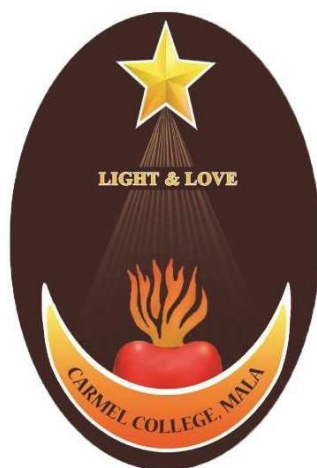




CARMEL COLLEGE (AUTONOMOUS) MALA

**BACHELOR OF VOCATION (B.Voc) PROGRAMME IN
SOFTWARE DEVELOPMENT**



**CURRICULUM AND SYLLABI
CHOICE BASED CREDIT SEMESTER SYSTEM
UNDER
FACULTY OF SCIENCE**

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REGULATIONS

FOR THE DEGREE OF B.VOC SOFTWARE DEVELOPMENT

1. TITLE OF THE PROGRAMME

This programme shall be called Bachelor of Vocation (B.Voc) Software Development as per the guidelines of UGC.

2. PROGRAMME - AN OVERVIEW

The University Grants Commission (UGC) has launched a scheme on 27 February, 2014 for skill development based higher education as part of college/university education, leading to Bachelor of Vocation (B.Voc.) Degree with multiple exits such as Diploma/Advanced Diploma/ Degree under the NSQF. B Voc Software Development is a vocational undergraduate program having 3 years' duration. Considering the implementation modalities, the guidelines of the scheme have been revised by UGC in the years 2015 and 2018. The B.Voc. programme is focused on universities and colleges providing undergraduate studies which would also incorporate specific job roles and their NOSs along with broad based general education. This would enable the graduates completing B.Voc to make a meaningful participation in accelerating India's economy by gaining appropriate employment, becoming entrepreneurs and creating appropriate knowledge

The main purpose of this programme is to mould the students with adequate skills in Software Development by providing them sufficient theoretical knowledge, Lab experiments, training in academic projects and involvement in real time client projects at 6th semester whole time internship in industries. This will enable the students to get hired in public and private IT organizations.

Broad Objectives

1. To provide judicious mix of skills relating to a software profession and appropriate content of general education.
2. By integrating with industries, ensure that the students have adequate knowledge and skills in computer applications so that they are work ready at each exit point of the programme.
3. To provide flexibility to students by means of pre-defined entry and multiple exit points.
4. To integrate NSQF within the undergraduate level of higher education in order to enhance employability of the graduates and meet industry requirements. Such graduates apart from meeting the needs of local and national industry are also expected to be equipped to become part of the global workforce.

To provide vertical mobility to students coming out of 10+2 with vocational subjects and Community Colleges.

PROGRAMME OUTCOMES (POs)

Software Development Graduates will be able to:

P01:	Open up a channel to IT Industries by supplying sufficient work ready students by developing skilled manpower in the various areas of Information Technology like: Web Deveopment, Database Management, Software Development, Computer Languages, Software Engineering, Mobile Applications, Multimedia Applications, etc.
P02:	Create, select and apply appropriate techniques, resources, mathematical and professional business skills and Modern IT Tools to complex software engineering activities and business presentations.
P0 3	Identify opportunities of Industry-Institute interactions by doing internships in industries.
P04:	Equip the graduates to go for their higher studies. After acquiring B.Voc, there is further educational opportunity to go for MVoc, MCA, MSc Computer Science, MBA, MTech etc.
POS:	Become an entrepreneur who can provide solutions and develop software products for Enterprise needs.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PS01	Demonstrate understanding of the principles and working of the hardware and software aspects of computer systems.
PS02	Understand the impact of general education in the areas like Disaster Management, Gender Studies, Environmental Science, Public Health, Sanitation and Safety, Entrepreneurship, Human Rights, IPR, Consumer Protection etc. and need for sustainable development.
PS03:	Develop competent technical speaking and writing skills in English so as to enable the graduate effectively communicate in the work place.
PS04:	Develop competency in advanced programming languages such as Machine Learning, AI, Big Data, IOT, OBA, Python, J2EE, Android, DotNet etc. and learn the development of software and web applications using these.
PSOS:	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

3. ELIGIBILITY CRITERIA FOR ADMISSION

- a) The admission to this programme will be as per the rules and regulations of the University for UG admissions.
- b) Candidates who have passed (Eligible for Higher Studies) the HSE of the Kerala State Board of Higher Secondary Examination or any other examination recognized as equivalent thereto with Mathematics/Computer Science/Computer Application/Information Technology/Informatics Practice/Informatics/WebTech/Additional Mathematics are eligible for admission.
- c) **Index Mark:**
 1. Total Part III + marks secured for Mathematics in the case of Science group with Mathematics as one of the subject AND Total Part III + marks secured for Computer Science/Computer Application/ Information Technology/ Informatics Practice/ Informatics/ Web Technology/ Additional Mathematics in the case of other combinations without Mathematics as one of the subject. If the Candidates has studied both Mathematics and any one of the following subjects Computer Science/Computer Application/ Information Technology/Informatics Practice/Informatics/ Additional Mathematics, then the marks secured for Mathematics or Computer Science/Computer Application/ Information Technology/ Informatics Practice/ Informatics/ Web Technology/ Additional Mathematics whichever is higher will added.
 2. An additional 25 marks will be awarded for VHSE/HSE with vocational pass out students.
- d) **Tie Break:** If there is a tie in the index marks priority must be given to Mathematics/Computer Science as the case may be. If there is a tie again the marks of the second subsidiary subject marks of English and then the marks for second language will be considered before going to general conditions.
- e) Separate rank lists shall be drawn up for reserved seats as per the existing rules.
- f) **Grace Marks** may be awarded to a student for meritorious achievements in co-curricular activities such as Sports/ Arts/ NSS/NCC/ Student Entrepreneurship.
- g) The eligibility criteria for admission shall be as announced by the University from time to time. The admission to this programme will be as per the rules and regulations of the University for UG admissions.

4. DURATION OF THE PROGRAMME

- a) Duration of an undergraduate programme is six semesters distributed over a period of 3 academic years.
- b) An academic week is a unit of five working days in which distribution of work is organized from Monday to Friday with Six contact periods of one-hour duration on each day.
- c) A sequence of 18 such weeks (16 instructional weeks and 2 weeks for examination) constitutes a semester.

5. COURSE STRUCTURE

- a) **Programme** means the entire course of study and examinations for the award of a degree.
- b) **Course:** Course means a segment of subject matter to be covered in a semester.
- c) This undergraduate programme includes 3 types of courses, GEC, SDC and AEC viz.,

i. General Education Components (GEC): General course means a course that comes under the category of courses, including compulsory English and additional language courses and a set of General courses applicable for Language Reduced Pattern (LRP) programmes, the selection of which is compulsory for all students undergoing programme. This programme follows the GEC of LRP (A11- A14) that comes under Group No. 6 which is newly created for BVoc programmes as per CBCSS VUG 2022 Regulations.

ii. Skill Development Components(SDC):

- a) This component should match the skill gap identified.
- b) At least 50% of Skill Development Component should be allotted to practical and can grow up to 60% based on the nature of the course. The practical component can be carried out/in the college and/or the industry partner premises

iii. Ability Enhancement Courses/ Audit Courses (AEC/AC) are courses which are mandatory for a programme but not conducted for the calculation of SGPA or CGPA. There shall be one audit course each in the first 4 semesters. Audit courses are not meant for class room study. The students can attain only pass (Grade P) for these courses. At the end of each semester there shall be examination conducted by the college from a pool of questions (Question Bank). The students can also attain these credits through online courses like SWAYAM, MOOC etc. (optional). The list of passed students must be sent to the University from the colleges at least before the fifth semester examination. The list of courses in each semester with credits is given below.

Semester	Courses	Credit
1	Environment Studies	4
2	Disaster Management	4
3	*Human Rights /Intellectual Property Rights /Consumer	4
4	<u>*Gender Studies/Gerontology</u>	4
*Colleges can opt any one of the courses.		

iv. Electives: In the 4th and 5th semester selective courses are included. Students are allowed to select elective courses in consultation with their faculties.

6. CREDIT

- a) Each course shall have certain credits. **Credit** is a unit of academic input measured in terms of weekly contact hours/course contents assigned to a course.
- b) A student is required to acquire a total of **180** credits for the completion of the programme which shall be counted for SGPA and CGPA.
- c) Each semester has a credit of 30. Out of which the general education components shall not exceed 40% of the total credit of each semester.
- d) The maximum credit for a course shall not exceed 5 and the minimum credit for a course is 2.
- e) **Extra credits** are mandatory for the programme. Extra credits will be awarded to students who participate in activities like NCC, NSS and Swatch Bharath. Those students who could not join in any of the above activities have to undergo Calicut University Social Service Programme (CUSSP). Extra credits are not counted for SGPA or CGPA. The maximum credits acquired under extra credits shall be 4. If more Extra credit activities are done by a student that may be mentioned in the Grade card.

7. EXAMINATION

- a) There shall be University examinations at the end of each semester.
- b) The medium of examination is in English.
- c) Evaluation and Grading:
Mark system is followed instead of direct grading for each question. For each course in the semester letter grade and grade point are introduced in 10-point indirect grading system as per guidelines given in Annexure-1.
- d) **Course Evaluation:** The evaluation scheme for each course shall contain two parts internal assessment and external assessment.

8. AWARD OF DEGREE

The successful completion of all the courses (General Education Components, Skill Development Components and Audit Courses) prescribed for this degree programme with 'P' grade shall be the minimum requirement for the award of degree.

Levels of Awards

B.Voc Software Development is a programme with Multiple Exit points as shown below:

Awards	Duration	NSQF Level
Diploma	1 year/ 2 semesters	Level 5
Advanced Diploma	2 years / 4 semesters	Level 6
B.Voc Degree	3 years / 6 semesters	Level 7

GRADUATE ATTRIBUTES

The Job Roles, Qualification Packs and NSQF Levels proposed to be covered in each year. Reference :

<http://www.nsdindia.org/nos>

IT-ITeS Sector Skill Council (SSC) : NASSCOM		
QP Code	Job Roles and Descriptions	NSQF Level
At the end of 1st Year (NSQF Level 6)		
SSC/Q0508	<p>Junior Software Developer</p> <p>Entry level roles in the software industry including support and help desk, testing, user interaction design, maintenance, enhancement, development and documentation.</p>	Level 4
SSC/Q2212	<p>Domestic Data Entry Operator</p> <p>Maintain proper entry of required data of customers through use of various data entry software and techniques.</p>	
SSC/Q0110	<p>Domestic IT Helpdesk Attendant</p> <p>Managing and resolving client queries/ issues primarily telephonic through calls</p>	
SSC/Q1301	<p>Test Engineer</p> <p>Responsible for conducting scheduled and unscheduled tests in the areas of integration, performance, and application etc.</p>	Level 5
SSC/Q0503	<p>Web Developer</p> <p>Responsible for designing and maintaining web-based applications that include static and dynamic content. This includes the design, layout and coding of a website.</p>	
SSC/Q0504	<p>Media Developer</p> <p>Responsible for designing and improving the look and feel, functionality and graphic appeal of the developed application.</p>	
SSC/Q0505	<p>Technical Writer</p> <p>Responsible for creating technical documentation related to an application like job-aids, help documents and training material.</p>	
SSC/Q0101	<p>Engineer-Technical Support (Level-1)</p> <p>Manage, co-ordinate and resolve incidents as quickly as possible at primary support level.</p>	
SSC/Q0801	<p>Infrastructure Engineer</p> <p>Provide technical assistance in the installation, configuration, administration, support and maintenance of systems, storage or back-up services of databases etc.</p>	

At the end of 2nd Year(NSQF Level 6)		
SSC/Q0509	<p>Master Trainer for Junior Software Developer</p> <p>Master Trainer for Junior Software Developer will be accountable to train and equip students of Oto 2 years' experience. Major responsibility being to prepare trainees and enable them to procure, and perform to a reasonable extent, at entry level jobs that exist in the IT Services Industry.</p> <p>Entrepreneurship:Enable students to participate and pursue entrepreneurial opportunities arising out of e-governance.</p> <p>Business Process Outsourcer:Enable to undertake and carry out data processing activities in computerized environments. Analyze business operations, trends, costs, revenues, financial commitments.</p> <p>Website Developer:Able to develop websites for various applications .</p> <p>Software Tester:Able to carry out Software testing and debugging activities.</p> <p>Documentation Support:Involvement in preparation and training of software manuals.</p> <p>System Admin : IT administration</p>	Level6
At the end of 3rd Year (NSQF Level 7)		
SSC/Q0501	<p>Software Developer</p> <p>Responsible for using specialized knowledge of software programming languages, software integration and delivery platforms to build software products and deliver business solutions.</p>	Level7
SSC/Q1302	<p>QA Engineer</p> <p>Design and implement Quality Assurance nonns, standards and guidelines to be followed across the organization</p>	
SSC/Q0701	<p>Understand the client's business requirements and translate them into technology requirements for the technology consultants. They act as facilitators in the process of solving and development of the end producVservice.</p>	
SSC/Q0201	<p>Application Maintenance Engineer</p> <p>Responsible for ensuring the availability of an application or product for end users. Such roles provide on-going/ad-hoc support for software products or customized applications aimed towards correction of faults/bugs or improvement of performance.</p>	

SSC/Q0507	<p>Engineer Trainee</p> <p>Responsible for supporting the work area/domain they are aligned to by assisting in performing the key activities and tasks involved.</p>	Level 7
SSC/Q0401	<p>Junior Data Associate</p> <p>Responsible for designing and implementing processes and layouts for complex, large-scale data sets used for modeling, data Management, manipulation, and research purposes.</p>	
SSC/Q1101	<p>Sales and Pre-Sales Analyst</p> <p>Support business development activities such as coordination with stakeholders, creating proposals and bids for project sales</p>	
SSC/Q0901	<p>Security Analyst</p> <p>Ensure the confidentiality, integrity and availability of system and data to the 'right' users within/outside of the organisation.</p>	
SSC/Q0502	<p>UI Developer</p> <p>Responsible for designing User interface for the developed application</p>	
SSC/Q0905	<p>Analyst End Point Security</p> <p>Responsible for troubleshooting and maintaining EPS solutions as well as assisting in installing and configuring EPS solutions as per instructions, when required.</p>	
SSC/Q0909	<p>Analyst Security Operations Centre</p> <p>Responsible for monitoring, analyzing and responding to alarms, raising tickets, follow-up for closure of tickets and any enhancements to existing information security measures.</p>	
SSC/Q0904	<p>Analyst Identity and Access Management</p> <p>Responsible for implementing, maintaining, provisioning and reconciling identity and access management to information technology and data</p>	
SSC/Q0912	<p>Penetration Tester</p> <p>Responsible for testing, identifying vulnerabilities, recording the test results, making reports and enhancing the existing tools and security services.</p>	
SSC/Q0903	<p>Analyst Application Security</p> <p>Responsible for analyzing application deployment architecture, security controls & taking corrective actions</p>	
SSC/Q0907	<p>Analyst Compliance Audit</p> <p>Responsible for conducting compliance audit, reporting and addressing risk issues.</p>	

B. VOC SOFTWARE**DEVELOPMENT PROGRAMME****STRUCTURE**

SEMESTER I								
C.No	Course Code	Course Name	Credit	Marks			Hrs./Week	
				Int	Ext	Tot	T	P
			3	15	60	75	3	3
1.1	A01	English-1	3	15	60	75	3	3
1.2	A02	English-2	4	20	80	100	4	4
1.3	A07(3)	Language other than English-1	4	20	80	100	4	4
1.4	SDC1IT01	Discrete Mathematics	4	20	80	100	4	4
1.5	SDC1IT02	Programming in C	4	20	80	100	4	4
1.6	SDC1IT03(P)	Programming in C - Lab	4		20	80	1	4
1.7	SDC1IT04(P)	Web Programming - Lab	4	20	80	100	1	3
1.8	SDC1IT05(P)	Office Automation & Design - Lab	4	20	80	100	1	3
Ability Enhancement Course - I (Environment Studies)			4					
Semester Total			30			750	20	10

SEMESTER II								
C.No	Course Code	Course Name	Credit	Marks			Hrs./Week	
				Int	Ext	Tot	T	P
2.1	A03	English - 3	4	20	80	100		
2.2	A04	English -4	4	20	80	100	4	4
2.3	A08(3)	Language other than English -2	4	20	80	100	4	4
2.4	SDC2IT06	Programming in Java	4	20	80	100	4	4
2.5	SDC2IT07	Relational Database Management System	4	20	80	100	4	4
2.6	SDC2IT08(P)	Programming in Java - Lab	3	15	60	75		3
2.7	SDC2IT09(P)	RDBMS-Lab	3	15	60	75		3
2.8	SDC2IT10(Pr)	Mini Project (Including Industrial Visit)	4	20	80	100		4

Ability Enhancement Course-II
(Disaster Management)

