimkar, Prof .Mrs. S.Joglekar; Algebra; Vision Publications,1998.
3) S.R. Patil, R.S.Bhamare, M.D.Bhagat, D.M.Pandhare; Algebra; Nirali Prakashan, 1998.

F.Y.B.Sc(COMPUTER SCIENCE)(CBCS 2018 Course)
SEMESTER I

CS-15 : PRINCIPLES OF ANALOG ELECTRONICS – I

Total credits: 03 **Total lectures: 45**

Course content

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 BJT, FET

1. Introduction to components

Resistors

Capacitors

Inductors and Transformers

Charging and discharging of capacitors

Growth and decay of current in L-R circuits

Growth and decay of voltage in C-R circuits

Simple numerical on the above

2. Network theorems (only statement and problems applied to DC)

Revision of Ohm's law & Kirchoff's laws

Thevenin's theorem

Norton's theorem

Maximum power transfer theorem

Superposition theorem

(numerical problems with
maximum two meshes)

3. Bipolar Junction Transistor

Bipolar Junction Transistor (BJT) symbol, types, construction, working principle, I-V Characteristics, parameters, specifications

BJT as an amplifier .Transitor amplifier configuarations - CB, CC and CE,

Transistor biasing, Q-point

DC load line for a CE amplifier

Transistor as a switch

Simple numerical problems on biasing and DC load line.

4. Amplifier

Concept and definition of an amplifier

Classification based on frequency, coupling and operating point

Single stage RC coupled CE amplifier.

Frequency response and bandwidth of RC coupled amplifier .

5. JFET and MOSFET

Working Principle of JFET and MOSFET

I/V Characteristics

Parameters

Application of JFET as a switch and as an amplifier.

Numerical problems.

comparison of JFET, MOSFET and BJT

Working principle of UJT and SCR

Application of UJT as relaxation Oscillator.

REFERENCE BOOKS

1. Integrated circuits by Milliman.
2. Electronic Devices and circuits: A. Motorshed, Prentice Hall of India.
3. Basic Electronics:Bernard Grob, McGraw Hill Publication, 8th Revised Edition,
4. 2010
5. Electronic Principles:Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
6. Principals of Electronics: V.K. Mehta, S.Chand and Co.
7. A text book of electrical technology: B.L.Theraja, S.Chand and Co.

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F.Y.B.Sc. (COMPUTER SCIENCE) (CBCS 2018 Course)

SEMESTER I

CS- 16 : Principles of Digital Electronics –I

Total credits:03 **Total lectures: 45**

Course content

Objectives:

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

1.Number Systems And conversions

Binary, Octal , Decimal, Hexadecimal number systems.

Inter conversions of number systems.

BCD, Excess-3 code,Gray codes and Hamming codes.

Error detection and correcting codes

Excess three code , One's and Two's compliment method

Examples

2.Logic gates And their Applications

Revision of different logic gates.

Boolean algebra and a few identities

De-morgan's I^{st} and 2^{nd} theorem.

Interconversion of gates.

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 logic families

TTL NAND gate, input output parameters, tristate logic

Fan-in fan-out, propogation delay, noise margin

3.Boolean Algebra and Karnaugh maps

Boolean algebra rules and Boolean laws: Commutative, Associative, Distributive,

AND, OR and Inversion laws,

De Morgan'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 .

Introduction to Karnaugh's map.

Formation of Pair,Quad and Octet.

Significance of Karnaugh Map.

Simplification of 2,3 and 4 variables using K-Map

4.Multiplexers - Demultiplexers and Encoder –Decoder

Introduction to multiplexers and Demultiplexers

2:1,Mux 4:1Mux, 8:1 Mux

Multiplexer Tree.

1:2Demux,1:4Demux,1:8Demux

Introduction to Encoders and decoders.

Decimal to BCD encoder

BCD to 7 Segment Decoder.

Study of IC 74147 and IC74138.

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

F.Y.B.Sc. (COMPUTER SCIENCE)(2018 Course)
SEMESTER I

CS PI : COMPUTER SCIENCE PRACTICAL -I

Total credits: 2

Course content

Objectives

1. To introduce the fundamental concepts of RDBMS
2. To learn SQL environment
3. To familiar with basic operations of SQL

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

List of Topics

1. Create simple tables.
2. Create tables using various data constraints.
3. Create tables using existing tables.
4. Different forms of select statements
5. Queries using insert, delete statements.
6. Queries using Alter and Update statements.
7. Simple queries using functions & Set Operators.
8. Simple queries using mathematical functions and Date functions

NOTE: At least 8 assignments must be performed.

Note: An Industrial visit should be arranged and report should be submitted at the end of academic year.

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F.Y.B.Sc. (COMPUTER SCIENCE)(2018 Course)
SEMESTER I

CS PII : COMPUTER SCIENCE PRACTICAL -II

Total credits: 2

Course content

Objectives

1. To introduce the fundamental concepts of C
2. To learn C Programming Language
3. To learn basic structures in C programming Language

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B) Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

List of Topics

1. Introduction to c programming environment.
2. Basic programs using c programming language including use of arthmatic operators, areas etc.
3. Program base on if statements,if---else and nested if else statements
4. Programs based on condition checking and Looping (e.g. inverting Number, checking whether number is prime, finding GCD and LCM etc.)
5. .Program based on switch case ,return and goto statements.
6. Program using Function
7. Program using recursion

NOTE : At least 8 assignments must be performed.

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F.Y.B.Sc. (COMPUTER SCIENCE)(2018 Course)

SEMESTER -I

CS EI : ELECTRONICS PRACTICAL –I

Total credits: 2

Course content

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.

- One activity equivalent to 2 experiments by the student.

a. Electronics project

b. Documentation type experiments

c. 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 8 experiments as well as on activities

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B)Semester examination: 60 Marks in One session of 3 Hrs .

60 marks Distribution: Practical work 50 marks and 10 marks for oral

Distribuition of 50 marks

Circuit diagram / flowchart and algorithm	15
Connection / program	10
Demonstration and working explanation	10
Observation table	10
Result analysis / conclusion	05

List of Topics

1. Identification of circuit components.
2. Use of CRO signal generators , power supplies and multimeters.
3. CRO for frequency ,phase and amplitude measurements.
4. Verification of KCL,KVL.
5. Verification of Thevenin's theorem.
6. Verification of Nortan's theorem.
7. Verification of maximum power transfer theorem.
8. Transistor as a switch.
9. FET characteristics.
10. SCR characteristics.
11. Study of logic gates.
12. Verification of Demorgan's theorem and conversion of one gate to other
13. Study of potential divider biasing of BJT and its use in DC motor driving
14. Diode as half wave ,full wave and bridge rectifier.
15. Study of output and transfer characteristics JFET/MOSFET
16. Study of I-V characteristics of UJT and Demonstration of UJT based relaxation oscillator .

NOTE : At least 8 Practicals must be performed.

F.Y.B.Sc. (Computer Science) (CBCS 2016 Course)

Semester- I

CS - 17 : COMPUTER ORIENTED STATISTICAL TECHNIQUES –I

Total credits: 3 **Total lectures: 45**

Course content

Objectives: The main objective of this course is to acquaint students with some basic concepts in Statistics and introduced some elementary statistical methods of analysis of data. At the end of this course students are expected to be able,

(i) to compute various measures of central tendency, dispersion, skewness and kurtosis.
(ii) to analyze data pertaining to attributes and to interpret the results.
(iii) to compute the correlation coefficient for bivariate data and interpret it.
(iv) to fit linear regression line to the bivariate data

Unit 1. Scope of Statistics and Data Condensation and Graphical Methods

1.1 Defination : Webseter's and Secrist's definition of Statistics
1.2 Importance of statistics
1.3 Scope of statistics : Industry, Goverment,. Computer science, social science,etc
1.4 Raw data, attributes and variables, discrete and continuous variables
1.5 General principles of classification of raw data
1.6 Construction of frequency distributionand cumulative frequency distribution, relative frequency distribution.
1.7 Graphical representation of frequency distribution : histogram,frequency polygon,frequency curve , ogive curve
1.8 Diagrammatic representation : simple bar, subdivided bar, pie diagram, use of MS-excel/ spreadsheet for domonstrating these diagram
1.9 Numerical problems

Unit 2.Measures of Central Tendency and Dispersion

2.1 Concept of central tendency
2.2 Criteria for good measures of central tendency
2.3 Arithmetic mean : definition for ungrouped and grouped data, combined mean, merits and demerits
2.4 Median: defination, formula for computation for ungrouped and grouped data, graphical methods, merits and demerits
2.5 Mode: definition, formual for computation for ungrouped and grouped data, merits and demerits
2.6 Use of appropriat average
2.7 Quartiles: defination, formulae for grouped data
2.8 Concept of dispersion and measures of dispersion
2.9 Absolute and relative measure of dispersion
2.10 Range: definition for ungrouped data, merits and demerits
2.11 Variance: definition for ungrouped and grouped data, combined Variance for two groups, merits and demerits
2.12 Standard deviation: definition for ungrouped and grouped data, Coefficient of variation
2.13 Numerical problems