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SEMESTER III									
IC.No	Course Code	Course Name	Credit	Marks			Hrs/Week		
				Int	Ext	Tot	T	P	Tot
3.1	A11	Basic Mathematics and General Awareness	4	20	80	100	4		4
3.2	A12	Professional Business Skills	4	20	80	100	4		4
3.3	SDC3IT11	Software Engineering	3	15	60	75	3		3
3.4	SDC3IT12	Programming in Python	4	20	80	100	4		4
3.5	SDC3IT13	Computer Networking Concepts	4	20	80	100	4		4
3.6	SDC3IT14(P)	Data Structures Using Java- Lab	4	20	80	100	1	3	4
3.7	SDC3IT15(P)	Programming in Python - Lab	4	20	80	100		4	4
3.8	SDC3IT16(P)	Computer Networking - Lab	3	15	60	75		3	3
	Ability Enhancement Course - III Human Rights\ Intellectual Property Rights\ Consumer Protection (Can opt anyone)		4						
Semester III Total				30		750	20	10	30
SEMESTER IV									
C.No	Course Code	Course Name	Credit	Marks			Hrs/Week		
				Int	Ext	Tot	T	P	Tot
4.1	A13	Entrepreneurship Development	4	20	80	100	4		4
4.2	A14	Public Health, Sanitation & Safety	4	20	80	100	4		4
4.3	SDC4IT17	Operating Systems	4	20	80	100	4		4
4.4	SDC4IT18	Computer Security	3	15	60	75	3		3
4.5	SDC4IT19 E1/E2	E1: J2EE E2: .Net Programming	3	15	60	75	3		3
4.6	SDC4IT20(P)	Operating Systems and Computer Security - Lab	4	20	80	100		4	4
4.7	SDC4IT21 (P)	E1: J2EE - Lab E2: Dot Net Programming- Lab	4	20	80	100		4	4
4.8	SDC4IT22(Pr)	Project Work/ Internship (Including Industrial Visit)	4	20	80	100		4	4
	Ability Enhancement Course (Audit Course)- IV Gender Studies\ Gerontology (Can opt any one)		4						
Semester IV Total				30		750	19	11	30

SEMESTER V									
C.No	CourseCode	CourseName	Marks				Hrs/Week		
			Credit	Int	Ext	Tot	T	P	Tot
5.1	SDC5IT23	Big Data Analytics	3	15	60	75	3		3
5.2	SDC5IT24	Machine Learning and Artificial Intelligence	3	15	60	75	3		3
5.3	SDC5IT25	Cloud Computing	3	15	60	75	3		3
5.4	SDC5IT26	Android App Development	3	15	60	75	3		3
5.5	SDC5IT27 E1 / E2 / E3 / E4	E1: Data Base Administration E2: Quality Assurance & Testing E3: Internet of Things(IoT) E4: Financial and Management Accounting	3	15	60	75	3		3
5.6	SDC5IT28(P)	Android App Development- Lab	4	20	80	100		4	4
5.7	SDC5IT29(P)	Machine Learning and AI - Lab	3	15	60	75		3	3
5.8	SDC5IT30(P)	Big Data Analytics - Lab	4	20	80	100		4	4
5.9	SDC5IT31 (P)	Cloud Computing & Electives - Lab Opt anyOne(OBA/Testing/IOT/Tally)	4	20	80	100		4	4
Semester V Total			30			750	16	14	
SEMESTER VI									
C.No	Course Code	Course Name	F-Marks				Hrs/Week		
				Ext	Tot	T	P	Tot	
6.1	SDC6IT32	Term paper	2	50	-	50			
6.2	SDC6IT33(Pr)	Internship & Project (900hrs.)	28					900	900
		Internship		40	160	200			
		Project		40	160	200			
Semester VI Total			30			450			900
Grand Total			180			4200			

SEMESTER1

SDC1IT01 Discrete Mathematics

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Hours Per Week:4 Total hours: 64
(This course taken from BCA programme: Course code: CA1 CO2)	
Course Objectives	
<ol style="list-style-type: none">1. To learn the mathematical logic & Boolean Algebra2. To learn the basic principles of set theory and graph theory.3. To learn mathematical modeling using ordinary and partial equations.	
Course Outcomes:	
<p>CO-1: Understand mathematical logic and Boolean algebra.</p> <p>CO-2: Evaluate Boolean functions and simplify expression using the properties of Boolean algebra</p> <p>CO-3: Understand some basic properties of graphs and related discrete structures, And be able to relate to practical examples</p> <p>CO-4: Understand some basic properties of trees and related discrete structures</p> <p>CO-5: Demonstrate different traversal methods for trees and graphs.</p>	

Course Outline:

Module I (12Hrs.)

Mathematical Logic: Propositions and logical operators, Truth tables, equivalence and Implementation, Laws of logic, Quantifiers.

Module II (12 Hrs.)

Boolean Algebra and its properties, Algebra of propositions & examples, De-Morgan's Laws, Partial order relations, greatest lower bound, least upper bound, Algebra of electric circuits & its applications. Design of simple automatic control system

Module III (14 Hrs.)

Graph: Simple and multigraph, Incidence and degree, Isomorphism, Sub graphs and Union of graphs, connectedness, Walks, Paths and Circuits, Euler's Formula, Eulerian graph, Hamiltonian graph, Chromatic Graphs, Planer Graphs, Travelling salesman problem, Complete, Regular and Bipartite graphs, Directed Graphs

Module IV (14 Hrs.)

Trees: Properties of trees, pendant vertices. Centre of a tree, rooted and binary trees, spanning trees, spanning tree algorithms, fundamental. Circuits; spanning trees of a weighted graph: cut sets and cut-vertices; fundamental cut sets; connectivity and separativity network. flows; max-flow min- cut theorem.

Module V (12 Hrs)

Plan on graphs, dual graphs, Kuratowski's two graph, matrix representation of graphs, incidence matrix, directed graphs, digraphs, directed paths and connectedness. Euler digraphs

Textbooks

1. Discrete Mathematical Structures with applications to Computer Science, J.K. Tremblay and R. Manohar, McGraw Hill

References:

Elements of Discrete Mathematics, C. L. Liu, TMH Edition Discrete mathematical Structures, Kolman, Busby, Ross, Pearson Graph theory, Harry, F., Addison Wesley.
 Finite Mathematics, S. Lipchutz, Schaum Series, MGH.
 Graph Theory, Deo. N, PHI

SDC1IT02 -PROGRAMMING IN C

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Hours Per Week:4 Total hours: 64
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Course Objectives

1. Understand the basics and background of computer system and its component
2. Understand the basics of computer programming
3. Write programs for solving simple computational problems using C.

Course Outcomes:

- CO-1:** Read, understand and trace the execution of programs written in C language.
- CO-2:** Write the C code for a given algorithm.
- CO-3:** Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
- CO-4:** Write programs that perform operations using derived data
- CO-5:** Choose the right data representation formats based on the requirements of the problem

Course Outline

Module I (10Hrs)

Computer system concepts, Computer system characteristics, Generation of computer, Introduction to Programming:- The problem solving aspect, Top-Down design, Algorithms and flowcharts, Implementation of algorithms, Program verification, efficiency of algorithms, Web Software Categories of Programming Languages: Machine Level Languages, Assembly Level Languages, High Level Languages Programming Design, Number system representation:- Binary, Decimal, Octal, Hexadecimal, Conversion from one number system to another, binary arithmetic. Addition, subtraction, multiplication, division.

Module II (10 Hrs)

Introduction to C Programming, overview and importance of C, C Program Structure and Simple programs, Creation and Compilation of C Programs under Linux and Windows Platforms. Elements of C Language and Program constructs, C -operators, arithmetic expressions, evaluation of expressions and precedence, Type conversion in expressions, operator precedence and associativity, I/O operations.

Module III (11 Hrs)

Decision making, Branching and Looping. Arrays & Strings one dimensional array, two dimensional array and multidimensional array, strings and string manipulation functions, bitwise operations, debugging.

Module IV (15 Hrs)

The Concept of modularization and User defined functions Multifunction Program, calling functions, various categories of functions, nesting of functions and recursion, functions and arrays, scope and lifetime of variables in functions, multi file programs. Structures and Union: structure definition, giving values to members, structure initialization, comparison of structure variables, arrays of structures, arrays within structures, structures within arrays, nested structures, structures and functions, Unions, bit fields

Module V (18 Hrs)

Pointers and Files: Understanding pointers, accessing the address of a variable, declaring and initializing pointers, accessing a variable through its pointer, pointer expressions, pointer and arrays, pointer and character string, pointers and functions, pointers and structures, pointer to pointer, dynamic memory allocation.

Files: Defining, Opening and closing files I/O operations on files - error handling on files random access of files command line operations. Preprocessor directives: Macro substitution directives

simple macro, macros with arguments nesting of macros, Compiler control directives, Command line arguments.

Reference Books

E. Balaguruswamy, Programming in ANSI C.

Yashwant Kanithkar, Let us C.

M Morris Mano, Computer System Architecture

William Stallings, Computer Organization & Architecture, PHI

SDC1IT03 (P) -PROGRAMMING IN C - LAB

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Hours Per Week:4 Total hours: 64
Course Objectives	
<ol style="list-style-type: none">1. To make the student learn a programming language.2. To learn problem solving techniques.3. To teach the student to write programs in C and to solve the problems	
Course Outcomes:	
<p>CO-1: To impart adequate knowledge on the need of programming languages and problem solving techniques.</p> <p>CO-2: To develop an in-depth understanding of functional and logical concepts of C Programming.</p> <p>CO-3: Recollect various programming construct like decision making, branching and looping to develop c programs</p> <p>CO-4: Implement different Operations on arrays, functions, structures & unions</p> <p>CO-5: Implement different Operations on pointers, and files.</p>	

Course Outline

Basic C Programming:

1. Write a program to print sample strings like "hello world", "Welcome to C Programming" with different formats using escape sequences.
2. Write a Program to print different data types in 'C' and their ranges.
3. Write a Program to initialize, assignment & printing variables of different datatypes.

Operators

4. Write Program to demonstrate arithmetic operators. (+,-,*,/,%)

5. Write Program to demonstrate logical operators. (logical AND, logical OR)
6. Write Program to read radius value from the keyboard and calculate the area of circle and print the result in both floating and exponential notations.
7. Write Program to calculate simple interest.
8. Write Program to convert temperature. (Fahrenheit -Centigrade and vice-versa).
9. Write Programs to demonstrate relational operators.(<, >, <=, >=, ==, !=)
10. Write a program to check equivalence of two numbers using conditional operator.
11. Write a Program to demonstrate pre increment and post increment. (++a, a++ where a is a value to be initialized)
12. Write a Program to demonstrate pre decrement and post decrement. (--a, a-- where a is a value to be initialized)
13. Write a program for computing the volume of sphere, cone and cylinder assume that dimension is integer's use type casting where ever necessary?

Decision Statements

14. Program to read marks of a student in six subjects and print whether pass or fail (using if- else).
15. Write a Program to calculate roots of quadratic equation (using if-else).
16. Program to calculate electricity bill. Read starting and ending meter reading.
 - a. The charges are as follows.
 - b. No. of Units Consumed Rate in (Rs.)
 - c. 1-100 1.50 per unit
 - d. 101-300 2.00 per unit for excess of 100 units
 - e. 301-500 2.50 per unit for excess of 300 units
 - f. 501-above 3.25 per unit for excess of 500 units

Switch operations

17. Write Program to perform arithmetic operations using switch case.
18. Write Program to display colors using switch case (VIBGYOR).
19. Write Program to display vowels and consonants using switch case.
20. Write Program to display names of days in a Week using switch case.

Basic Loop operations (Do the Following Programs Using for, while, do-while loops.)

21. Write program to calculate sum of individual digits of a given number.
22. Write program to check whether given number is palindrome or not.
23. Write program to print prime numbers in the given range.
24. Write program to display multiplication tables from 1 to 10 except 3 and 5.

Advanced loops

25. Write program to print the Fibonacci series for given 'N' value.
26. Write program to check whether a given number is a Fibonacci number or not.
27. Write program to read 2 numbers x and n then compute the sum of the Geometric Progression. $1+x+x^2+x^3+\dots+x^n$
28. Write a program to Pascal Triangle.

Arrays, Strings & Functions

1-D Arrays

29. Write program to store 10 elements in the 1-D array and print sum of the array.
30. Write program to print minimum and maximum elements in the 1-D array.
31. Write program to count no. of positive numbers, negative numbers and zeros in the array.
32. Write program to search the given element by using linear search.
33. Write program to sort the given elements using bubble sort technique.

2-D Arrays

34. Write program to perform matrix addition and matrix subtraction.
35. Write program to perform matrix multiplication by checking the compatibility.
36. Write program to print the transpose of a matrix.

Strings

37. Write program to perform various string manipulations using built-in functions.
38. Write program to print the given strings in ascending order.
39. Write program to verify the given string is palindrome or not (without built-in functions, with using built-in functions).
40. Write program to concatenate two strings using arrays.

Functions

41. WAP to find sum of two numbers using functions.
42. WAP to find product of two numbers using functions without arguments, without return type.
43. WAP to find difference of two numbers using functions without arguments, with return type.
44. WAP to find sum of two numbers using functions with arguments & without return type.

Functions, Recursion and Pointers

45. Write program to swap two numbers using Call by Value and Call by Reference.
46. Write a program to calculate factorial, gcd using recursion and non-recursion functions.
47. Write program to perform arithmetic operations using pointer.
48. Write a program matrix addition using pointers.

Structures

49. WAP to create structure for an account holder in a bank with following Fields: name, account number, address, balance and display the details of five account holders.
50. WAP to find total marks of individual student & average marks of 10 students using structure.

File: (File operations using command line arguments)

51. WAP to copy the contents of one file to another file using command line arguments.
52. Write a program to reverse the first n characters in a file use command line arguments.

Reference Books:

1. Problem Solving and Program Design in C, 4th edition, by jeri R. Hanly and Elli B. Koffman.
2. E. Balaguruswamy, Programming in ANSIC

SDC1IT04 (P) WEB PROGRAMMING - LAB

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits :4 Hours Per Week:4 Total hours: 64
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!Course Objectives

1. Understand and Practice web development
2. Get hands on interactive Html, CSS, JavaScript, Bootstrap PHP
3. Develop and design web application having images and animations

Course Outcomes:

- C0-1:** Understand the important HTML tags for designing static pages and separate design from content using Cascading Style sheet.
- C0-2:** Design and develop web pages using CSS styles, internal and/or external style sheets.
- C0-3:-** Develop interactive web applications using HTML, CSS, JavaScript and XML.
- C0-4:-** To develop the ability to build efficient web based applications using PHP
- C0-5:-** To learn the basic constructs in PHP Programming.

Course Outline

Basics of HTML (10 Hrs.)

1. The Introduction of HTML Documents
2. Illustration of Body and pre Tag
3. Illustration of text Formatting & Text font tags

4. Illustration of background image and color
5. Illustration of List tags (Ordered, Unordered, Nested List)
6. Illustration of Tables tags and Frame tags
7. Illustration of Hypertext Tag
8. Illustration of Image Tags
9. Illustrations of Forms and Attributes
10. Managing Forms
11. Create Simple Webpages using the above

CSS & JavaScript (22 Hrs.)

12. Illustrations of CSS properties and attributes
13. Illustration of selectors in CSS
14. Illustration of box model in CSS
15. Illustration of form validation
16. Create a webpage which displays "Hello World" with font size 20 pixels, bold format, in "Times New Roman" font green in color using Inline CSS, Embedded CSS & External CSS.

JavaScript

17. Write a JavaScript program to find the area and circumference of a circle (use form)
18. Write a program to find the sum of the digits and reverse of a number (use form).
19. Write a JavaScript program using 3 dialog boxes (alert, prompt, confirm)
20. Write a JavaScript program for validating the Email registration form.
21. Write a JavaScript program to create a color palette and change the background color (using mouseover event).
22. Write a JavaScript program to change the background color of the document using an array of colors. (Array)
23. Validating Form Entries
24. Browser detection and Browser compatibility checking for website.

Basics of PHP (32 Hrs.)

25. Write a PHP program to store current date/time in a cookie and display the 'last visited on' date/time on the web page upon reopening of the same page.
26. Write a program to demonstrate session.
27. Create a PHP program to display the biodata of a person in a table format, by reading the personal details using an HTML page.
28. Create a table "product" with fields itemcode, itemname, unitprice using MySQL. Write PHP program to insert records into the table and display the items in a table format.

29. Write a PHP program for insert, delete, update and display operation on account table. The account table contains fields such as account no, name and amount.
30. Create a MySQL table student with fields roll no, name, mark, grade. Write a PHP program to insert data and display the mark list of a student by accepting the register no of the student.
31. Create a login page using MYSQL database Integrating Web forms using PHP.
32. Programs implementing features of PHP Built-in Support for layout, grids, fluid grids, and responsive designs using Bootstrap.
33. Create a small website using PHP

SDC11T0S (P) - OFFICE AUTOMATION & DESIGN LAB

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits: 4 Hours Per Week:4 Total hours: 64
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Course Objectives

1. Understand the need and working of Design Software's and its tools.
2. Learn the basic principles of design.
3. Learn to create interactive design content for Web & Social Media.

Course Outcomes:

- CO-1:**By learning the course, the students will be able to perform documentation Gain proficiency in identified technical skills, understand the process of word,
- CO-2:** To create Social Media Advertisements.
- CO- 3:** To create informatics video content for presentation. To establish as an Interactive content designer for Digital media.
- CO- 4:** To design Website layout and elements.

Course Outline MS

Word (10 Hrs.)

1. Using word to create project certificate.
2. Creating project abstract Features to be covered: -Formatting Styles, inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.
3. Creating a Newsletter: Features to be covered: -Table of Content, Newspaper columns, Images from files and clipart, drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs

4. Creating a Feedback form- Features to be covered- Forms, Text Fields, Inserting objects, Mail Merge in Word

MS Excel (15 hrs.)

1. Creating a Scheduler - Features to be covered: Gridlines, Format Cells, Summation, auto fill, Formatting Text
2. Calculations - Features to be covered: - Cell Referencing, Formulae in excel - average, standard deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP
3. Performance Analysis - Features to be covered: - Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting
4. Cricket Score Card - Features to be covered: -Pivot Tables, Interactive Buttons, Importing Data, Data Protection, Data Validation
5. Create a Google Excel sheet with 4 sheets for displaying the internal mark of students

MS PowerPoint (10 hrs)

6. PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting, Images, Clip art, Video, Objects, Tables & Charts
7. Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide sorter, notes etc.), Inserting - Background, textures, Design Templates, Hidden slides. Auto content wizard, Slide Transition, Custom Animation.
8. A PPT presentation with 10 slides

Illustrator/ Inkscape, Photoshop/GIMP (29 Hrs.)