Unit 3. Moments and Measures of Skewness and Kurtosis

3.1 Raw and central moments: definition, for ungrouped and grouped Data (only up to first 4 moments)
3.2 Relation between central and raw moments
3.3 Idea of symmetric frequency distribution, skewness of a frequency distribution, positive and negative skewness, empirical relation between mean, median and mode
3.4 Pearson's and Bowley's coefficients of skewness
3.5 Idea of kurtosis for a frequency distribution
3.6 Measures of skewness and kurtosis based on moments
3.7 Numerical problems

Unit 3. Correlation and Regression (for ungrouped data)

4.1 Bivariate data : scatter diagram
4.2 Concpt of correlation, positive correlation, negative correlation
4.3 Karl Pearson's cofficient of correlation (r)
4.4 Limits of r, $-1 \leq r \leq 1$, and interpretation of r
4.5 Concept of regression, cause and effect relation
4.6 Properties of regression coefficient : $b_{xy}\ b_{yx} = r^2$, $b_{xy}\ b_{yx} \leq 1$, $bxy = r\sigma_x/\sigma_y$, and $bxy = r\ \sigma_y/\sigma_x$
4.7 Numerical problems

Books Recommended

1) Hogg R. V. and Craig, R. G.
   Introduction to Mathematical Statistics.
2) Hoel. P. G.
   Introduction to Mathematical Statistics.
3) Feller. W
   Introduction to probability Theory and it's Applications. Vol –I
4) Mood A. M., Grabill, F. A. Boes D. C.
   Introduction to Theory of Statistics.
5) Meyar P. L.
   Introduction to Probability and Statistical Applications.
6) Goon, Gupta and Das Gupta
   Fundamentals of Statistics Vol I & II
7) S. P. Gupta
   Statisticalmethods.

F.Y.B.Sc. (Computer Science)(2018 Course)

Semester- I

CS18: Compulsory English - I

Total credits: 03 **Total lectures: 45**

Course content

A. Objectives:

a) To encourage and enable the students to read the various types of texts on their own and discuss them among peers.
b) To develop competence among the students for self-learning.
c) To develop their communicative skills and their proficiency in English language.
d) To make students aware of the different communicative skills.
e) To prepare them to function effectively in their future professions.

Prescribed Text: ***Views & Visions: An English Coursebook for Undergraduates*** *by* Orient BlackSwan

Prose:

1. Towards Universal Brotherhood *Rashtrasant Tukdoji Maharaj*
2. Buddha, 'The Enlightened One' *Max Eastman*
3. How Wealth Accumulates and Men Decay *George Bernard Shaw*
4. The Romance of a Busy Broker *O. Henry*
5. Kalpana Chawla Anonymous

Poetry:

1. Where the Mind is Without Fear *Rabindranath Tagor*
2. A Psalm of Life *H.W. Longfellow*
3. Mirror *Sylvia Plath*
4. Lord Ullin's Daughter *Thomas Cambell*
5. Curious Mishaps *Vikram Seth*

Grammar, Usage and Composition:

1. Articles 2. Prepositions 3. Tense
4. Kinds of Sentences 5. Transformation of Sentences

(Note: All the units as covered in the prescribed text)

F.Y.B.Sc. (COMPUTER SCIENCE)(2018 Course)

SEMESTER –I

CS- 19 : ELEMENTARY ALGORITHMICS

Total credits: 03 **Total lectures: 45**

Course content

Objectives:

- Analyze the performance of algorithms.
- To develop Analytical / Logical Thinking and Problem Solving capabilities
- Apply important algorithmic design paradigms and methods of analysis.

1. Concepts of Problem, Procedure and Algorithm, Algorithm Representation through Pseudo-Code and Flow-Charts Tracing of Algorithms. Concept of a program and structure of procedure oriented languages.

2. Problem Analysis and Design of Algorithms for problems such as (1) Swapping(2) Counting (3) Finding the Sum, Product, maximum, minimum of a list of numbers, and (4) Simple variations of the above problems realization that there

   may be alternative algorithm and that one algorithm may be better (in some sense)than the other.

3. Problem Analysis and Design of Algorithms for problems such as (1) Evaluation of a polynomial (2) Sum of first n factorials (3) Finding the n^{th} term of a

   Fibonacci sequence, (4) Finding the largest and second largest of a list, (5) Evaluating finite series and variations of these problems, (6) Determining n^{th} root of a number

4. Introduction to recursive algorithms and their tracing. Applications to (1) Computation of a factorial, sum, maximum, Fibonacci terms . (2) Base conversion (3) Reversing a String and checking for palindrome property. (4) To compute GCD .

5. Concept of array and problems that involve array manipulation (1) Removing the duplicates (2) Partitioning of an array, (3) Listing of prime numbers (4) Finding the prime factor of a number (5) Printing a Histogram.

6 . The problem of search and merge, Linear, Binary search algorithms. The problem of Sorting, Selection, Insertion, Bubble, Quick, and Merge Sort algorithms.

Reference Books :

1. How to solve it by a computer by Dromey R.G.
2. Data Structures, Algorithms and applications in C++ (Ch I I) by Sartaj Sahni

F.Y.B.Sc. (COMPUTER SCIENCE)(2018 Course)

SEMESTER-II

CS-21 : RDBMS USING ORACLE

Total credits: 03 **Total lectures: 45**

Course content

Objectives:

1. To teach database management operations
2. To teach data security and its importance
3. To teach client server architecture
4. To Understand Concepts of Data Normalization

Chapter 1 : Transaction Concepts

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

Chapter 2 : Relational algebra

Preliminaries, Relational algebra (selection, projection, set operations, renaming joins, division

Chapter 3 : Relational Database Design

Dependencies : Functional, transitive , multi –valued , Normalization : First ,Second ,Third normal form, Desirable properties of decomposition(lossless - join , dependency preservation)

Chapter 4: PL/SQL

Introduction, Syntax, Datatypes, Variables, Control Structure(Conditional & Iterative),block structure

Chapter 5 : Stored Procedure & Triggers

Creating Procedure(Declarative Part, Executable Part), Syntax Applications ,Using Procedures, Advantages, functions, Use of database triggers ,Types of triggers, Working of Triggers

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

10.Commercial Application Development Using ORACLE DEVELOPER 2000,BPB PUBLICATIONS By IVAN BAYROSS

F.Y.B.SC. (COMPUTER SCIENCE)(2018 Course)

SEMESTER II

CS-22 : PROGRAMMING IN C-II

Total credits: 03 **Total lectures: 45**

Course content

Objectives:

1. To train students in professional skills related to Software Industry.
2. To prepare necessary knowledge base for research and development in Computer Science.
3. To help students build-up a successful career in Computer Science using foundation of C language.

1. Arrays

Declaration, entering data into an array, reading data from an array, one dimensional arrays, two dimensional arrays, multi dimensional arrays, arrays and functions, character strings, declaring and initializing string variables, standard library functions, arrays of strings.

2. Structures and Unions

Declaration of structures, initialization of structures, nested structures, Arrays of structures, Declaration of union, initialization of union, differentiate between structures and union.

3. Pointers

Introduction to pointers, pointer declaration ,uses of pointers, applications of pointers, pointer arithmetic, pointer to pointer, pointer to constant object, pointers and arrays, pointers to functions ,pointers to structures.

4 File handling

Introduction, streams, types of files, operations on file standard input-output functions, formatted input-output functions.

References

- Programming in C by S . Kohan
- Born to code in C by H Schildt
- The art of C by H Schildt
- C programming by Kerninghan & Richie – 2 nd edition
- Let us C by Yashwant Kanetkar
- C programming by E- Balaguruswami

F.Y.B.Sc.(COMPUTER SCIENCE) (2018 Course)

SEMESTER-II

CS-23 :GRAPH THEORY

Total credits: 03 **Total lectures: 45**

Course content

Objectives:

The main objective of this course is to introduce students to some basic concepts in Graphs, operations on graphs, Connected Graphs, Eulerian and Hamiltonion graphs, Trees, Directed Graphs. At the end of this course student are expected to be able to.

(1) find adjacency and incidence matrix of graphs.

(2) studied various types operations on graph.

(3) find shortest path of graph using Dijkstra's Algorithm.

(4) introduce the Chinese Postman Problem and Travelling Salesman Problem.

(5) find shortest spanning tree using Kruskal's algorithm.

Unit 1 : Graphs

(1.1) Definition, Elementary terminologies and results, Graphs as Models.

(1.2) Special types of graphs.

(1.3) Isomorphism.

(1.4) Adjacency and Incidence Matrix of a Graph.

Unit 2 : Operations on Graphs

(2.1) Subgraphs, induced subgraphs,Vertex delition, Edge delition, edge contraction.

(2.2) Complement of a graph and self-complementary graphs.

(2.3) Union, Intersection and Product of graphs.

(2.4) Fusion of vertices.

Unit 3 : Connected Graphs.

(3.1) Walk, Trail, Path, Cycle : Definitions and elementary properties.

(3.2) Connected Graphs : definition and properties.

(3.3) Distance between two vertices, eccentricity, center, radius and diameter of a graph.

(3.4) Isthmus, Cut vertex : Definition and properties.

(3.5) Cutset, edge-connectivity, vertex connectivity.

(3.6) Weighted Graph and Dijkstra's Algorithm.