Basic designing concept using Photoshop /GIMP& Illustrator/ Inkscape

9. Image processing, RAW image editing, Hue & Saturation, Levels & Curves, Filters
10. Photo editing, Different types of selection Techniques, Retouching a photograph
11. Masking & Slicing Tools
12. Visiting Cards.
13. Brochures
14. Logo designing (Illustrator/Inkscape)
15. Vector design- SVG Files Creation, Create SVG Animation (character, shapes, products in Illustrator/Inkscape)
16. Web layout design (Photoshop/GIMP)
17. Web Adds- GIF, SVG (Adobe Animate)
18. Create Animated Web banner

SDC21T06 PROGRAMMING IN JAVA

100 Marks [Internal: 20, External: 80] Examination : 2.5 Hours	Credits:4 Hours Per Week:4 Total hours: 64
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Course Objectives

1. Learn the OOPS Concept and use object oriented approach for solving real life problems
2. To learn the core Java language
3. To demonstrate skills in writing programs using exception handling techniques and multithreading.
4. To understand streams and efficient user interface design techniques
5. Develop GUI based applications using java

Course Outcomes:

- C0-1:** To Familiarize Java programming Constructs
- C0-2:** To solve the inter-disciplinary applications using the Basic Principles of OOPs(Class, Object Inheritance, Polymorphism etc.) and Packages
- C0-3:** To familiarize the concepts of Threads, Synchronization, Files and facilitate students in handling exceptions
- C0-4:** To Learn Common abstract user interface components to design GUI in Java using Applet, AWT and Swing
- C0-5:** Apply JDBC to provide a program level interface for communicating with database using java programming

Course Outline:

Module I (14 Hrs.)

Java Basics- Review of Object oriented concepts, History of Java, Java buzzwords, JVM architecture, Byte code, Features of Java, Language Components - Primitive Data Types, Keywords, variables, literals, Control structures - Decision Making Statements, Looping Statements, Jump Statements, Operators and Expressions - Casts and Conversions, Arrays. Simple java program, constructors, methods, Static block, Static Data, Static Method String and String Buffer Classes.

Module II (14 Hrs.)

Inheritance and Polymorphism: Basic concepts, Types of inheritance, Member access rules, Usage

of this and Super key word, Method Overloading, Method overriding, Abstract classes, Dynamic method dispatch, Usage of final keyword.

Packages and Interfaces: Defining package, Access protection, importing packages, Defining and Implementing interfaces, and Extending interfaces.

I/O STREAMS: Concepts of streams, Stream classes-Byte and Character stream, reading console Input and Writing Console output, File Handling.

Module III (10 Hrs)

Exception Handling: Exception types, Usage of Try, Catch, Throw, Throws and Finally keywords, Built-in Exceptions, Creating own Exception classes. MULTI THREADING: Thread, Thread lifecycle, creating threads using Thread class and Runnable interface, Synchronization, Thread priorities, Inter Thread communication

Module IV(14 Hrs)

Applets -Hierarchy of Applet, Life Cycle of Applet, Applet tag, Display Graphics and Animation in Applet. AWT Controls - The AWT class hierarchy, user interface components- Labels, Button, Text Components, Check Box, Check Box Group, Choice, List Box, Panels - Scroll Pane, Menu, Scroll Bar. Working with Frame class, Colour, Fonts and layout managers. Event Handling- Events, Event sources, Event Listeners, Event Delegation Model (EDM), Handling Mouse and Keyboard Events, Adapter classes, Inner classes. Swings: Introduction to Swings, Hierarchy of swing components. Containers, Top level containers - JFrame, JWindow, JDialog, JPanel, JButton, JToggleButton, JCheckBox, JRadioButton, JLabel, JTextField, JTextArea, JList, JComboBox, JScrollPane

Module V (12Hrs)

Swing and JDBC: JDBC: introduction, architecture, Drivers, connections, statements, result set and Meta data, Transactions, creating Java Packages.

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1. Java Complete Reference, Herbert Scheidt, Tata McGraw hill edition.
2. Programming in Java, E Balaguruswamy
3. Java Enterprise in a nutshell, David Flanagan, Jim Farley, William Crawford & Kris Mangnusson, OReilI
4. Head First Java, O'rielly publications
5. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition, Pearson Education, India.
6. J. Nino, F. A. Hosch (2002), An Introduction to programming and design using Java, John Wiley & sons, New Jersey. 4. V. Daniel Liang

SDC2IT07-RELATIONALDATABASE MANAGEMENT SYSTEM

100 Marks [Internal: 20, External: 80] Examination : 2.5 Hours	Credits: 4 Hours Per Week:4 Total hours: 64
Course Objectives	
<ol style="list-style-type: none">1. Understand the need and working of Data Base and Data Base Management Systems.2. Learn the basic principles of database models and database design.3. To understand essential DBMS concepts such as: database security, integrity and normalization.4. Learn the basics of RDBMS and data manipulation using SQL.5. To study PUSQL language	
Course Outcomes:	
<p>C0-1: Describe the fundamental concepts of database management systems</p> <p>C0-2: Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.</p> <p>C0-3: Improve the database design by normalization.</p> <p>C0-4: populate relational database and formulate SQL queries on data</p> <p>C0-5: To learn PUSQL Programming Constructs (Trigger, Cursor, Stored Procedure)</p>	

Course Outline

Module I (12Hrs.)

Introduction to database systems, Purpose of Database System, File Systems Versus a DBMS, View of data - Data abstraction, Data models, Instances and Schemas, Query Processor, Data Independence, Database Languages and Interfaces, Database architecture and Three Level Architecture, Database users and Administrators

Module II (12 Hrs.)

Entity-Relationship Model - Conceptual Data Models for Database Design Entity Relationship Models, Concept of Entity, Entity Sets, Relationship Sets, Attributes, Domains, Constraints, Keys, Strong and Weak Entities, Concepts of EER, Relational Data Model - Introduction to the Relational Model Relations, Domains and Attributes, Tuples, Keys. Integrity Constraints over Relations,

Enforcing Integrity constraints, Relational Algebra and Operations, Relational Calculus and Domain Calculus, Logical data base Design: ER to Relational.

Module III (12 Hrs.)

Relational Database Design - Relational database design Anomalies in a Database, Normalization Theory, Functional Dependencies, First, Second and Third Normal Forms, Relations with more than one Candidate Key, Good and Bad Decompositions, Boyce-Codd Normal Form, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form.

Module IV (13 Hrs.)

SQL Concepts: Basics of SQL, DDL, DML, DCL, Tables - Create, Modify and Delete table structures, Rename and Drop tables, defining constraints - Primary key, foreign key, unique, not null, check, IN operator Computations done on table data - Select command, Logical operators, Range searching, Pattern matching, grouping data from tables in SQL, GROUP BY, HAVING clauses, Joins - Joining multiple tables, joining table to itself, Views - Creation, Renaming the column of a view, destroys view

Module V (15 Hrs.)

Program with SQL - Data types: Base and Composite, Attributes . Variables - Constants - Using set and select commands, Control Structures, IF, IF THEN ELSE, IF THEN ELSEIF, CASE. Loops: LOOP, EXIT, CONTINUE, WHILE, FOR, and FOREACH, Security - Locks, types of locks, levels of locks. Cursors - Working with cursors, Error Handling, developing stored procedures, create, alter and drop, passing and returning data to stored procedures, using stored procedures within queries, building user defined functions, creating and calling a scalar function, implementing triggers, creating triggers multiple trigger interaction.

Reference Books:

1. John Watson, OCA Oracle Database 12c Installation and Administration Exam Guide
2. Paul Nielsen, Microsoft SQL Server 2000 Bible, Wiley Dreamtech India Pubs
3. CJ Date, Introduction to Database Systems, Addison Wesley.
4. Silberschatz, Korth, "Data base System Concepts", 4th ed., McGraw hill, 2006.
5. Raghu Ramakrishnan and Johannes Gehrke, Database Management Systems (3/e), McGraw Hill, 2003
6. <https://docs.oracle.com>

SDC21T08 {P} - PROGRAMMING IN JAVA - LAB

75 Marks [Internal: 15, External: 60] Examination: 2 hrs	Credits: 3 Hours Per Week: 3 Total hours: 48
Course Objectives	
<ol style="list-style-type: none">1. To practice programming in Java.2. To learn GUI Application development in JAVA.3. Capable to build database connectivity programs using JDBC	
Course Outcomes	
<p>001: Able to write programs for solving real world problems</p> <p>CO2: Apply the concepts of polymorphism and inheritance for problem solving in Java. Implement the concepts of packages and interfaces</p> <p>003: Develop programs for exception handling, multi-threading and 10 application programs</p> <p>004: Design GUI applications using Applet and swing components</p> <p>COS: Build database connectivity programs using JDBC</p>	

Course Outline

Java Programs using Basic Language Constructs - (8 Hrs)

1. Simple Java programs like computing formulas expressions etc.
2. Write a program to find the distance between two points.
3. Write a program to find the sum, difference, product, quotient and remainder of two numbers passed as command line argument.
4. Read an array of 10 or more numbers and write a program to find the smallest element in the array
b) Largest element in the array c) Second largest element in the array.
5. Write a program to perform base conversion
 - a. Integer to binary
 - b. Integer to Octal
 - c. Integer to Hexadecimal
6. Write a program to verify DeMorgan's Law
7. Write a program to merge two arrays.
8. Write a program to find the trace and transpose of a matrix .
9. Program to find the sum of the digits and reverse of a given number using class & objects
10. Program to find the volume of cube, rectangular box, cylinder using function overloading.

Inheritance, Polymorphism, Interface and Packages - (8 Hrs.)

11. Create a class student with methods to read and display the student details. Create a derived class result with methods to read marks of 5 subjects. Write a java program to display the total and grade of students, creating objects of class result.
12. Create a class Employee with ID, Name Designation and Dept. Create a child class salary with Basic, HRA, DA and Allowance . Write a program to compute the net salary assuming that HRA is 1250, DA, Allowance are 110% and 35% of the Basic salary.
13. Create an interface calculator having methods to perform basic arithmetic operation. Write a program to implement the interface to perform operation on integer and float values.
14. Create a class factorial with a method that accept a number and return its factorial in package P1. Using the factorial class, write a program to find the factorial of a number.

Exceptions, Threads, I/O Streams -- (10 Hrs.)

15. Write a program to handle arithmetic exception.
16. Write a multi thread java program for displaying odd numbers and even numbers up to a limit (Hint Implement thread using Runnable interface).
17. Write a multi thread java program for displaying numbers ascending and descending order
18. Write a program to copy a file to another. Pass the file names as command line arguments.

Applet, AWT, Swing -- (10 Hrs.)

19. Write JAVA program to paint like paint brush in applet.
20. Write JAVA program to display analog clock using Applet.
21. Write JAVA program to create different shapes and fill colors using Applet.
22. Write JAVA program that display the x and y position of the cursor movement using Mouse.
23. Write JAVA program that identifies key-up key-down event user entering text in a Applet
24. Write JAVA program to build a Calculator in Swings
25. Write JAVA program that to create a single ball
26. Create an Applet for displaying smiling face.
27. Create an Awt application to add.remove items in a listbox.
28. Create an Awt application to select gender using radio buttons

Implement JDBC with MySQL Database - (12 Hrs)

29. Write a program to display IP address of the system.
30. Write a program to implement echo server (A server that echoes the messages the client sends)
31. Create a database table employee (id, name, design, dept.). Write a program to list the
32. employees using JDBC.
33. Write a program to insert a new employee record to the above table To find the sum of command line arguments and count the invalid integers entered.

SDC21T09(P) RDBMS-LAB

75 Marks [Internal: 15, External: 60] Examination : 2 Hours	Credits: 3 Hours Per Week:3 Total hours: 48
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!CourseObjectives

1. To explain basic database concepts, applications, data models, schemas & instances.
2. To demonstrate the use of constraints and relational algebra operations.
3. Describe the basics of SQL and construct queries using SQL.
4. To facilitate students in Database design
5. To study PUSQL language

Course Outcomes:

CO-1: Apply the basic concepts of Database Systems and Applications .

CO-2: Use the basics of SQL and Formulate queries using SQL DMUDDL/DCL Commands in database creation and interaction.

CO-3: Design a commercial relational database system (Oracle, MySQL) by writing SQL using the system.

CO-4: Capable to build and Manage PUSQL Programs

Course Outline

Lab Exercises

1. Create a table employee with fields (EmpID, EName, Salary, Department, Age). Insert some records.

Write SQL queries using aggregate functions for

- a) Display the total number of employees.
- b) Display the age of the oldest employee of each department.
- c) Display departments and the average salaries
- d) Display the lowest salary in employee table
- e) Display the highest salary in sales department;

2. A trading company wants to keep the data of their Order Processing Application using the following relations.

Customer _Master

Customer_Number - Primary Key

Customer_Name - Not NULL

Address -

Pincode-

Order _Master

Order_Number- Primary Key

Order_date- Not NULL

Customer_Number- Refers Customer_master table

Order_amount - Not NULL

Order_Detail

Line_Number- Primary Key

Order_Number- Primary Key

Item_No - Not NULL, Refers ITEM table

Quantity- Not NULL

ITEM

Item_No - Primary Key

UnitPrice - Not NULL

SHIPMENT

Order_Number- Primary Key

Warehouse_No - Primary Key, Refers Warehouse table

Ship_Date - Not NULL with Integrity Check **WAREHOUSE**

Warehouse_No - Primary Key

City - Not NULL

- a) Create the above tables by properly specifying the primary keys and foreign keys.
- b) Enter at least five tuples for each relation.
- c) Produce a listing : Cust_Name, No_of_orders, Avg_order_amount, where the middle column is the total number of orders by the customer and the last column is the average order amount for that customer.
- d) List the Order_Number for orders that were shipped from **a**// the warehouses that the company has in a specific city.
- e) Demonstrate the deletion of an item from the ITEM table and demonstrate a method of handling the rows in the ORDER_ITEM table that contains this particular item.

3. In this session you need to create database for an Employee management system of an ABC organization. The details about different tables are given below. According to that you can proceed further and create tables using PostgreSQL/MySQL Create the following tables with the specified constraints:

Department:

Department Number- Primary Key

Department Name - Not NULL unique

Manager ID - Refers to EmployeeID of employee table.

Manager

Date of Joining - Not NULL.

Employee:

FirstName-NotNULL

Middle Initials

Last Name - Not NULL

Employee ID- Primary Key

Date of Birth- Not NULL

Address

Gender-MorF

Salary-Range of 5000 to 25000

Date of Joining

Department Number - Refers to Department Number of Department table.

Department location:

Department Number - Refers to Department number of department table. Department

Location - Not NULL.

Department number & Department location are combined Primary Key

Project:

Project Name - Not NULL. Project

Number - Primary Key. Project

Location - Not NULL.

Department number - Refers to department number of Department table.

Works-on:

EmployeeID-NotNULLreferstoEmployeeIDofEmployee table.Project

Number-NotNULLreferstoProject number ofProject table.Hours-Not
NULL.

Employee ID & Project Number are combined primary key.

Dependent:

EmployeeID-Refertoemployee tableEmployeeIDfield

Dependent Name - Gender- M or F

Date of Birth - Not NULL

Relationship - Not NULL

Now enter a few sets of meaningful data and answer the following queries.

- a) List the department wise details of all the employees.
 - b) Find out all those departments that are located in more than one location.
 - c) Find the list of projects.
 - d) Find out the list of employees working on a project.
 - e) List the dependents of the employee whose employee id is 001
4. These sessions is similar to the previous one, but in this session, assume that you are developing a prototype database of the College library management system, for that you need to create the following tables:

Book Records Book

details

Member details and

Book issue details

Book Records: Accession Number ISBN Number

Books: ISBN Number Author Publisher Price

Members: Member ID Member Name Maximum Number of books that can be issued
Maximum Number of days for which book can be issued

Book Issue: Member ID Accession Number Issue Date Return Date You

must create constraints, including referential integrity constraints, as appropriate.

Please note accession number is unique for each book. A book, which has no return date, can be considered as issued book. Enter suitable data into the tables. Now answer the following:

- a) Insert data in all the three tables (use insert).
- b) Insert appropriate description associated with each table and the column (use comment).
- c) Display the structure of the tables.
- d) Display the comments that you have inserted.
- e) Using SELECT statement, write the queries for performing the following function:
 - i. Get the list of all books (No need to find number of copies).
 - ii. Get the list of all members.
 - iii. Get the Accession number of the books which are available in the library.
 - iv. On return of a book by a member calculate the fine on that book.
 - v. List of books issued on 01-Jan-2005.
 - vi. Get the list of all books having price greater than Rs. 500/-
 - vii. Get the list of members who did not have any book issued at anytime.
 - viii. Get the list of members who have not returned the book.
 - ix. Display member ID and the list of books that have been issued to him/her from time to time.
 - x. Find the number of copies of each book (A book accession number would be different but ISBN number would be the same).
 - xi. Find the number of copies available of a book of given ISBN number.
 - xii. Get the member ID and name of the members to whom no more books can be issued, because they have already got as many books issued as the number for which they are entitled.

5. This session is based on Lab 2 where you have created a library management system. In this session you have different query specification. You must create appropriate forms, reports, graphs, views and data filtering, use of multilevel report, etc. to answer these queries.
 - a) Get the list of ISBN-Number, Book name, available copies of the books of which available copies are greater than zero.
 - b) Get the list of ISBN-Number, Book name, Total copies, available copies of the book of which available copies are greater than zero. List should be displayed in alphabetical order of book name.
 - c) Get the list of ISBN number, Book name, Author, total copies, cost (cost is price totalcopies). List should be displayed in descending order of cost.
 - d) Get the list of books issued to each member.
 - e) Write query to know the maximum and average price of the books.
 - f) Get the list of all existing members and the number of days for which a member is allowed to keep the book. Also find out the members who have got the maximum number of books issued.
 - g) Get the list of member codes of those members who have more than two books issued.
 - h) Find the details of the books presently issued to a member.
 - i) Create the history of issue of a book having a typical accession number.
 - j) To set the width of the book name to 35.
6. Create the following table and perform the necessary tasks defined below one by one. You must use the query tools/ SQL/ Reports/ Forms/ Graphs/Views/ using client/server wherever needed. Create the following table named customer

Column name	Type	size
Customer ID	Character	10
Name	Character	25
Area	Character	3
Phone	Numeric	7

Insert the appropriate data into table and do the following.

- a) Update Phone numbers of all customers to have a prefix as your city STD Code
 - b) Print the entire customer table
 - c) List the names of those customers who have e as second letter in their names.
 - d) Find out the Customer belonging to area "abc".
 - e) Delete record where area is NULL.
 - f) Display all records in increasing order of name.
 - g) Create a table temp from customer having customer-id, name, and area fields only
 - h) Display area and number of records within each area (use GROUP by clause)
 - i) Display all those records from customer table where name starts with "a" or area is "abc".
 - j) Display all records of those where name starts with "a" and phone exchange is 55.
7. Answer the following queries using Library system as created earlier. You must create a view to know member name and name of the book issued to them, use any inbuilt function and operators like IN, ANY, ALL, EXISTS.
 - a) List the records of members who have not been issued any book using EXISTS operator.

- b) List the members who have got issued at least one book (use IN/ ANY operator).
 - c) List the books which have maximum Price using ALL operator.
 - d) Display Book Name, Member Name, and Issue date of Book. Create a view of this query of the currently issued books.
- 8.** Create a table of Employee (emp_number, name, depLnumber, salary) and Department (depL number, depLname). Insert some records in the tables through appropriate forms having integrity checks. Add some records in employee table where department value is not present in department table. Now answer the following query:
- a) Display all records from employee table where department is not found in department table.
 - b) Display records from employee table in a report format with proper headings. This report must also contain those records where department number does not match with any value of department table.
 - c) Display those employee records who have salary less than the salary of person whose
 - d) emp_number= A100.
 - e) Create another table: SalesData (RegionCode, City, SalespersonCode, SalesQty).
 - f) Display records where salesperson has achieved sales more than average sales of all sales persons of all the regions.
- 9.** Create the following tables:
- Order party: (Order number, Order date, customer code)
- Order: Order number, Item code, Quantity
- a) The key to the second table is order-number+ item-code
 - b) Create a form for data entry to both the tables.
- 10.** Create a table shop with fields Item_ID, Item_Name, Price, and Quantity. Write a procedure 'sales' to update the quantity by accepting Item_ID and Quantity as argument.
Write PostgreSQL block to invoke the procedure
- 11.** Implement student information system
- 12.** SQL scripts to display various reports like Result of an Examination, Salary Report, Sales Report, Sales reports grouped on Sales person or item, etc
- 13.** Write simple PostgreSQL anonymous blocks for displaying whole numbers from 1 to 100, odd numbers from 1 to 100, even numbers from 1 to 100, positive whole numbers up to a given number, odd numbers from 1 to a given number, even numbers from 2 to a given number, Fibonacci numbers up to 100, Strange numbers up to 1000, factorials of the numbers from 1 to 10, etc.
- 14.** Create a table product with the fields(Product_code primary key, ProductName, Category, Quantity, Price). Insert some records Write the queries to perform the following.
- a) Display the records in the descending order of Product_Name
 - b) Display ProductCode, ProductName with price between 20 and 50
 - c) Display the ProductName and price of categories bath soap, paste, washing powder

- d) Display the product details whose Quantity less than 100 and greater than 500
- e) Display product names starts with 's'
- f) Display the products which not belongs to the category 'paste'
- g) Display the product names whose second letter is 'a' and belongs to the Category 'washing powder'

15. Create a STUDENT table with following fields:

Field Name	Type	Width
RegNo	Character	10
Name	Character	20
Paper1	Numeric	3
Paper2	Numeric	3
Paper3	Numeric	3
Paper4	Numeric	3
Papers	Numeric	3
Total	Numeric	3
Result	Character	6
Grade	Character	1

Enter the RegNo, Name and Marks in 5 Papers of at least 10 students. Write a SQL program to process the records to update the table with values for the fields

Total (Paper1+Paper2+Paper3+Paper4+Paper5),

Result ("Passed" if total is greater than or equal to 50% of the total;

"Failed" otherwise), and

Grade ("A" if mark obtained is greater than or equal to 90% of the total mark, "B" if

mark obtained is greater than or equal to 75% of the total mark, "C" if mark obtained is greater than or equal to 60% of the total mark,

"D" if mark obtained is greater than or equal to 50% of the total mark, and "F" if mark obtained is less than 50% of the total mark).

Display a report in descending order of the total mark, showing the data entered into the table along with the total marks, result and grade.

16. Prepare a salary report of the employees showing the details such as:

EmpNo, Name, Basic Pay, DA, Gross Salary, PF, Net Salary, Annual Salary and TaxFor this

purpose, create a table named SALARIES having the following structure.

FieldName	Type	Width
EmpNo	Character	10

Name	Character	20
Basic	Numeric	6

Enter the records of at least 10 employees. Use the following information for calculating the details for the report:

DA is fixed as the 40% of the basic pay. PF

is fixed as 10% of the basic pay.

Gross Salary is (Basic Pay + DA). Net

Salary is (Gross Salary - PF)

Annual Salary is (12 * Net Salary)

Tax is calculated using the following rules:

If annual salary is less than 100000, No Tax

If annual salary is greater than 100000 but less than or equal to 150000, then the tax is 10% of the excess over 100000.

If annual salary is greater than 150000 but less than or equal to 250000, then the tax is 20% of the excess over 150000.

If annual salary is greater than 250000, then the tax is 30% of the excess over 250000.

17. Generate a Hospital information system that can generate the following reports:

- Patients who belongs to in-patient category
- Patients who belongs to out-patient category

For this purpose, create a table named HOSPITAL having the following structure.

Field Name	Type	Width
PatientID	character	10
Name	character	20
Age	numeric	3
Doctor	character	20
PatientType	character	15
ConsultCharge	numeric	6
BloodTestCharge	numeric	6
XrayCharge	numeric	6
OtherCharges	numeric	6
TotalAmount	numeric	6

Enter the records of at least 10 patients. Write a SQL program to display the report in the ascending order of patient name.

18. Using the Hospital table created in Lab 16, generate a Hospital information system that can generate the following reports:
 - a. Patients undergone blood test.
 - b. Patients who have taken X-Rays
19. Design a Hotel Bill calculating system that generates hotel bills for the customers.
20. Design an Electricity Bill Report generating system that generates electricity bills details of customers for a month.
21. Generate a Library Information System that generates report of the books available in the library.
22. Programs involving multiple tables.
23. Create a table named Elec_Bill (CusLNo, CusLName, Units_Consumed, Bill_Amt). Set bill_amt as null. Write a PostgreSQL function to calculate the Bill_Amt by accepting CusLNo and Units_Consumed. Write a PostgreSQL block to update the calculated amount by invoking the function.
24. Create two tables

Book (BookID, BookName, Author, Publisher) and

Book_Del (Date_of_Del, BookID, BookName)

Create an application to generate a trigger before deleting a record from book table. The trigger procedure should insert the deleted BookID and BookName along with current date to the table Book_Del.

PUSQL Programs

- a. PUSQL Program to Reverse aString
- b. PL/SOL Program for Palindrome Number
- c. PUSQL Program to Swap two Numbers
- d. PUSQL Program for Armstrong Number
- e. PUSQL Program to Find Greatest of Three Numbers
- f. PUSQL Program to Print Patterns
- g. PUSQL Program involving cursors
- h. PUSQL Program involving triggers
- i. PUSQL Program Stored procedures, stored procedures with parameters

SDC2IT10 (Pr) MINI PROJECT

100 Marks [Internal: 20, External: 80] Examination: 2.5 Hours	Credits:4 Total hours: 64	Hours Per Week:4
Course Objectives		
<ol style="list-style-type: none">1. To learn hand on experience of industrial programming skills2. To provide practical knowledge on software development process3. To give an awareness about Industrial practices		
Course Outcomes:		
C0-1 Acquire the basic knowledge about handling real world projects C0-2: Apply academic skills in industrial circumstances C0-3: Able to gain practical knowledge and implement all learning concepts in form of an application .		

The main objective of this project course is to provide learners a platform to demonstrate their practical and theoretical skills gained during Semester 1 and Semester 2 of study in First year of B.Voc Mobile Application Development Programme satisfying their job role Intern Developer / Intern Web Developer. Topics selected should be complex and large enough to justify as First year of B.Voc Mobile Application Development Programme Mini project. The courses studied by the students during the First year of B.Voc Mobile Application Development Programme provide them the comprehensive background knowledge on diverse subject areas in computer science such as Front end and backend development etc., which will be helping students in doing project work. Students can also undertake group project to learn how to work in groups. However, the maximum number of students in a group must be limited to 4. For internal evaluation, the progress of the student shall be systematically assessed through *two or three stages of evaluation at periodic intervals*. A bonafied project report shall be submitted in hard bound complete in all aspects.

Industrial Visit:

Guide Lines:

Minimum one day visit to National research Institutes, Laboratories, and places of scientific Importance or Software Companies.

OR

One week Industrial Training/ internship at any software firms/ Research Labs The

Industrial visit should be done in first or second semester.

A 10 - 20 page Industrial visit/ Training report have to be submitted with certificate from industry/ institute, sufficient photos and analysis along with Project for evaluation in the second semester.

SEMESTER III

A11 BASIC MATHEMATICS AND GENERAL AWARENESS

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Total hours: 64	Hours Per Week:4
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Course Objectives

1. Understand and explain the importance of critical thinking.
2. To overcome or solve the problems occurring in our everyday life.
3. To understand basic of computer and relative concepts.
4. To make the students understand the various services offered by various banks and insurance companies

Course Outcomes:

CO-1: Apply numerical and reasoning skills in competitive examinations.

CO-2: Understand some basic concepts of research and its methodologies.

CO-3: Bridge the fundamental skills of computers with the present level of knowledge of the students.

CO-4: To train and equip the students with the skills of modern banking and insurance.

Course Outline:

Module - 1: Numerical Ability (12 Hours)

Data Interpretation (Bar Graph, Line Chart, Tabular, Pie Chart), Inequalities/ Quadratic Equations, Number Series, Simplification and Approximation, Percentages, Average, Ratio and Proportion, Partnership, Profit and Loss, Simple Interest & Compound Interest, Problem on Ages, Data Sufficiency, Speed, Distance and Time, Work, Time and Wages, Probability, Permutation and Combination.

Module-2: Reasoning Ability (15 Hours)

Advance Puzzles, Seating Arrangements, Distance and Direction, Blood Relations, Syllogism, Order and Ranking, Coding-Decoding, Machine Input-Output, Alphabet and Number Series. Analogy, Passage and Conclusions, Statement and Conclusion, Statement and Assumptions, Statement and Arguments, Decision Making

Module-3: Research Aptitude (12 Hours)

Research: Meaning, Types, and Characteristics, Positivism and Post positivism approach to research, Methods of Research: Experimental, Descriptive, Historical, Qualitative and Quantitative

methods, Steps of Research, Thesis and Article writing: Format and styles of referencing, Application of ICT in research, Research ethics.

Module - 4: Computer Aptitude (15 Hours)

History of computers, Basics of computer's hardware and software, Short Cut Keys, operating system, Internet, Networking, Basics of MS-Office: MS-word, MS-Excel, MS-PowerPoint, Database, Hacking, Security Tools and Viruses.

Module - 5: General/ Financial Awareness (16 Hours)

History of Banking in India, Banking and Financial Reforms in India, Financial Institutions in India, Functions of Banks, Types of Bank Accounts, Types of Loans, Types of Mortgages, Types of Cheque & Cards, Foreign Banks in India, Fund Transfer Services, Structure of Banking Industry, Principles of Insurance, Credit & Debit, Mutual Funds, Bombay Stock Exchange (SSE), National Stock Exchange (NSE), Banking Ombudsman, Inflation, Money Laundering & Anti-Money Laundering, Green Banking, RBI Act, 1934.

Text Book References:

1. Quantitative Aptitude for Competitive Examinations - Quantitative Aptitude R.S Agrawal, S.Chand, ISBN: 9789352534029, 9789352534029
2. Edition: Revised & Enlarged Edition, 2020
3. Verbal Reasoning (Useful for Various Competitive Exams), Dr. LAL & KUMAR, ISBN: 978- 81-7482-581-0
4. Teaching and Research aptitude, Upkar's Publications, Pratiyogitha Darpan, ISBN: 97874822154.
5. Banking Awareness (English, Paperback, unknown), Arihant Publishers, ISBN: 9789311124667, 9789311124667

A12 PROFESSIONAL BUSINESS SKILLS

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Hours Per Week:4 Total hours: 64
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Course Objectives

1. To update and expand basic Informatics skills of the students
2. To equip the students to effectively utilize the digital knowledge resources for their study

Course Outcomes:

C0-1: Able to become a professional by acquiring various soft skills needed for business success

C0-2: Explore the world of e-learning and also the various consequences of Cyberspace and crimes.

C0-3: Application of data analysis and the role of artificial intelligence in e-business.

C0-4: Apply the skills of digital marketing and e-commerce.

Course Outline:

Module I (15 Hrs)

Professionalism: Meaning -Definition - Characteristics - Traits and Qualities of a good professional - Professionalism in business - Professional Skills: important soft skills for business success- Professionalism in Communication : Verbal Communication: Professional Presentation - Different Presentation Postures- Written Communication : Email - Significance of Email in business
- Email etiquette: format- rules - dos and don'ts-Technical Documentat ion: Standards -Types

Module II (12 Hrs)

E-Learning: Introduction of electronic learning - benefits and drawbacks of e-Learning - Online education - Digital age learners - Knowledge resources on internet - E-books, Audio, Video and other means for e-learning- Introduction to e-content development and tools - Online libraries - MOOCs - Thee-Learning as a service Industry - major technologies usedin e-earning- different approaches for e-Learning delivery- E-learning in India

Module III (18 Hrs)

Business Data Analysis: Features of New Generation Computers - Concept of data analysis- Business Data Analysis - Data Analyst - Types of analysts - organization and source of data, importance of data quality, dealing with missing or incomplete data- Social Networking Analysis - Big Data Analysis - Role of Data Scientist in Business & Society - Role of Artificial Intelligence and Intelligent Agents in e-business - Ethical and Legal considerationsin Business Analytics

Module IV (15 Hrs)

Socio - Cyber Informatics: IT and society - Digital Divide - Digital Natives-Cyber space - New opportunities and threats - Cyber ethics - Cyber-crimes -Types - Cyber Laws - Organizations related with cyber laws-Cyber addictions - Information overload - Health issues - e-waste and Green Computing -Recent E-governance initiatives in India

Module V (20 Hrs)

Digital Marketing: Introduction to Digital Marketing Environment -meaning & Concept -Need for digital marketing - Advantages and disadvantages of digital marketing -Trends in digital marketing- Types of digital marketing - Business models in digital marketing Business to Business (B2B), Business to Customer (B2C), Customer to Customer (C2C), Business to Employees (B2E), Business to Government (B2G) - Online advertising -types of online advertising - Top e-commerce websites around the world and its scenario in India. PPC (Pay per Click) advertising - Search engine Analytics - search engine ads - social media channels and ads

References Books:

1. Professional Business Skills - Lee Pelitz 2nd Edition
2. Peter Norton, Introduction to Computers, Tata McGraw Hill Private Limited, New Delhi,
3. Alan Evans, ITLESL, Leslie Lamport, Dolores Etter, Darren George,
4. Kenneth C Laoudon, Gary Rogers, Rainer Handel, INFORMATICS-Technology in Action,
5. Pearson Education, Delhi, 2009.
6. V.Rajaraman, Introduction to Information Technology, PHI Learning Private
7. Limited, New Delhi, 2009.
8. Godfrey Parkin, Digital Marketing: Strategies for online success, New Holland
9. publishers Ltd, 2009
10. Damian Ryan, Understanding Digital marketing: Marketing strategies for Engaging
11. the Digital generation, Kogan page, 3rd Edition, 2014
6. Jonah Berger, Contagious Why things catch on, Simon & Schuster, 2013
7. Turban E, Armson, JE, Liang, TP & Sharda, Decision support and Business
12. Intelligence Systems, 8th Edition, John Wiley & Sons, 2007
13. Frank J. Ohlhorst, Big Data Analytics, 1st Edition, Wiley, 2012.
14. 10. Efraim Turban, Ramesh Sharda, Jay Aronson, David King, Decision Support and Business
15. Intelligence Systems, 9th Edition, Pearson Education, 2009
16. 11. Microsoft Office 2007 Business Intelligence- Reporting, Analysis, and Measurement
17. from the Desktop, Doug Harts, TATA McGraw-Hill Edition, 2008
1. Data Mining for Business Intelligence: Concepts, Techniques, and Applications in
18. Microsoft Office Excel with XLMiner, Galit Shmueli, Nitin R. Patel, Peter C. Bruce, Wiley
19. Publication, 2010

SDC3IT11 SOFTWARE ENGINEERING

75 Marks [Internal: 15, External: 60] Examination 2.5 Hours	Credits:3 Hours Per Week:3 Total hours: 48
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Course Objectives

1. To apply software engineering knowledge and methods
2. Ability to identify the needs of software development cycle.
3. Understand and identify various software designing problems, and solve these problems by designing and selecting software engineering models, criteria, strategies, and methods.
4. Analyse various communication methods and skills to communicate with their team mates to conduct their practice-oriented software projects.