Unit 4 : Eulerian and Hamiltonian Graphs

(4.1) Seven Bridge Problem, Eulerian Graph : Definition and Examples, Necessary and Sufficient condition.

(4.2) Fleury's Algorithm.

(4.3) Hamiltonian Graphs : Definition and Examples, Necessary Condition.

(4.4) Introduction of Chinese Postman Problem and Travelling Salesman Problem.

Unit 5 : Trees

(5.1) Definition, Properties of trees.

(5.2) Center of a tree.

(5.3) Binary Tree : Definition and properties.

(5.4) Tree Traversal : Ordered rooted Tree, Preorder traversal, inorder traversal and postorder traversal, Prefix Notation.

(5.5) Spanning Tree : Definition, Properties, Shortest Spanning Tree, Kruskal's Algorithm.

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).
5) S.R. Patil, R.S.Bhamare, M.D.Bhagat, D.M.Pandhare, S.M Waingade, N.M Phatangare; Discrete Mathematics; Nirali Prakasha.

F.Y.B.Sc.(COMPUTER SCIENCE) (2018 Course)

SEMESTER-II

CS-24: ALGEBRA-II

Total credits: 03 **Total lectures: 45**

Course content

Objectives:

The main objective of this course is to introduce students to some basic concepts in Groups, normal subgroups, homomorphism and isomorphism, Connected Graphs, Eulerian and Hamiltonion Rings and field.

At the end of this course student are expected to be able to.

1) examples of group , subgroup, various properties.
2) operations on a group.
3) study the ring and integral domain.

Unit 1: Groups

(1.1) Binary Operations, Semigroups, Monoids, Groups: Definitions and Examples,Simple, Properties

(1.2) Abelian Group, Finite Group, Infinite Group

(1.3) Order of an element of a Group

(1.4) Subgroups: Definition, Necessary and Sufficient Conditions, Examples on finding subgroups of finite groups, Union and Intersection of Subgroups

(1.5) Cyclic Subgroups: Definition, Simple Properties.

(1.6) Coset : Definition & Simple Properties.

(1.7) Lagrange's theorem (with proof) & its Corollaries .

(1.8) Permutation Groups :Definition of S_n and detail discussion of the group S_3 ,Cycles and Transpositions, Even and Odd Permutations, Order of Permutation, Properties :

a) $0(S_n) = n!$ b) A_n is subgroup of S_n .

Unit 2: Normal Subgroups, Homomorphism & Isomorphism

(2.1) Normal Subgroups: Definition,properties with examples

a) If g is abelian group then every subgroup of G is normal.

b) H is normal subgroup of G iff $xhx^{-1} = H$,

c) H is normal subgroup of G iff every left coset of H in G is also a right coset of H in G . (all with proof).

d) H is normal subgroup of G iff product of two right coset of H in G is also a right coset of H in G.

e) If H is subgroup of index 2 in G then H is normal subgroup of G .

f) If H is the only subgroup in G of a fixed finite order then H is normal subgroup of G. (all without proof.).

(2.2) Quotient Groups: Definition and Examples
(2.3) Homomorphism and Isomorphism: Definitions, Examples, Simple properties.

Unit 3: Rings & Fields

(3.1) Rings , Integral Domains: Definitions ,Some results (without proof),Examples.
(3.2) Fields , Skew Field: Definitions ,Some results (without proof),Examples.

References:

1) J.B. Fraleigh, A. First Course in Abstract Algebra, Third Ed., Narosa, New Delhi, 1990.

2) S.R. Patil, R.S. Bhamare, M.D. Bhagat, D.M. Pandhare; Algebra; Nirali Prakashan, 1998
3) S.R. Patil, R.S. Bhamare, M.D. Bhagat, D.M. Pandhare; Algebra; Nirali Prakashan, 2003.
4) P.B. Bhattacharya, S.K. Jain, S.R. Nagpaul : Basic abstract algebra (second edition).

F.Y.B.Sc. (Computer Science) (2018 Course)

SEMESTER II

CS-25 :PRINCIPLES OF ANALOG ELECTRONICS – II

Total credits: 03 **Total lectures: 45**

Course content

Objectives

1. To get familiar with differential amplifiers
2. To understand basics of operational amplifiers
3. To study features of oscillators
4. To study elementary concepts of power supply

1.Differential amplifier

Black box concept

Different modes of operation

Parameters of differential amplifier

Differential Amplifier with constant current source

Concept of feedback

Types of feedback

2.Operational Amplifier

Introduction to OP-AMP

Block diagram

Concept of virtual ground

OP-AMP IC 741

OPAMP applications - Inverting and non inverting amplifier, adder, subtractor, comparator, integrator and differentiator

Numerical problems.