Course Outcomes:

- 00-1** : Understand the basic concepts of software engineering techniques.
- 00-2** : Apply Techniques of Test Design.
- 00-3** : Understand Test Design Management.
- 00-4** : Analyze the various software testing approaches.

Course Outline:

Module 1 (10 Hrs.)

Introduction to software Engineering, Software Components, Software Characteristics, software Applications, Software engineering processes, Similarity and differences from conventional engineering processes Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, WIN-WIN spiral model, Formal method model, Time boxing model, Incremental model, Rapid Application Developmental(RAD) Model, Component based Development Model, Evolutionary development models, Iterative Enhancement Models.

Module 2 (10 Hrs.)

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, software quality Frameworks, ISO 9000 models.

Module 3 (10 Hrs)

Basic Concept of Software Design, Architectural Design: Software Architecture, Data Design,

Architectural Styles, Mapping Requirements into Software Architecture Low Level Design: Modularization, Coupling and Cohesion Measures.

Module 4 (8 Hrs.)

Top-Down and Bottom-Up Testing Strategies: White Box Testing, Black Box Testing, Maintenance, Categories of maintenance: Preventive, Corrective and perfective maintenance, cost of maintenance, Software Reengineering, Reverse Engineering.

Module 5 (J Hrs.)

Software configuration management Activities: Change control Process, Software Version Control, An Overview of CASE Tools Estimation.

References:

1. R.S Pressman, Software Engineering A Practitioners Approach, McGraw Hill.
2. James Peter, Software Engineering, an Engineering Approach, John Wiley.
3. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
4. K.K Agarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
5. Carlo Ghezzi, M Jarayeri, D Manodrioli, Fundamentals of Software Engineering, PHI PubI
6. Pankaj Jalote, Software Engineering, Narosa Publication.

SDC3IT12 PROGRAMMING IN PYTHON

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credit s:4 HoursPerWeek:4 Total hours: 64
Course Objectives	
<ol style="list-style-type: none"> 1. Expertise Python Programming 2. Learn web based applications for mobile devices 	
Course Outcomes:	
C0-1: Explain basic principles of Python programming language C0-2: Implement object oriented concepts C0-3: Implement database and GUI applications. C0-4: Implementing Server side programming using Python Server side scripting. C0-5: Explaining the features of displaying data from MYSQL in webpage	

Course Outline

Module 1(10Hrs)

Introduction to Python Features, Python interpreter and Idle, data types, strings, variables, operators and expressions, control flow tools, loops, break, continue, data structures, Input and Output, functions .

Module II (14 Hrs)

Introduction to Object Oriented Concepts in Python Class, class variable, data member, function overloading, instance variable, inheritance, instance, instantiation, method, object, operator overloading, exception handling.

Module III (15 Hrs.)

- Introduction to Mobile Web Introduction to HTML, Basic formatting tags: heading, paragraph, underline break, bold, italic, underline, superscript, subscript, font and image. Different attributes like align, colour, bgcolor, font face, border, size. Navigation Links using anchor tag: internal, external, mail and image links. Lists: ordered, unordered and definition, Table tag, **HTML** Form controls: form, text, password, text area, button, checkbox, radio button, select box, hidden controls, Frameset and frames.

Module IV (10 Hrs.)

Server side programming using Python Server side scripting CGI role of Web server - XAMMPP /WAMP (choose any one of these servers) - Python server side script XAMMPP/WAMP - capturing form data - validation - processing data - exchange of data between form and server

Module V (15 Hrs)

Python MySQL Database Integration integration: Features of MySQL, data types, Introduction to SQL commands SELECT, DELETE, UPDATE, INSERT. Python functions for MySQL data base operations - database connection, selection, query, fetching results Insertion and Deletion of data using Python Displaying data from MYSQL in webpage

ReferenceBooks:

1. David M.Beazly, Python EssentialReference
2. Mark Lutz, Programming Python
3. Python Pocket Reference: Python in your pocket, Mark Lutz

SDC3IT13 COMPUTER NETWORKING CONCEPTS

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 HoursPerWeek:4 Total hours: 64
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Course Objectives

1. To develop an understanding of computer networking basics.
2. To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications.

Course Outcomes:

- CO-1:** Recognize the technological trends of Computer Networking.
- CO-2:** Discuss the key technological components of the Network.
- CO-3:** Evaluate the challenges in building networks and solutions to those
- CO-4:** Analyze, specify and design the topological and routing strategies for an IP based networking infrastructure
- CO-5:**-Havea working knowledge of datagram and Network Security

Course Outline

Module I (10Hrs)

Introduction to Computer networks, Network Technologies- Classification- Network Topologies, Network Models, Layered model-OSI and TCP/IP models, Transmission media, Physical layer, Analog and Digital data, Periodic-aperiodic signals, Composite signals, Transmission Modes, Digital data transmission, Different Linecoding techniques, digital data to analog-ASK, FSK, PSK QAM Multiplexing techniques.

Module II (10 Hrs)

Data link layer, Error detection and correction- Types of errors, Error detection techniques -Vertical redundancy check (VRC), longitudinal redundancy Check (LRC),Checksum, Cyclic Redundancy Check (CRC), Errorcorrection,Hamming code, Linediscipline,Flowcontrol-Stop & wait,Slidingwindow,Error control, HLDG, Multiple Access, Random Access,ALOHA, Polling, Wired LANs,Switching -Circuit,Packet andMessage switching,SONET, Frame Relay, ATM, IP and related protocols ICMP, NAT, ARP and RARP, TCP/IP, IEEE Ethernet standards.

Module III (15 Hrs)

Network layer- Networking devices, Addressing - Physical addressing IPv4 & IPv6, Network Address Translation (NAT), Internet protocols, Datagram, Address Mapping, Error reporting and multi casting Delivery, Forwarding and Routing algorithms, Distance Vector Routing, Link

StateRouting, OSPF, Transport layer- UDP, TCP, Congestion control techniques, QoS, Application Layer- email, www, http, SNMP & CMIP.

Module IV (15 Hrs)

Wireless LAN- IEEE 802.11 Architecture, Generations of Cellular Network, DSSS, FHSS, Medium Access, CSMA/CA, Back-off algorithm, IEEE 802.11 Framing, Cellular Telephone Network-Frequency Reuse, Mobility Management, MAC Techniques- FDMA, TDMA, CDMA, Wi-Max, PAN, Satellite Network, Latest technologies in Wireless and communication and Remote Sensing

Module V (14 Hrs)

Network Security-Cryptography, Cryptographic types and Algorithms, Digital Signature, VPN, Firewalls, Introduction to Berkeley sockets, TCP and UDP socket functions, sockets and Unix signals, client-server socket implementation, Datalink access, programming libp cap.

Reference Books:

1. Andrew S. Tanenbaum, "Computer Networks", Fifth Edition, Pearson Education India, 2013.
2. Peterson and Davie, "Computer Networks, A Systems Approach", 5th ed., Elsevier, 2011.
3. W. Richard Stevens, Bill Fenner and Andrew Rudoff, "Unix Network Programming", Volumes 1 and 2, Third Edition, Addison-Wesley Professional, 2003.
4. Michael Donahoo, Ken Calvert, Pocket Guide to TCP/IP Socket Programming in C, Morgan Kaufmann Series in Networking, 2000.

SDC3IT14 (P)- DATA STRUCTURE USING JAVA- LAB

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 HoursPerWeek:4 (1 Theory +3 Labs) Total hours: 64
Course Objectives	
1. To familiarize the students with language environment and to develop the programs for solving the problems using function overloading, constructors and objects.	
2. Describe the procedural and object oriented paradigm with concepts of streams, classes, functions, data and objects.	

Course Outcomes:

C0-1: Ability to identify the appropriate data structure for given problem.

C0-2: Graduate able to design and analyze the time and space complexity of algorithm or program.

C0-3: Ability to effectively use compilers includes library functions, debuggers and trouble shooting.

C0-4: Illustrate the programs using DS

Course Outline

Practical 1 (20 Hrs)

1. Write JAVA programs to implement recursive and non-recursive
 - i) Linear search
 - ii) Binary search
2. Write a JAVA programs to
 - i. implement i. Bubble sort
 - ii. Selection
 - sort iii. Quick sort
 - iv. Insertion sort
 - v. Merge sort
 - vi. Heap sort

Practical 2 (24 Hrs)

3. Write a JAVA programs to implement the following.
 - i. To implement array operations: insert and delete
 - ii. To perform push and pop operations for stack
 - iii. To perform insert and delete operations for linear queue.
 - iv. To perform insert and delete operations for circular queue.
 - v. To perform linear and binary searching, pattern matching etc.
 - vi. Write JAVA programs to implement the deque (double ended queue) ADT using a doubly linked list and an array

Practical 3 (20 Hrs)

4. Implementing binary tree and traversals
5. Implementing binary search trees

SDC31T15 (P) PROGRAMMING IN PYTHON - LAB

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Total hours: 64	HoursPerWeek4
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Course Objectives

1. Problem solving using Python
2. Programming Capability

Course Outcomes:

- CO- 1: Write, test, and debug simple Python programs.
- CO- 2: Implement Python programs with conditionals and loops.
- CO- 3: Develop Python programs step-wise by defining functions and calling them.
- CO- 4: Use Python lists, tuples, dictionaries for representing compound data.
- CO- 5: Read and write data from/to files in Python

Course Outline

Practical -1 (20Hrs.) - Exercise 1: Programs on basic control structures & loops.

1. Write a program for checking the given number is even or odd.
2. Using a for loop, write a program that prints the decimal equivalents of 1/2, 1/3, 1/4 ... 1/10
3. Write a program for displaying reversal of a number.
4. Write a program for finding biggest number among 3 numbers.
5. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.

Exercise 2: Programs on operators & I/O operations.

6. Write a program that takes 2 numbers as command line arguments and prints its sum.
7. Implement python script to show the usage of various operators available in python language.
8. Implement python script to read person's age from keyboard and display whether he is eligible for voting or not.
9. Implement python script to check the given year is leap year or not.

Practical II (20Hrs.) - Exercise 3: Programs on Python Script.

10. Implement Python Script to generate first N natural numbers
11. Implement Python Script to check given number is palindrome or not.
12. Implement Python script to print factorial of a number.
13. Implement Python Script to print sum of N natural numbers.

14. Implement Python Script to check given number is Armstrong or not.
15. Implement Python Script to generate prime numbers series up to n

Exercise 4: Programs on Lists.

16. Finding the sum and average of given numbers using lists.
17. To display elements of list in reverse order.
18. Finding the minimum and maximum elements in the lists.

Practical III (24Hrs.) - Exercise 5: Programs on Strings.

19. Implement Python Script to perform various operations on string using string libraries.
20. Implement Python Script to check given string is palindrome or not.
21. Implement python script to accept line of text and find the number of characters, number of vowels and number of blank spaces in it.

Exercise 6: Programs on functions.

22. Define a function max_of_three() that takes three numbers as arguments and returns the largest of them.
23. Write a program which makes use of function to display all such numbers which are divisible by 7 but are not a multiple of 5, between 1000 and 2000.

SDC3IT16 (P) COMPUTER NETWORKING- Lab

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 HoursPerWeek:4 Total hours: 64
Course Objectives	
<ol style="list-style-type: none"> 1. To develop an understanding of computer networking basics. 2. To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications. 	
Course Outcomes:	
<p>CO-1: Recognize the technological trends of Computer Networking.</p> <p>CO-2: Discuss the key technological components of the Network.</p> <p>CO-3: Evaluate the challenges in building networks and solutions to those</p> <p>CO-4: Analyze, specify and design the topological and routing strategies for an IP based networking infrastructure</p> <p>COS: Have a working knowledge of datagram and Network Security</p>	

Course Outline:

Practical 1 (10 Hrs) - Exercise 1

1. Configure IP address for nodes (IP4 and IP6).
2. Create network patch code for cross-over/straight-through cabling.

Practical 2 (20 Hrs) - Exercise 2

3. Install and configure switches/routers to provide network/internet connectivity.
4. Install and enable proxy server, setup NFS.

Practical 3 (20 Hrs) - Exercise 3

5. Install and configure CIFS for Windows/Linux resource sharing.
6. Implement socket client-server applications
7. Enable telnet, ftp, rsh, ssh and other remote computing technics for both Linux and Windows environments.

Practical 4 (14 Hrs) - Exercise 4

8. Capture packets from network and analyze them.
9. Configure DNS on Windows and configure WindowsServer Active Directory Services and test authentication for network users
10. Implement DHCP Service in yourlab.

SEMESTER IV

A13 ENTREPRENEURSHIP DEVELOPMENT

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Total hours: 64	HoursPerWeek:4
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Course Objectives

1. To familiarize the students with the concept of entrepreneurship.
2. To identify and develop the entrepreneurial talents of the students.
3. To generate innovative business ideas in the emerging industrial scenario

Course Outcomes:

- CO-1:** Able to understand the nature of entrepreneurship and the financial assistance and guidance from the government.
- CO-2:** Confirm an entrepreneurial business idea
- CO-3:** Explore entrepreneurial leadership and management style.
- CO-4:** Confidence in Setting up of Industrial unit.

Course Outline:

Module I (15 Hrs)

Concepts of entrepreneur: Entrepreneur- Definitions - Characteristics of entrepreneur Classification of Entrepreneur-Entrepreneurial traits -Entrepreneurial functions - role of entrepreneurs in theeconomic development - Factor effecting entrepreneurial growth -Entrepreneurship - Meaning - definition - Entrepreneur vs Intrapreneur - Women Entrepreneurs - Recent development - Problems - Entrepreneurial Development Programmes- Objectives of EDP- Methods of training- Phases of EDP.

Module II (17 Hrs)

Institutional support and incentives to entrepreneurs- Functions of Department of Industriesand Commerce (DIC) - Activities of Small Industrial Development Corporation (SIDCO)-Functions of National Small Industries Corporation(NSIC)- Functions of Small Industries Development Bank of India (SIDBI) - Khadi Village Industry Commission (KVIC)-Small Industries Service Institute (SISI)- Functions and services of Kerala Industrial Technical Consultancy Organisation (KITCO)-Activities of Science and Technology EntrepreneurshipDevelopment Project (STEDP)-Strategies of National Entrepreneurship Development Board(NEDB) -Objectives of National Institute for entrepreneurship and small business development (NIESBUD) - TechnoPark-Functions of techno park Incentives- Importance Classification of incentives - Subsidy- Types of Subsidy.

Module III (15 Hrs)

Micro Small and Medium Enterprises- Features- Objectives- Importance- Role of SME in theeconomic development- MSME Act 2006- Salient features- Credit Guarantee Fund Trust Scheme for MSMEs - Industrial Estates-Classification-Benefits- Green channel- Bridge capital- Seed capital assistance-Margin money schemes - Single Window System- Sickness Causes - Remedies- Registration of SSI.

Module IV (18 Hrs)

Setting up of Industrial unit-(Only Basic study) Environment for Entrepreneurship - Criteriafor selecting particular project- Generating project ideas-Market and demand analysisFeasibility study- Scope of technical feasibility- Financial feasibility- Social cost-benefitanalysis-Government regulations for project clearance- Import of capital goods- approval offoreign collaboration-Pollution control clearances- Setting up of micro small and mediumenterprises-Location decision-Significance.

Module V (15 Hrs)

Project Report - Meaning-Definition - Purpose of project reports-Requirements of goodreport - Methods of reporting - General principles of a good reporting system - Performa of aproject report -

Sample project report. (The preparation of sample project report shall be treated as an assignment of this course).

Reference Books:

1. Shukla M.B. Entrepreneurship and small Business Management, Kitab Mahal Allahabad.
2. Sangram Keshari Mohanty, Fundamentals of entrepreneurship, PHI, New Delhi.
3. Nandan H. Fundamentals of Entrepreneurship, PHI, New Delhi.
4. Small-Scale Industries and Entrepreneurship, Himalaya Publishing, Delhi
5. C.N. Sontakki, Project Management, Kalyani Publishers, Ludhiana.
6. Sangam Keshari Mohanty. Fundamentals of Entrepreneurship, PHI, New Delhi
7. Peter F. Drucker- Innovation and Entrepreneurship.
8. Vasanth Desai, Small Business Entrepreneurship, Himalaya Publications.
9. MSME Act 2006.

A14 PUBLIC HEALTH, SANITATION & SAFETY

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Hours Per Week:4 Total hours: 64
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Course Objectives

1. To familiarize the students with the concept of entrepreneurship.
2. To identify and develop the entrepreneurial talents of the students.
3. To generate innovative business ideas in the emerging industrial scenario

Course Outcomes:

After learning the course, the students should be able to:

- C0-1:** Identify the diseases associated with occupation
- C0-2:** Identify the hazard in industrial area and propose preventive measures
- C0-3:** Manage safety in industries and propose safety measures and PPE
- C0-4:** Demonstrate the hygiene and sanitation procedures
- C0-5:** Demonstrate the microorganism responsible for the disease and their control

Course Outline:

Module 1 (12 Hrs)

Health-Physical, Mental, Social - Positive health- Quality of life Index.

Health programmes: Health programmes control measures in operation in India- Tuberculosis, poliomyelitis, leprosy, filariasis and diphtheria Health situation in India- Health Problems-Primary health care in India -PHCs National Programmes for elimination of diseases. -Water borne diseases and air borne diseases. Methods of disease transmission.

Module 2 (12 Hrs)

Sanitation: Definition and meaning. Microbial growth pattern and factors affecting microbial proliferation. Sewage **Disposal:** disposal of sewage and night soil-treatment of sewage system
Waste disposal- Disposal of solid waste; Waste water handling :Pre-treatment, primary treatment, secondary treatment, tertiary treatment and disinfection. **Water** - supply sources- impurities and purification of water.

Module 3 (14 Hrs)

Contamination: Sources of contamination and protection against contamination.

Methods of killing micro-organism-Use of heat, chemicals and **radiation.** **Methods of inhibiting microbial growth-** Use of refrigeration, chemicals, dehydration and fermentation **Principles of hygiene:** General principles of hygiene-its relation to food preparation and food handling habits.

Personnel hygiene- Meaning & importance; Hygienic practices of employees; personal hygiene and contamination of food Products-Sanitation Training and Education for Food Service Workers.

Module 4(12 Hrs)

Food Borne infection, intoxication: Food poisoning-causes and types-Definition, Exotoxin, Endotoxin, intoxications control measures food borne in intoxication and infection-sources-effects and prevention. symptoms&control: *Botulism, Staphylococcus, E.coli and salmonella.* Food infections -sources, symptoms Methods of Prevention & investigation of food borne disease outbreak.

Module 5 (14 Hrs)

Occupational Safety, Health and Environment: Definition-safety at work place- safe use of machines and tools-hazard-physical hazard (noise, radiation, fire, Electrical, illumination)-chemical hazard-biological hazard-Personal Protective Equipment - Accident preventive techniques-First Aid- Plant Layout for safety-safety of different sectors.

References:

1. Parke.K.2007.Textbook of preventive and Social Medicine19thEdition,M/s. BanaraisdasisBhanetPublishers,Jabaipur,India.
2. William,C.,FrazierandDennieC. Westheff.1996.FoodMicrobiology4thEdition,TataMcGrawHillCompanylimited
3. S.Roday-Food Hygiene and Sanitation
4. M.Jacob.(1989)-Safe food Handling.
5. V.N.Reinhold- Principles of Food Sanitation
6. B.C.Hobbs & R.J.Gilbert- Food Poisoning and Hygiene.

SDC4IT17 OPERATING SYSTEMS

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 HoursPer Week:4 Total hours: 64
Course Objectives	
<ol style="list-style-type: none">1. Understand the basic components of a computer operating system, and the interactions among the various components.2. Cover an introduction on the policies for scheduling, deadlocks, memory management, synchronization, system calls, and file systems	
Course Outcomes:	
C0-1 Understand the functions of Operating System C0-2 Classify the different types of OS C0-3 Understand the memory management policies, allocation and scheduling of processes C0-4 Evaluate the requirement for process synchronization and coordination handled by operating system C0-5 Understand the virtual memory & their policies, I/O management, File management and disk scheduling.	

Course Outline

Module I (10Hrs)

Fundamentals Operating System (OS): OS functions and characteristics, Historical Evolution of OS, Parallel systems, distributed systems, booting, issues in operating system design.

Module II (15 Hrs.)

Process Management: Process abstraction, process address space, process management, system calls, threads, process hierarchy. CPU Scheduling-levels of scheduling, comparative study of scheduling algorithms, multiple processor scheduling. Deadlocks - Characterization, prevention and avoidance, deadlock detection and recovery. Concurrent Processes- Critical section problem, semaphores monitors, inter-process communication, message passing mechanisms.

Module III (15 Hrs.)

Memory Management-Storage allocation methods, address binding, virtual memory concept, demand paging, page replacement algorithms, segmentation, dynamic linking and sharing libraries, thrashing.

Module IV (10 Hrs.)

File Systems: Functions, File access and allocation methods, Directory system, File protection mechanisms, implementation issues, file system hierarchy, directory system, file protection mechanisms, implementation issues. File allocation, free space management, file protection and security, Hardware organization, device scheduling policies, device drivers. Device management: Functions, Techniques for devicemanagement: Dedicated, Shared, Virtual, Spooling, Channels and Control units.

Module V (14 Hrs.)

Case Studies: Windows, Unix/Linux.

Reference Books:

1. Silberschatz, Galvin, Gagne, Operating System Concepts
2. Nutt G.J, Operating Systems a Modern Perspective, Addison Wesley
3. William Stallings, Operating Systems, Internals and Design Principles
4. Mark Minasi, The Complete PCU upgrade and Maintenance

SDC4IT18 COMPUTER SECURITY

75 Marks [Internal: 15, External: 60] Examination 2 Hours	Credits:3 Hours Per Week:3 Total hours: 48
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Course Objectives

1. This course provides a broad introduction to a variety of topics in applied computer, Network and system security.
2. These include system/software vulnerabilities, applied cryptography, host-based and network-based security, privacy, anonymity, usability, security economics, risks and vulnerabilities, policy formation, controls and protection methods, and issues of law and privacy

Course Outcomes:

- CO- 1:** Explain some common software vulnerability issues and classifications mechanisms
- CO-2:** Understand different security protocols.
- CO-3:** Understand security models for computer systems security
- CO-4:** Implement cyber security solutions and use of cyber security, information assurance, and cyber/computer forensics software/tools.
- CO-5:** Explain the various controls available for protection against internet attacks, including authentication, integrity check, firewalls, and intruder detection systems.

Course Outline:

Module I (8 Hrs)

Computer security - Overview of Computer Security Concepts and Foundations, Basics of Computer Security- Overview- Definition of terms - Security goals - Shortcomings -Attack and defense

Module II (10 Hrs)

Encryption and Cryptography - Ciphers and codes - Block & Stream Ciphers - Symmetric and Asymmetric Cryptosystem - Public key algorithms - Key distribution - Digital signatures - Pretty good privacy - Authentication and Key Exchange Protocols - Directory Authentication service - Diffie-Hellman key exchange - Kerberos.

Module III (10 Hrs)

Software Security - Buffer Overflow - Malicious code - Worms - Intruders - Error detection and correction - OS protection policies - Trusted Systems - Memory protection - Access control matrix - User authentication - Security models - Disaster recovery

Module IV (10 Hrs)

Database Security- Integrity constraints - Multi-phase commit protocols - Networks Security- Internet Security Protocols and Standards - Threats in networks - TCP Attacks, DNS Vulnerabilities,SSL/TLS, DDoS - Privacy enhanced email - DS authentication - Next Generation System Designs and Challenges - Internet-of-Things and Smart Grid Security - Data & Infrastructure Security in Cloud/Edge Computing

Module V (10 Hrs)

Web and Electronic Commerce - Threats on the web - Secure socket layer - Client-side certificates - Applet security model - cyber-security Policies & Initiatives - NCCC - CERT-In - NCIIPC - security policy: Case Study - Unix Windows NT - Browsers and Java scripts - Risk Modeling - Cyber-Risk Assessment- Threat Information Sharing -Cyber-insurance

Reference Books:

1. Cryptography & Network Security, PHI William Stalling
2. Cryptography & Network Security, Mc Graw Hill Atul Kahate
3. Cryptography & Network Security, PHI 4Forouzan
4. Modern Cryptography, Theory & Practice, Pearson Education. Wenbo Mao

SDC4IT19 E1 - J2EE

75 Marks [Internal: 15, External: 60] Examination: 2 Hours	Credits:3 HoursPerWeek:3 Total hours: 48
Course Objectives	
<ol style="list-style-type: none">1. On completion of this course, the student should be able to: Learn distributed enterprise applications using java.2. Learn web development and server side programming using java3. Learn database managements and spring frameworks.	
Course Outcomes:	
<p>CO1: - Learn distributed enterprise applications using java.</p> <p>CO2 - Learn web development and server side programming using java</p> <p>CO3: - Learn database managements and spring frameworks.</p> <p>C04: -The students will be able to develop a small project.</p>	

Course Outline:

Module I (6 Hrs)

Core Java EE: Platform Overview, Distributed Multi tiered Applications, Web & Business Components, services & types, Java EE Application Assembly & Deployment - Packaging Applications, Java EE modules, Getting Started with Web Applications, Model View Controller (MVC) Architecture. Application Deployment Web application development and deployment Steps, Configuring Web application - Web application deployment descriptor (web.xml file)

Module II (8 Hrs)

Servlets: Servlet Overview, Life cycle of Servlet, Handling Client HTTP Request & Server HTTP Response, Initializing Parameters & Servlet Context, Initializing a Servlet, initialization Parameters, Servlet Context Attributes (Context binder), Session Management, Request Dispatcher & Redirecting.

Module III (8 Hrs)

JSP: Overview of JSP, JSP Architecture & life cycle, Components of Java Server Pages, Implicit Objects & Standard JSP Tags, Scope of JSP objects.

Module IV (8 Hrs)

JDBC: JDBC Overview & Architecture, Step by Step Usage of JDBC API, Connecting to Database in Java, Prepared Statement & JDBC Transactions. Developing Web Application with MySQL Database by implementing Java Beans, DAO's & MVC Architecture.

Module V (8 Hrs)

Hibernate: Introduction to Hibernate, ORM Overview, Hibernate Environment, Hibernate Architecture & API, Hibernate Configuration, Hibernate Sessions, Persistent Class & Mapping Files, Building Hibernate application, Hibernate Query Language (HQL), Hibernate O/R Mappings - Collection & Association Mappings (Many-to-One, One-to-one, One-to-Many, Many-to-Many) Implementing Hibernate in Java Web Applications using NetBeans with MySQL.

Module VI (8 Hrs)

Spring: Introduction to Spring Framework Architecture, Bean Definition, Bean Scopes & BeanDefinition Inheritance, Spring IoC Containers, Understanding inversion of control (IoC) - Dependency Injection (DI), Spring Setter Injection, Spring Constructor Injection, IoC in Action, Architecture of Spring Web MVC Framework, Spring MVC Getting Started - constructing web MVC application using Spring Framework, AbstractController in Spring MVC, Spring MVC Controllers hierarchy, SimpleFormController, Spring DAO design pattern, Building Spring MVC Framework Applications by using Netbeans.

SDC4IT19 E2 - .NET PROGRAMMING

75 Marks [Internal: 15, External: 60] Examination: 2 Hours	Credits:3 Hours Per Week:3 Total hours: 48
Course Objectives	
<ol style="list-style-type: none">1. Programming in C #programming language,2. Knowledge of object-oriented paradigm in the C #programming language,3. Understand security scenario and preventive measures of .NET environments4. Acquire good idea about different tools available to secure computer environment	
Course Outcomes:	
C0-1: Knowledge of the structure & model of the programming language C # (note) C0-2: Use the programming language C # for various programming technologies C0-3: Develop software in C # (application) C0-4: Evaluate user requirements for software functionality required to decide whether the programming language C # can meet user requirements (analysis) CO-5: Propose the use of certain technologies by implementing them in the C # programming language to solve the given problem	

Module I (10 Hrs)

The origins of the .NET technology .net framework, Features of .net, architectures of C#.net. Introduction to visual studio,.net IDE interface and event driven programming. The common language runtime, The Just-In-Time Compiler visualstudio, NET Framework class library introduction.NET languages, benefits of the.NET approach, C# and .NET.

Module II (10 Hrs)

Basic classes, declarations, conditionals, loops, arrays, strings, enumerations, Windows Forms and Controls, Menus, Image List, Tree Views, List Views, Toolbars, Status Bar and Progress bars. Object Oriented Programming in c#.NET, Class and Object, Properties, methods and events. Constructors and Destructors, Method overloading, Inheritance.

Module III (10 Hrs)

Database : Connected and disconnected mechanism, Connection Objects, Command Objects, Data Adapters, Dataset Class, Data binding with controls like Text Boxes, List Boxes, Data grid. Exception, structured exception handling using try, catch and final statements, and user defined exception.

Module IV (9 Hrs)

Building a Web Application, Examples Using Standard Controls, Using HTML Controls, Validating Form Input Controls using Validation Controls, Data Management with ADO.net, Creating a Site Navigation Hierarchy, Navigation Controls, Membership and Role Management, Login Controls, Securing Applications, caching for Performance, working with XML, Using Crystal Reports in Web Forms.

Module V (9 Hrs)

Databases: Introduction, Using SQL to work with database, retrieving and manipulating data with SQL, working with ADO.NET, ADO.NET architecture, ASP.NET data control, data source control, deploying the web site.

Reference Books :

1. .Net Framework Essentials .3rd Edition (O'Reilly)
2. Beginning with C#.Net. Wroax publications
3. Ian Gariffiths, Mathew Adams, Jesse Liberty, -Programming C# 4.0|, O'Reilly, Fourth Edition, 2010.
4. Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Apress publication, 2012.
5. Andy Wigley, Daniel Moth, Peter Foot, Mobile Development Handbook, Microsoft Press, 2011.

SDC4IT20 (P) OPERATING SYSTEMS AND COMPUTER SECURITY - LAB

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 HoursPer Week:4 Total hours: 64
Course Objectives	
<ol style="list-style-type: none">1. To understand and appreciate the principles in the design and implementation of operating systems software2. To study about the basics of Unix/Linux/Windows systems3. To understand the Shell scripting concepts.4. To understand security scenario and preventive measures5. To have a fairly good idea about different tools available to secure computer environment	
Course Outcomes:	
<p>C01: Familiarization with UNIX system calls for process management and inter process communication. Experiments on process scheduling and other operating system tasks through simulation/implementation.</p> <p>CO2: - Ability to implement inter-process communication, to design and solve synchronization problems, to implement operating system concepts such as scheduling, deadlock management, file management, and memory management.</p> <p>C03: - Understand security environment and requirement of in cyberspace.</p> <p>C04: - Identify tools to secure organizations IT infrastructure and assets.</p> <p>COS:- Take precautionary measures to ensure protection from attacks, damages and costs.</p>	

Course Outline

Practical 1:(10 Hrs) - BASICS OF UNIX COMMANDS

1. Write a command to list all the links from a directory?
2. Create a read-only file in your home directory?
3. How will you find which operating system your system is running on in UNIX?
4. How will you run a process in background?
5. How do you know if a remote host is alive or not?

Practical 2: (15Hrs) --- Shell Scripting

6. Write a shell script that accept a file name starting and ending line numbers as arguments and display all the lines between given line no:
7. Write a shell script that delete all lines containing a specified word.
8. Write a shell script that displays a list of all the files in the current directory
9. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. whenever the argument is a file or directory.
10. Write a shell script that accept a list of file names as arguments count and report the occurrence of each word.
11. Write a shell script to find the factorial of given integer
12. Write a shell script that list the all files in a directory

Practical 3(15Hrs) -- CPU SCHEDULING ALGORITHMS

13. First Come First Serve(Fcfs)
14. Shortest Job First(Sjf)
15. Round Robin
16. Priority

Practice 4 (10 Hrs)

17. DINING-PHILOSOPHERS PROBLEM
18. Scan network - detect hosts online, do port scan, identify services running in each hosts, detect OS
19. Sniffing - Use Wireshark, tcpdump and ethereal to analyze traffic
20. IDS - Use IDS to study logs.

Practice 5 (10 Hrs)

21. Firewall - Use firewall options in Windows and Linux to protect host and network - Windows Firewall, Linux IPTable and ufw etc.
22. Detect Threats - Use nmap for port scanning, OS finger printing, tcp and udp port scanning
23. Crack Identification - Identify how Computers are cracked using buffer overflow.

SDC4IT21 (P) E1 - J2EE - Lab

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Hours PerWeek: 4 Total hours: 64
Course Objectives	
<ol style="list-style-type: none">1. Ability to design console based, GUI based and web based applications.2. Able to understand integrated development environment to create, debug and run multi-tier and enterprise-level applications	
Course Outcomes:	
<p>CO-1: Ability to Create Web Applications using Java Servlet</p> <p>CO-2: Graduate able to Manage Web Session using Servlet and JSP</p> <p>CO-3: Ability to effectively Handle Errors and Exceptions in Web Applications</p> <p>CO-4: Ability to use NetBeans/ Eclipse IDE for creating J2EE Applications</p> <p>CO-5: Ability to create applications using Hibernate & Spring Framework</p>	

Practical 1 (15 Hrs)

1. Practical demonstration on Distributed Multi-Tiered Applications, Web & Business Components,
2. Handling Client HTTP Request & Server HTTP Response,
3. Initializing Parameters & Servlet Context.
4. Initializing a Servlet, Parameters,
5. Programme for Servlet Context Attributes (Context binder), Session Management,

Practical 2 (14 Hrs)

6. Programme for Request Dispatcher & Redirecting.
7. Programme on Components of Java Server Pages, Implicit Objects & Standard JSP Tags, Scope of JSP Objects

Practical 3 (15 Hrs)

8. Step By Step Usage of JDBC API
9. Connecting to Database in Java.
10. Developing Web Application with MySQL Database by implementing Java Beans, DAO's & MVC Architecture

Practical 4 (10 Hrs)

11. Implementing Hibernate in Java Web Applications using Netbeans/ Eclipse with MySQL
12. Building Spring MVC Framework Applications by using Netbeans/ Eclipse

SDC4IT21 (P) E2 - .NET LAB

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Hours Per Week: 4 Total hours: 64
Course Objectives	
<ol style="list-style-type: none">1. Understand the fundamentals of developing modular application by using object oriented methodologies2. Introduce to .Net IDEComponent Framework.3. Develop applications with C#.Net4. Develop custom interfaces for applications and leverage the available built-in interfaces in building complex applications	
Course Outcomes:	
<p>C0-1: Students will be able to design web applications using C#.NET</p> <p>C0-2: Build applications on Visual Studio .NET platform by understanding the syntax and semantics of C#</p> <p>C0-3: Illustrate the use of generics and collections in C#. Learn about advanced and latest features of C#</p> <p>C04: Create simple data binding applications using ADO.Net connectivity.</p>	

Practical 1 (15 Hrs)

1. Simple C# programs
2. Create and populate Windows Forms
3. Create and use user controls in a Windows Forms application

Practical 2 (15 Hrs)

4. Create menus in a Windows Forms applications
5. Add code to form and control event procedures in a Windows Forms applications.