3.Oscillators

Introduction to Oscillators.

Concept of positive feedback

Barkhausen criteria

Classification of oscillators

Weinbridge oscillator, Phase Shift oscillator

Hartley, Colpitt oscillator

Crystal oscillator

Numerical problems.

4.Power Supply

Review of rectifiers,

Types of regulations.

Block diagram, working and specifications of regulated power supply

Switching mode power supply **(SMPS**)

Uninterrupted power supply **(UPS**)

REFERENCE BOOKS

1. Integrated circuits by Milliman.
2. Electronic Devices and circuits: A. Motorshed, Prentice Hall of India.
3. Basic Electronics:Bernard Grob, McGraw Hill Publication, 8th Revised Edition,2010
4. Electronic Principles: Albert Malvino, David J Bates, McGraw Hill 7th Edition. 2012
5. Principals of Electronics: V.K. Mehta, S.Chand and Co.
6. A text book of electrical technology: B.L.Theraja, S.Chand and Co.

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F.Y.B.Sc. (Computer Science) (2018 Course)

SEMESTER II

CS – 26 : PRINCIPLES OF DIGITAL ELECTRONICS –II

Total credits: 03 **Total lectures: 45**

Course content

Objectives:

1. To get familiar with concepts of digital electronics
2. To learn the concept of flip -flops
3. To understand the working of counters
4. To study Shift registers
5. To get introduced to semiconductor memory.

1.Flip-flops

Introduction to flip flop

RS flip-flop, Clock R-S flip-flop

JK flip-flop, Master-slave JK flip flop

D and T flip-flop.

Race around condition

Triggering in flip-flops,

Preset Clear, Delay (Definitions only)

Examples of commonly used flip-flops and their applications.

2.Counters

Introductions to counters.

Asynchronous counters, Synchronous counter,

Modulus of counter

Ring counter , Up-down counter,

study of IC 7490 (Internal block diagram)

Frequency division in IC 7490(MOD 2,MOD 4, MOD 6 ,MOD 8, MOD 10)

3.Study of shift registers

Serial and parallel data shifting. SISO (right and left shift), SIPO ,PIPO And PISO. Study of IC 7495 .

4.Clock generating circuits

Multivibrators

Introduction to IC555,

Working of IC 555 as a clock generator(Astable, monostable, bistable multivibrator),

Working of IC 741 as a clock generator (No derivations expected for the above, only formula and problems)

Duty cycle

Problems.

5.Semiconductor Memory

Introduction to memory devices.

RAM,ROM,PROM,EPROM

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

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F.Y.B.Sc. (Computer Science) (2018 Course)

SEMESTER II

CS PIII : COMPUTER SCIENCE PRACTICAL-III

Total credits: 02

. **Objectives**

1. To introduce the concepts of PL/SQL Block Structures
2. To understand PL/SQL control Structures
3. To familiar with handling errors, Procedures and triggers.

Course content

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B)Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

List of Topics

1. Assignment on nested queries.
2. Introduction to PL/SQL blocks structure .
3. Simple PL/SQL blocks
4. Assignments based on PL/SQL Conditional statements
5. Assignments based on PL/SQL Looping statements
6. Usage of procedures.
7. Assignments based on exception Handling
8. Usage of triggers.

NOTE: At least 8assignments must be performed.

Note: An Industrial visit should be arranged and report should be submitted at the end of academic year.

F.Y.B.Sc. . (Computer Science)(2018 Course)

SEMESTER II

CS PIV : COMPUTER SCIENCE PRACTICAL -IV

Total credits: 02

Objectives

1. To introduce the arrays concept
2. How to handle data of different Structure
3. Introduction to file structure .

Course content

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.

B)Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

List of Topics

1. Programs using one dimensional and two dimensional array
2. Programs based on character array. (counting of character words, lines and white spaces etc.)
3. Programs on pointer
4. Programs on Structure and Unions.
5. Programs on structure within structure
6. Programs on File handling.

NOTE : At least 8 assignments must be performed.

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F.Y.B.Sc. (Computer Science)(2018 Course)

SEMETER-II

CS EII : ELECTRONICS PRACTICAL –II

Total credits: 02

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.