Practical 3 (14 Hrs)

6. Validate user input in a Windows Forms applications
7. Bind Windows Forms applications to various data sources by using Microsoft ADO.NET

Practical 4 (20 Hrs)

- 8 Debug a Windows Form Application (try/catch)
- 9 Adrotator Control
- 10. Calendar control
 - i. Display messages in a calendar control
 - ii. Display vacation in a calendar control
 - iii. Selected day in a calendar control using style
 - iv. Difference between two calendar dates
- 11. Treeview control
 - i. Treeview control and datalist
 - ii. Treeview operations
- 12. Validation controls
- 13. Query textbox and Displaying records
- 14. Display records by using database

SDC41T22 (Pr)- PROJECT WORK/ INTERNSHIP

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Hours Per Week:4 Total hours: 64
Course Objectives	
<ul style="list-style-type: none">1. Learn hands on experience of industrial programming skills.2. Acquire the live experience by doing internship in companies.3. Able to know how data collection is done form the live environment .4. To apply various levels testing strategies	
Course Outcomes:	
CO1: Identify the requirements of real world problems.CO2: Study and enhance software/ hardware skills. CO3: Demonstrate and build the project successfully by hardware requirements, coding, emulating and testing. CO4: To report and present the findings of the study conducted in the preferred domain CO5: Demonstrate Team work	

Course Outline

The main aim of this project is to implement the theoretical knowledge gained from various areas to develop effective solutions to various real life computing problems. The course Project / Internship is one that involves practical work for understanding and solving problems in the field of computing and it shall be done considering the following criteria.

Every student may opt for a 30 days internship in IT companies, or a project in the college itself with the guidance of the faculty at the department.

The project shall be done either individually or group wise. If it is group project, it is recommended to have a maximum of 2 members. The project may be Commercial /Technical/Research Project based on Application Development Technologies learnt in previous semesters.

Each student should submit their Project Report (in duplicate) within a period of two weeks at the department. This period shall be counted from the last date of completion of their Training. The supervisor in the organization under whose guidance the training is carried out will be required to grade the student's report.

An Internship Completion Certificate from the organization in which the student is undergoing internship should also be submitted at the Department and attached in the Internship Report.

Each student will have to prepare proper documentation consisting of Software Requirements Specification (SRS), Modelling Techniques, Development Strategies, Implementation and Testing Strategies.

Student may use any Design Methodologies such as SSAD, OOAD and UML, etc.

The project work shall be presented by students using Power Point Presentation Tool to the panel of Examiners, along with a live demonstration of the project.

The evaluation of the Internship and Project will be done separately by an External Examiner appointed by the University and the evaluation process follows 80% external assessment and 20 % internal assessment.

Marks shall be distributed as per the following tables shows below:

Marks Distribution -Project Work

Distribution	External Evaluation (80)	Internal Evaluation (20)
Design and Development	40	5
Presentation	20	5
Record	10	5
Viva	10	5

Marks Distribution - Internship

Distribution	External Evaluation (80)	Internal Evaluation (20)
Report	50	10
Presentation	20	5
Viva	10	5

Industrial Visit:

- Minimum one or two day visit to Techno Parks, Digital Parks, National research Institutes.Laboratories, and places of scientific Importance or Software Companies .
- A Report should be submitted by the students within two weeks after the visit with enough photographs and certificates, if any, received from the institution.

SEMESTER V

SDC51T23 BIG DATA ANALYTICS

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:3 Hours Per Week: 3 Total hours: 48
Course Objectives	
<ol style="list-style-type: none">1. To understand the computational approaches to Modeling, Feature Extraction.2. To understand the need and application of Map Reduce.3. To understand the various search algorithms applicable to Big Data.4. To analyze and interpret streaming data.5. To learn how to handle large data sets in main memory.6. To learn the various clustering techniques applicable to Big Data	
Course Outcomes:	
<p>C0-1: -Design algorithms by employing Map Reduce technique for solving Big Data problems.</p> <p>C0-2: -Identify similarities using appropriate measures.</p> <p>C0-3: -Design solutions for problems in Big Data by suggesting appropriate clustering techniques</p> <p>C0-4: -Discuss algorithms for Analytical Theory and Methods</p> <p>C0-5: - Point out problems associated with streaming data and handle them</p>	

Course Outline

Module I (8Hrs)

Introduction to Big Data: Evolution of Big Data, Best Practices for Big Data Analytics, Big Data Characteristics, Validating, The Promotion of the Value of Big Data, Big Data Use Cases Characteristics of Big Data Applications, Perception and Quantification of Value Understanding Big Data Storage, A General Overview of High-Performance Architecture HDFS Map Reduce and Varn, Map Reduce Programming Model.

Module II (10 Hrs.)

Clustering and Classification: Advanced Analytical Theory and Methods, Overview of Clustering K-Means, Use Cases, Overview of The Method, Determining The Number of Clusters Diagnostics, Reasons to Choose and Cautions . Classification: Decision Trees,

Overview of A Decision Tree, The General Algorithm, Decision Tree Algorithms, Evaluating A Decision Tree
Decision Trees in R, NaYve Bayes, Bayes? Theorem, NaYve Bayes Classifier.

Module III (10 Hrs)

Association and Recommendation System: - Advanced Analytical Theory and Methods: Association Rules, Overview, Apriori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules, Finding Association & Finding Similarity, Recommendation System: Collaborative Recommendation- Content Based Recommendation, Knowledge Based Recommendation- Hybrid Recommendation Approaches.

Module IV (10 Hrs)

Stream Memory: Introduction to Streams Concepts, Stream Data Model and Architecture, Stream Computing, Sampling Data in A Stream, Filtering Streams, Counting Distinct Elements in A Stream Estimating Moments, Counting Oneness in A Window, Decaying Window, Real Time Analytics Platform (RTAP) Applications, Case Studies Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

Module V (10 Hrs)

NoSQL Data Management for Big Data and Visualization: - NoSQL Databases : Schema-Less Models? Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores, Object Data Stores, Graph Databases Hive, Sharding, H Base, Analyzing Big Data with Twitter ,Big Data for E-Commerce Big Data for Biogs, Review of Basic Data Analytic Methods using R.

Reference Books:

1. . Jure Leskovec, AnandRajaraman,Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, Second Edition, 2014.
- 2 Jiawei Han, MichelineKamber, JianPei, "Data Mining Concepts and Techniques", Morgan Kaufman Publications, Third Edition, 2011 .
- 3 Ian H.Witten, Eibe Frank "Data Mining - Practical Machine Learning Tools and Techniques", Morgan Kaufman Publications, Third Edition, 2011.
- 4 David Hand, HeikkiMannila and Padhraic Smyth, "Principles of Data Mining", MIT Press,2001.

SDCSIT24 MACHINE LEARNING & ARTIFICIAL INTELLIGENCE

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:3 Hours Per Week: 3 Total hours: 48
Course Objectives	
<ol style="list-style-type: none">1. To introduce the prominent methods for machine learning2. To study the basics of supervised and unsupervised learning3. To study the basics of connectionist and other architectures	
Course Outcomes:	
<p>C0-1: Differentiate Various Learning Approaches, and to Interpret the Concepts of Supervised Learning</p> <p>C0-2: Compare The Different Dimensionality Reduction Techniques</p> <p>C0- 3: Apply Theoretical Foundations of Decision Trees to Identify Best Split and Bayesian Classifier to Label Data Points</p> <p>C0- 4: Illustrate The Working of Classifier Models Like SVM, Neural Networks and Identify Classifier Model for Typical Machine Learning Applications</p>	

Course Outline

Module I (8Hrs)

Introduction to Machine Learning, Examples of Machine Learning applications - Learning associations, Classification, Regression, Unsupervised Learning, Reinforcement Learning. Supervised learning- Input representation, Hypothesis class Version space, Vapnik- Chervonenkis(VC)Dimension, Model Development and Operations.

Module II (10 Hrs)

Classification- Cross validation and re-sampling methods- K-fold cross validation, Boot strapping, Measuring classifier performance- Precision, recall, ROC curves. Bayes Theorem, Bayesian classifier, Maximum Likelihood estimation, Density functions, Linear Regression, Logistic Regression.

Module III (10 Hrs)

Decision Trees- Entropy, Information Gain, Tree construction, ID3, Issues in Decision Tree learning- Avoiding Over-fitting, Reduced Error Pruning, Problem of Missing Attributes, Gain Ratio, Classification by Regression (CART), Random Forest, Neural Networks- The Perceptron, Activation Functions, Training Feed Forward Network by Back Propagation.

Module IV (10 Hrs)

Kernel Machines- Support Vector Machine, Optimal Separating hyper plane, Soft-margin hyperplane, Kernel trick, Kernel functions . Discrete Markov Processes, Hidden Markov models, three basic problems of HMMs- Evaluation problem, finding state sequence, Learning model parameters. Combining multiple learners, Ways to achieve diversity, Model combination schemes, Voting, Bagging, Boosting

Module V (10 Hrs)

Unsupervised Learning, Clustering Methods, K-means, Expectation-Maximization Algorithm, Hierarchical Cluster, Python Libraries for ML, Open CV, Matplotlib, pip, Numpy, Pandas, Scikit- Learn, Scipy, TQDNM, TensonFlow, KERAS, PyTorch, Statmodels, Plotly, NLTK, Scrapy, and PySpark

References:

1. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer, 2006.
2. Ethem Alpaydın, Introduction to Machine Learning (Adaptive Computation and Machine Learning), MIT Press, 2004.
3. Margaret H. Dunham. Data Mining: introductory and Advanced Topics, Pearson, 2006
4. Mitchell. T, Machine Learning, McGraw Hill.
5. Ryszard S. Michalski, Jaime G. Carbonell, and Tom M. Mitchell, Machine Learning: An Artificial Intelligence Approach, Tioga Publishing Company.

SDC51T25 CLOUD COMPUTING

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:3 Hours Per Week:3 Total hours: 48
Course Objectives	
<ol style="list-style-type: none">1. Comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications.2. To expose the students to frontier areas of Cloud Computing and information systems, while providing sufficient foundations to enable further study and research.	
Course Outcomes:	
<p>C0-1: Articulate the main concepts, key technologies , strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.</p> <p>C0-2:-Identify the architecture and infrastructure of cloud computing, including Saas, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.</p> <p>C0-3: Explain the core issues of cloud computing such as security, privacy, and interoperability.</p> <p>C0-4: Choose the appropriate technologies, algorithms, and approaches for the related issues.</p> <p>C0-5:-Identify problems, and explain, analyze, and evaluate various cloud computing solutions.</p>	

Course Outline

Module I (8 Hrs)

Introduction: Distributed Computing and Enabling Technologies, Cloud Fundamentals: Cloud Definition, Evolution , Architecture, Applications, Deployment models, and Service models.

Module II (10 Hrs)

Virtualization Concepts: Issues with virtualization, technologies and architectures, Internals of virtual machine monitors/hypervisors, virtualization of data centers, and Issues with Multi- tenancy.

Module III (10 Hrs)

Implementation: Case Study of Cloud Computing Systems like Amazon EC2 and S3, GCP, Microsoft Azure etc., Build Private/Hybrid Cloud using open source tools, Deployment of Web Services from Inside and Outside a Cloud Architecture. MapReduce and its extensions to Cloud Computing, HDFS, and GFS. Interoperability and Service Monitoring Managing interoperability, Vendor lock-in, Interoperability approaches. SLA Management, Metering Issues, and Report generation.

Module IV (10 Hrs)

Resource Management and Load Balancing: Distributed Management of Virtual Infrastructures, Server consolidation, Dynamic provisioning and resource management, Resource Optimization, Resource dynamic reconfiguration, Scheduling Techniques for Advance Reservation, Capacity Management to meet SLA requirements and Load Balancing, Various load balancing techniques.

Module V (10 Hrs)

Migration and Fault Tolerance: Broad Aspects of Migration into Cloud, Migration of Virtual Machines and techniques. Fault Tolerance Mechanisms. Security: Vulnerability Issues and Security Threats, Application-level Security, Data level Security, and Virtual Machine Level Security, Infrastructure Security, and Multi-Tenancy Issues. IDS: host-based and network-based, Security-as-a-Service. Trust Management, Identity Management, and Access Controls Techniques. Advances: Grid of Clouds, Green Cloud, Mobile Cloud Computing, Kubernetes, Edge Computing Vs Cloud

References:

1. Cloud Computing Principles and Paradigms, Rajkumar Buyya, James Broberg, Andrzej Goscinski, Wiley Publishers
2. Cloud Computing Bible, Barrie Sosinsky. Wiley Publishers.
3. Cloud Computing Web-based Applications that change the way you work and collaborate online, Michael Miller, Pearson Education.
4. Mastering Cloud Computing, Rajkumar Buyya, Christian Vacchiola, SThamaraiSelvi, McGraw
5. Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide. David S. Linthicum.
6. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumaraswamy, Shahed Latif, O'Reilly .
7. Cloud Computing: A Practical Approach. Toby Velte, Anthony T Velte, Robert Elsenpeter, McGraw

SDC5IT26 ANDROID APP DEVELOPMENT

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:3 Hours Per Week:3 Total hours: 48
Course Objectives	
<ol style="list-style-type: none">1. Develop mobile applications with Google Android Platform2. Learn more about mobile operating system3. Get an insight to cross platform mobile app development	
Course Outcomes:	
<p>C0-1: Understand the installation of Android Development Kit</p> <p>C0-2: Design GUI for their simple applications</p> <p>C0-3: Perform multi-screen applications</p> <p>C0-4: Working with images and text files</p> <p>CO-5: Develop Mobile Application using Android</p>	

Course Outline

Module I(10Hrs)

Introduction & environment set up: Introduction to object oriented programming and java basics, introduction to android and smart phones, Android Architecture & Virtual Machine, Mobile Technology terminologies, setting up the environment, Setting up Emulators, android fundamentals Activities and Applications Activity Life Cycles Activity Stacks, Activity States, introduction to manifest, resources &R.java, assets, Values - strings.xml

Module II (10 Hrs)

Basic UI design: Form widgets, views, Layouts &Draw able Resources XML Layouts, Linear Layouts, Relative layouts, Table Layouts, android Widgets, UI XML Specifications Events, Bundles & Intents Explicit Intents Implicit Intents Event Broadcasting with Intents Event Reception with Broadcast Receivers, Adapters and Data Binding.

Module III (10 Hrs)

Files, Content Providers, and Databases: Saving and Loading Files, SQLite Databases Android Database Design Exposing Access to a Data Source through a Content Provider Content Provider Registration Native Content Providers, Android Debug Bridge (adb) tool, Linkify.

Module IV (15 Hrs)

Custom components, Threads & multimedia: Adapters and Widgets, Notifications, Custom components
Threads running on UI thread, Worker thread Handlers & Runnable AsyncTask(in detail), Playing
Audio and Video, Recording Audio and Video, Using the Camera to Take and Process Pictures.

Module V (15 Hrs)

Networking & Location based services: Live Folders, Using SD cards - Reading and writing, XML
Parsing JSON Parsing Including external libraries in our application, Map- Based Activities, Maps
via intent and Map Activity GPS, Location based Services configuration, Geocoding, Accessing
Phone services (Call, SMS, MMS) Network connectivity services, Using WiFi & Bluetooth Action bar
tabs and custom views on Action bars. Introduction to cross-platform application development
tools like ruby on rail, phone gap etc.

References:

1. Beginning Android 4, Onur Cinar, Apress Publication.
2. Professional Android 4 Application Development, Reto Meier

SDC5IT27 E1 DATA BASE ADMINISTRATION

75 Marks [Internal: 15, External: 60] Examination 2.5 Hours	Credits:3 Hours Per Week:3 Total hours: 48
Course Objectives	
<ol style="list-style-type: none">1. The key goal is to prepare students for a professional career in the field of data administration and database design2. To get acquainted students with good knowledge of DBMS. During the course, students will learn about database design and database handling activities.3. To get acquainted students with basics of database security and administration.	
Course Outcomes:	
C0-1: Will be able to work in a group on the design, and implementation of a database system project.	
C0-2: Experiences how to manage data by establishing a database connection over the current programming languages.	
C0-3: Experiences on how to implement an application using a database management system.	
C0-4: Will be able to do database administration works.	

Course Outline

Module I (8Hrs)

Oracle Database Architecture, Preparing the Database Environment and Creating Database, Managing the Oracle Instance, Configuring the Oracle Network Environment, Managing Database Storage Structures, Administering User Security, Managing Data and Concurrency, Managing Undo Data Module, Implementing Oracle Database Security, Database Maintenance, Performance Management, Intelligent Infrastructure Enhancements.

Module II (10 Hrs)

Backup and Recovery Concepts-Performing Database Backups, Performing Database Recovery Moving Data Module, Database Architecture and ASM, Configuring for Recoverability Using the RMAN recovery Catalog, Configuring Backup Specifications, -Using RMAN to Create Backups and Recovery, Performing User Managed Backup and Recovery, Using RMAN to Duplicate a Database, Performing Table space, Point-in Time Recovery, Monitoring and Tuning RMAN Module Using Flashback Technology, Diagnosing the Database, Managing Memory, Managing Database Performance, Space Management, Managing Resources, Automating Tasks with the Scheduler, Administering the Scheduler.

Module III (9 Hrs)

SQL SERVER Architecture - SQL DB Files, Locks in SQL Server, Transaction Isolation Levels, SQL server Installation, SQL Server Backup & Restore -Types of Backups, Understanding SQLLSN & Backups-Restore, Data Import & Export, Security Model- SQL Server Authentication Vs Windows Authentication, Server Level Roles, Transparent Data Encryption.