- One activity equivalent to 2 experiments by the student.

a. Electronics project
b. Documentation type experiments
c. 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 8 experiments as well as on activities

Course content

Practical Examination

A) Internal Marks 40 : Completion of journal , attendance and involvement in activities.
B)Semester examination: 60 Marks in One session of 3 Hrs .
60 marks Distribution: Practical work 50 marks and 10 marks for oral

Distribuition of 50 marks

Circuit diagram / flowchart and algorithm	15
Connection / program	10
Demonstration and working explanation	10
Observation table	10
Result analysis / conclusion	05

List of Topics:

1. Study of phase shift oscillator
2. Study of Wein bridge oscillator.
3. Study of Crystal Oscillator.
4. OP-AMP application as an adder
5. OP-AMP application as subtractor
6. OP-AMP application as an integrator
7. OP-AMP application as differentiator
8. Study of 7490 as a counter.
9. Study of flip-flops
10. Study of shift register IC 7495.
11. Study of up down counter
12. Build and Test Diode matrix ROM
13. Study of Four bit Universal Adder/Subtractor

NOTE : At least 8 Practicals must be performed

F.Y.B.Sc. (Computer Science)(2018 Course)

Semester II

CS – 27 : COMPUTER ORIENTED STATISTICAL TECHNIQUES -II

Total credits: 03 **Total lectures: 45**

Course content

Objectives

The main objective of this course is to introduce to the students the basic concepts of probability, axiomatic theory of probability, concept of random variable, probability distribution (univariate) discrete random variables, expectation and moments of probability distribution. By the end of the course students are expected to be able

(i) to find the probabilities of events.
(ii) to obtain a probability distribution of random variable (one dimensional) in the given situation, and
(iii) to apply standard discrete probability distribution to different situations
(iv) to apply continuous probability distribution to different situations.
(v) to apply small and large sample tests to different situations.

Unit 1. Probability

1.1 Idea of deterministic and non-deterministic models
1.2 Sample space (Finite and countably finite)
1.3 Events : types of events, operations on events
1.4 Probabitity : classical definition, relative frequency approach, probability models
1.5 Axioms of probability
1.6 Probability of events
1.7 Theorems on probability :

1) $0 \leq P(A) \leq 1$
2) $P(A)+P(A')=1$
3) $P(A) \leq P(B)$ when $A \subset B$
4) $P(A \cup B) = P(A)+P(B)-P(A \cap B)$

1.8 Concept and definitions of conditional probability $P(A \cap B)=P(A)\ P(B\ /A)$
1.9 Concept and definitions of independence of two events
1.10 Numerical problems

Unit 2. Discrete Random Variables and some Standard Discrete Probability Distributions

2.1 Definition of random variable and discrete random variable.
2.2 Definition of probability distribution and distribution, Probability mass function.
2.3 Definition of expectation and variance, theorems on expectation.
2.4 Binomial distribution : definition, mean. Variance, additive property, illustrations of real life situations.
2.5 Poisson distribution : definition, mean, variance, additive property, approximation to binomial, illustrations of real life situations.
2.6 Numerical problems

Unit 3. Continuous random variables and some Standard Continuous Probability Distribution

3.1 Definition through p.d.f.
3.2 Distribution function : definition, statements of properties
3.3 Definitions of mean and variance
3.4 Exponential distribution : p.d.f. with mean, nature of probability curve, mean, variance, lack of memory property.
3.5 Normal distribution : defination of p.d.f., identification of parameters, Probability curve, standard normal distribution.
3.6 Numerical problems

Unit 4. Test of Hypothesis and Some Large and Small sample Tests

4.1 Definitions : random sample, parameter, statistic, standard error of statistic.
4.2 Concept of null and alternative hypothesis, critical region, level of significance, types of error, Concept of test of hypothesis, one sided and two sided tests.
4.3 $H_0 ; \mu = \mu_0$ Vs $H_1 = \mu \neq \mu_0$
4.4 $H_0 = P = Po$ Vs $H_1 = P \neq Po$
4.5 Chi-square test for goodness of fit and 2 X2 contingency table
4.6 t-test for testing $H_0 ; \mu = \mu_0$ Vs $H_1 = \mu \neq \mu_0$
4.7 Numerical problems

Books Recommended

1) Hogg R. V. and Craig, R. G.
Introduction to Mathematical Statistics.
2) Hoel. P. G.
Introduction to Mathematical Statistics.
3) Feller. W
Introduction to probability Theory and it's Applications. Vol –I
4) Mood A. M., Grabill, F. A. Boes D. C.
Introduction to Theory of Statistics.
5) Meyar P. L.
Introduction to Probability and Statistical Applications.
6) Goon, Gupta and Das Gupta
Fundamentals of Statistics Vol I & II
7) S. P. Gupta
Statistical methods.
8) Waikar and Lev.
Elementary Statistical Methods.
9) BIS Publication
Statistical Quality Control (Hand Book)
10) ATAG (Automotive Industries Action Group) :SPC/MMS manuals.
11) Samprit Chatterjee and Bertram Price.
Regression analysis by Example (1991).
John Wiley and sons. Inc.
12) Guilford, J. P. and Fruchter B: Fundamental Statistics in Psychology and Education
(1980), Mc Graw Hill.
13) Mathur, Rajiv. Learning Excel-97 for windows step by step Galgotia

F. Y. B. Sc. (Computer Science)(2018 Course)

Semester II

CS-28 : Compulsory English - II

Total credits: 03 **Total lectures: 45**

Course content

Objectives:

a) To encourage and enable the students to read the various types of texts on their own and discuss them among peers.
b) To develop competence among the students for self-learning.
c) To develop their communicative skills and their proficiency in English language.
d) To make students aware of the different communicative skills.
e) To prepare them to function effectively in their future professions.

Prescribed Text: ***Views & Visions: An English Coursebook for Undergraduates*** *by* Orient BlackSwan

Prose:

1. The Task of Education — *Vinoba Bhave*
2. A Letter by Hazlitt to His Son — *William Hazlitt*
3. The Bet — *Anton Chekov*
4. Curious Mishaps — *Vikram Seth*
5. Refund — *Fritz Karinthy*

Poetry:

1. Polonius to Laertes — *William Shakespear*
2. No Men are Foreign — *James Kirkup*
3. Stopping by Woods on a Snow Evening — *Robert Frost*
4. The Golden Pitcher — *Acharya Vidyasagar Maharaj*

Grammar, Usage and Composition:

1. Degrees of Comparison
2. One-word Substitution
3. Synonyms and Antonyms
4. Paragraph Writing
5. Reading Comprehension
6. Summarising

(Note: All the units as covered in the prescribed text.)

F.Y.B.Sc. (Computer Science)(2018 Course)

SEMESTER-II

CS-29 : OPERATING ENVIRONMENT

Total credits: 03 **Total lectures: 45**

Course content

Objectives:

1) To aware the computer fundamentals
2) To know the structure and working of compute
3) Obtain understanding of the concepts of information technology

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1. Computer definition, uses, block diagram, functions of ALU, input/output, scanner, plotter, keyboard, mouse, MICR, bar decoder, OCR, joystick, monitor, printer, memory unit and CPU.

2. Software-types, compilers, interpreter, assembler, linker, loader, high level and low-level languages. Files-types and operations, indexed, sequential and hashed

   organization. Sorting, merging, indexing and updating functions, concept of a file allocation table.

3. Operating System-types-timesharing, batch processing, multiprogramming , real- time; functions of operating systems – Introduction to file management, detailed study of DOS and Windows.

4. Networking - Data communication concepts, classification, communication media, LAN, Wan, Man, Internet, Intranet, Extranet , and their efficient use.

5. Study of office 2000(MS-Word, MS-Power Point, MS-Excel)

Reference Books :

1. A First course in computers by Ravi Saxena
2. Computer Fundamentals :Milind Oak
3. Computer Fundamentals : P.K.Sinha
4.

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F.Y.B.Sc. (Computer Science)(2018 Course)

SEMESTER-II

UGSEC 21 : HTML PROGRAMMING

Total credits: 02 **Total lectures: 30**

Unit- 1 Introduction

HTML file structure, HTML tags, types of tags

Unit-2 The Basics
The Head, the Body , Colors, Attributes Lists, ordered and unordered

Unit-3 Links
Introduction , Relative Links, Absolute Links, Link Attributes ,Using the ID Attribute to Link Within a Document

Unit-4: Images
Putting an Image on a Page, Using Images as Links, Putting an Image in the Background

Unit 5: – Tables
Creating a Table, Table Headers , Captions, Spanning Multiple Columns ,Styling Table

Unit 6 – Forms
Basic Input and Attributes ,Other Kinds of Inputs ,Styling forms with CSS

Book Recommended:
1. Introduction to **HTML** and CSS -- O'Reilly , 2010
2. HTML, DHTML, JavaScript, Perl CGI-Ivan Byross

Software Lab Based on HTML:
Q.1. Create an HTML document with the following formatting options:
I. Bold
II. Italics
III. Underline
IV. Headings (Using H1 to H6 heading styles)
V. Font (Type, Size and Color)
VI. Background (Colored background/Image in background)
VII. Paragraph
VIII. Line Break
IX. Horizontal Rule
X. Pre tag

Q.2. Create an HTML document which consists of:
I. Ordered List
II. Unordered List
III. Nested List
IV. Image

Q.3. Create an HTML document which implements Internal linking as well as External linking.
Q.4. Create a table using HTML which consists of columns for Roll No., Student's name and grade.

Roll No.	Name	Grade

Q.5. Create HTML documents having multiple frames.

Q.6. Create HTML documents using input tags to design student registration form.

Q.7. Create HTML documents to add audio and video file on web page.