Module IV (9Hrs)

SQL Server Performance Tuning, index, defragmentation and Maintenance, Creating & Running Traces, Database Mirroring, Clustering, Replication, SQLCMD & PSScripts

Module V (9 Hrs)

Case Studies: MySQL Maria DB, PostgreSQL

References:

1. [John Watson, OCA Oracle Database 12c Installation and Administration Exam Guide](#)
2. [Oracle Database Administration for Microsoft SQL Server DBAs \(Oracle Press\)](#)
3. [Hans-Jürgen Schöning, Mastering PostgreSQL 13: Build, administer, and maintain database applications efficiently with PostgreSQL 13, 4th Edition.](#)
4. [https:// docs.oracle.com](https://docs.oracle.com)

SDC5IT27 E2- QUALITY ASSURANCE AND TESTING

75 Marks [Internal: 15, External: 60] Examination 2 Hours	Credits:3 Hours Per Week:3 Total hours: 48
Course Objectives	
<ol style="list-style-type: none">1. To identify the basics of testing, test planning & design and test team organization2. To study the various types of test in the life cycle of the software product.3. To build design concepts for system testing and execution4. To learn the software quality assurance metrics, defect prevention techniques5. To learn the techniques for quality assurance and applying for applications.	
Course Outcomes:	
<p>CO-1: Perform functional and nonfunctional tests in the life cycle of the software product.</p> <p>CO-2: Understand system testing and test execution process.</p> <p>CO-3: Identify defect prevention techniques and software quality assurance metrics.</p> <p>CO-4: Apply techniques of quality assurance for typical applications.</p>	

Module 1 (8 Hrs.)

Quality Revolution, Verification and Validation, Failure, Error, Fault, and Defect, Objectives of Testing, Testing Activities, Test Case Selection White-Box and Black Test Planning and design, Test Tools and Automation, Power of Test. Test Team Organization and Management-Test Groups, Software Quality Assurance Group System Test Team Hierarchy, Team Building .

Module II (8 Hrs)

System Testing - System Integration Techniques-Incremental, Top Down Bottom Up Sandwich and Big Bang, Software and Hardware Integration, Hardware Design Verification Tests, Hardware and Software Compatibility Matrix Test Plan for System Integration. Built- in Testing. functional testing - Testing a Function in Context. Boundary Value Analysis, Decision Tables. acceptance testing - Selection of Acceptance Criteria, Acceptance Test Plan, Test Execution Test. software reliability - Fault and Failure, Factors Influencing Software, Reliability Models.

Module III (12 Hrs)

System test categories Taxonomy of System Tests, Interface Tests Functionality Tests. GUI Tests, Security Tests Feature Tests, Robustness Tests, Boundary Value Tests Power Cycling Tests Interoperability Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests. Test Generation from FSM models- State-Oriented Model. Finite-State Machine Transition Tour Method, Testing with State Verification. Test Architectures- Local, distributed, Coordinated, Remote. system test design- Test Design Factors Requirement Identification, modeling a Test Design Process Test Design Preparedness, Metrics, Test Case Design Effectiveness. system test execution- Modeling Defects, Metrics for Monitoring Test Execution Defect Reports, Defect Causal Analysis, Beta testing, measuring Test Effectiveness.

Module IV(8 Hrs)

Software quality - People's Quality Expectations, Frameworks and ISO-9126, McCall's Quality Factors and Criteria - Relationship. Quality Metrics . Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement, Testing Maturity Model.

Module V (9 Hrs)

Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees. Comparing Quality Assurance Techniques and Activities . QA Monitoring and Measurement, Risk Identification for Quantifiable Quality Improvement. Case Study: FSM-Based Testing of Web-Based Applications.

References:

1. Software Testing And Quality Assurance-Theory and Practice, Kshirasagar Nak Priyadarshi Tripathy, John Wiley & Sons Inc, 2008
2. Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, Jeff Tian, John Wiley & Sons, Inc., Hoboken, New Jersey. 2005.
3. Software Quality Assurance - From Theory to Implementation, Daniel Galin, Pearson Education Ltd UK, 2004 Software Quality Assurance, Milind Limaye, TMH, New Delhi, 2011

SDC5IT27 E3 - INTERNET OF THINGS (IoT)

75 Marks [Internal: 15, External: 60] Examination 2.5 Hours	Credits:3 Hours PerWeek:3 Total hours: 45
Course Objectives	
<ol style="list-style-type: none">1. To understand Smart Objects and IoT Architectures2. To learn about various IoT-related protocols3. To build simple IoT Systems using Arduino and Raspberry Pi.4. To understand data analytics and cloud in the context of IoT5. To develop IoT infrastructure for popular applications	
Course Outcomes	
<p>C01: - Explain the concept of IoT.</p> <p>C02: -Analyze various protocols for IoT.</p> <p>C03: -Design a PoC of an IoT system using Raspberry Pi/Arduino</p> <p>C04: -Apply data analytics and use cloud offerings related to IoT.</p> <p>COS: -Analyze applications of IoT in real time scenario.</p>	

Course Outline

Module 1(9 Hrs)

Fundamentals Of IoT:-Evolution of Internet of Things, Enabling Technologies, IoT Architectures: one M2M, IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack Fog, Edge and Cloud in IoT- Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

Module II (10 Hrs)

IoT Protocols:-IoT Access Technologies: Physical and MAC Layers, Topology and Security Of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah And LoRawan, Network Layer: IP Versions, Constrained Nodes And Constrained Networks, Optimizing IP For IoT: From 6lowpan To 6Lo, Routing Over Low Power And Lossy Networks, Application Transport Methods: Supervisory Control And Data Acquisition, Application Layer Protocols: Coap And MQTT.

Module III (8Hrs)

Design and Development :-Design Methodology, Embedded Computing Logic, Microcontroller, System On Chips, IoT System Building Blocks, Arduino, Board Details, IDE Programming, Raspberry Pi, Interfaces and Raspberry Pi with Python Programming.

Module IV (10 Hrs)

Data Analytics and Supporting Services:-Structured Vs Unstructured Data And Data In Motion Vs Data In Rest, Role Of Machine Learning, No SQL Databases , Hadoop Ecosystem - Apache Kafka, Apache Spark, Edge Streaming Analytics And Network Analytics, Xively Cloud For IoT, Python Web Application Framework - Django -AWS For IoT- System Management With NETCONF- YANG

Module V (8 Hrs)

Case Studies/Industrial Applications: -Cisco IoT System, Ibm Watson IoT Platform, Manufacturing, Converged Plantwide Ethernet Model (Cpwe), Power Utility Industry, Gridblocks Reference Model, Smart and Connected Cities: Layered Architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

References:

1. Arshdeep Bahga, Vijay Madiseti, -Internet of Things - A hands-on approach, Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , -The Internet of Things - Key applications and Protocols, Wiley, 2012 (for Unit 2).
3. Jan Hoelzer, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), -Architecting the Internet of Things, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.

SDC5IT27E4 FINANCIAL & MANAGEMENT ACCOUNTING

75 Marks [Internal: 15, External: 60] Examination: 2 Hours	Credits: 3 Hours Per Week: 3 Total hours: 45
Course Objectives	
<ol style="list-style-type: none">1. To get a general introduction on accounting and its general applications.2. To get an understanding on various tools for financial statement analysis.3. To get an understanding on accounting procedures upto the preparation of various financial and management statements.	
Course Outcomes:	
<p>C0-1: To get a general introduction on accounting and its general application.</p> <p>C0-2: To get a general understanding on various tools for financial statement analysis</p> <p>C0-3: To get a general understanding on accounting procedures up to the preparation of various financial statements.</p>	

Course Outline

Module I (10Hrs)

Principles of accounting, Some fundamentals concepts and conventions, Systems of accounting double entry principles, Advantages of Double entry system, personal, real, nominal accounts. Cash book-forms of cash books, subdivisions of Journal, Ledgers, limitations of financial Accounting, Trial balance, Final accounts, Trading P/L *Ne*, Balance sheet

Module II (8 hrs)

Invitation to management accounting: Analysis and interpretation of trading accounts and financial Statements, Horizontal Vertical analysis, Common size Balance sheet, common size income Statement, comparative income and balance sheet, trend analysis.

Module III (8 hrs)

Ratio analysis: uses of ratios in interpreting trading accounts and financial statements, different types of ratios, Liquidity ratios, turnover ratios-activity ratios, solvency ratios.

Module IV (9 hrs)

Fund flow statement, schedule of changes in working capital, fund from operation, cash flow Statement, cash from operating activities, cash from financing activities, cash from investing activities

Module V(10 hrs)

Marginal costing- Break even point - cost volume profit analysis- margin of safety -standard costinganalysis of variance-material-labour-0/H-sales Variables-Budget and Budgetary control- different types of budgets- master budget- sales budget-production budget-flexible budget-cash budgetadvantages-preparation

References:

1. Pandey I.M "Financial Management" Vikas publishing house
2. Kellock.J "elements of Accounting" Heinmann
3. S.N Maheshwari "advanced Accountancy" Vikas publishing house
4. A.Vinod "cost andManagement accounting"-Calicut University central co-operative stores

SDC51T28 (P) ANDROID APP DEVELOPMENT - LAB

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 HoursPerWeek:4 Total hours: 64
Course Objectives	
<ol style="list-style-type: none">1. To understand activities and intents, designing user interface using views, data persistence, content providers,2. To understand messaging and networking, location-based services, and developing android services	
Course Outcomes:	
<p>C01: -Demonstrate their skills of using Android software development tools</p> <p>CO2: -Demonstrate their ability to develop software with reasonable complexity on mobile platform</p> <p>CO3:-Demonstrate their ability to deploy software to mobile devices</p> <p>C04:- Demonstrate their ability to debug programs running on mobile devices</p>	

Lab Exercises:

1. Developing Simple Applications for Android
2. Creating Applications with Multiple Activities and a Simple Menu using ListView
3. Creating Activities for Menu Items and Parsing XML Files
4. Writing Multi-Threaded Applications using AsyncTask
5. Using WebView and Using the Network
6. Using Audio Functions in Android
7. Graphics Support in Android
8. Preferences and Content Providers
9. Preference Activity
10. Creating Menus
11. Location Services and Google Maps in Android
12. Obtaining User Location
13. Obtaining a Maps APIKey
14. Creating Status Bar Notifications
15. Develop a mob app including all the above features

SDCSIT29 (P) MACHINE LEARNING AND AI - LAB

75 Marks [Internal: 15, External: 60] Examination: 2 Hours	Credits:3 Hours Per Week:3 Total hours: 48
Course Objectives	
<ol style="list-style-type: none">1. Understand various algorithms related to machine learning2. To discover patterns in your data and then make predictions based on often complex patterns to answer business questions	
Course Outcomes:	
<p>C0-1: Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.</p> <p>C0-2: Be able to design and implement various machine learning algorithms in range of real-world applications.</p> <p>C0-3: Apply various machine learning algorithms in real world entities</p> <p>C0-4: Develop AI Solutions</p>	

Course Outlines:

Lab Exercises:

1. Experiment the vacuum cleaner world example
2. The probability that it is Friday and that a student is absent is 3%. Since there are 5 school days in a week, the probability that it is Friday is 20%. What is the probability that a student is absent given that today is Friday? Apply Baye's rule in python to get the result. (Ans: 15%)
3. Extract the data from database using python
4. Implement the Romanian Example using the Depth First Search
5. Design a program for the greedy best first search or A* search
6. Construct the simulated annealing algorithm over the travelling salesman problem.
7. Implement a basic binary genetic algorithm for a given problem
8. Experiment the Graph Coloring CSP or Crypt Arithmetic Puzzle
9. Implement the Tic-Tac-Toe game using any adversarial searching algorithm
10. Implement k-nearest neighbours classification using python

SDC51T30 (P) BIG DATA ANALYTICS - LAB

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Hours Per Week:4 Total hours: 64
Course Objectives	
<ol style="list-style-type: none">1. Understand the Big Data Platform and its Use cases2. Provide an overview of Apache Hadoop3. Exposure to Data Analytics with R.	
Course Outcomes:	
<p>C0-1: Identify Big Data and its Business Implications. C0-2: Access and Process Data on Distributed File System C0-3: Develop Big Data Solutions using Hadoop Eco System C0-4: Apply Machine Learning Techniques using R.</p>	

Course Outlines:

a) R Programming -- (20Hrs)

1. Study of basic Syntaxes in R
2. Implementation of vector data objects operations
3. Implementation of matrix, array and factors and perform vain R
4. Implementation and use of data frames in R
5. Create Sample (Dummy) Data in Rand perform data manipulation with R
6. Study and implementation of various control structures in R
7. Data Manipulation with dplyr package
8. Data Manipulation with data.table package
9. Study and implementation of Data Visualization with ggplot2
10. Study and implementation data transpose operations in R

b) Hadoob -- (20Hrs)

11. Draw and explain Hadoop Architecture and Ecosystem with the help of a case study using WorkCount example. To define and install Hadoop.
12. Implement the following file management tasks in Hadoop System (HDFS): Adding files and directories, retrieving files, Deleting files
13. Run a basic WordCount MapReduce program to understand MapReduce Paradigm: To count words in a given file, to view the output file, and to calculate execution time.

c) NoSQL - MongoDB (24Hrs)

14. Perform NoSQL database using mongodb to create, update and insert.
15. Study and implement basic functions and commands in R Programming.
16. Build Word Cloud, a text mining method using R for easy to understand and visualization than a table data.
17. Implement Bloom Filters for filter on Stream Data in Python.
18. Implement Flajolet-Martin Algorithm for counting distinct elements in Stream Data.
19. Implement clustering program using R programming.
20. Find Term Frequency and Inverse Document Frequency (tf-idf) Matrix for Recommendation Systems and Plot TF Using R used.
21. Finding similar documents with Cosine Similarity in R.

SDC5IT31 (P) CLOUD COMPUTING AND ELECTIVES - LAB

(Electives: DBA /IoT/ Testing/ Tally)

100 Marks [Internal: 20, External: 80] Examination 2.5 Hours	Credits:4 Hours Per Week:4 Total hours: 64
Course Objectives	
<ol style="list-style-type: none">1. Understand the techniques of cloud computing2. Able to know various applications of DBA3. Understand the applications of IoT4. Get awareness about various testing strategies5. To know the financial and management techniques of business	
Course Outcomes:	
<p>CO-1: Apply various cloud services in development process</p> <p>CO-2: Database installation and creation and Managing Database instances</p> <p>CO-3: Develop technique of testing in various stages of development</p> <p>CO-4: Able to understand the application areas of IOT</p> <p>CO-5: Apply fundamental principles of financial & management accounting</p>	

CLOUD COMPUTING - LAB

Exercises (32 Hrs)

1. Install QEMU/KVM Virtual Machine environment
2. Setup LAMP in QEMU/KVM Virtual environment
3. Install Google App Engine and setup simple web app using Python/Java
4. Enable/use different micro services provided by GCP
5. Document, Draft and implement a cloud computing lab for academic purpose
6. Experiment using
 - i. Cloud monitoring tools: Amazon Cloudwatch, Microsoft Cloud monitoring, AppDynamics, Retrace etc.
 - ii. Configuration management tools: Puppet, Chef, Ansible, CFEngine, JUJU, Bamboo
Workflow management tools: Evernote, Jira, VersionOne, Workzone, Scrum Mate etc

DBA- LAB

Exercises (32 Hrs)

1. Laboratory Component
2. Different Database Systems Installation
3. Tuning
4. Backup
5. Recovery
6. Monitoring
7. User Creation and Maintenance
8. Security Auditing
9. Migration Etc.

IoT LAB

Exercises (32 Hrs)

1. Study and Install IDE of Arduino and different types of Arduino.
2. Write program using Arduino IDE for LED blinking.
3. Write Program for RGB LED using Arduino.
4. Write Program to monitor temperature using Arduino.
5. Implement RFID, NFC using Arduino.
6. Implement MQTT protocol using Arduino.
7. Study and Configure Raspberry Pi.
8. WAP for LED blink using Raspberry Pi.
9. Implement Zigbee Protocol using Arduino / Raspberry Pi.
10. Experiments with different categories of IoT sensors such as Smart Agriculture Sensors

TESTING LAB

Exercises (32 Hrs)

1. Write a test case based on controls.
2. Test data in a flat file.
3. Manual test case to verify student grade
4. Write and test a program to select the number of students who have scored more than 60 in any
5. one subject(or all Subjects)
6. Write and test a program to login a specific web page.
7. Write and test a program to get the number of list items in a list/ combo box.
8. Test a HTML file.
9. Test a program in MS Excel for Data Driven Wizard.
10. Test the addition of two values in C++ Program

TALLY- LAB

Exercises (32 Hrs)

1. Company creation, deletion, alteration
2. Groups and Ledgers in Tally
3. Journal Vouchering
4. Inventory Accounting
5. Bill wise entry (BR/BP)
6. Cost Centres
7. Import and Export ledgers
8. GST, CST etc
9. Preparation of Trading Profit and Loss Account
10. Preparation of Balance Sheet

SEMESTER VI

SDC61T32 TERM PAPER

Number of Credits: 2
Course Evaluation: 50 Marks [Internal Assessment only] No External Assessment
Course Objectives
To acquire the confidence in presenting the topic and preparing a report.
Course Outcomes:
C0-1: Demonstrate capacity to improve student achievement, engagement & retention C0-2: Analyze the problem of study and collect necessary data. C0-3: Students work in traditional rhetorical forms and write a research paper. C0-4: Implement, evaluate and generate reports.

Course Outline

The student is expected to do an extensive literature survey and analysis in an area related to computer science especially in mobile application development, chosen by him/her, under the supervision of a faculty member from the department.

He/ she shall select the topic based on the references: from reputed International Journals, preferably IEEE journals. The students should undertake a detailed study on the topic and submit a report prior to the presentation

Evaluation of term paper should be done internally. A faculty member can be appointed as a guide/ supervisor. The student has to choose an area for his/her work after due consultation and approval from the guide.

The topic shall be presented in the class taking duration of 15-20 minutes. A committee consisting of three/four faculty members shall evaluate the seminar presentation.

Proper presentation aids can be used. Every student shall participate in the seminar.

Mark Distribution:

Criteria	Marks (50)
Content (sets out relevant issues, explains key terms, confident with material, aids understanding)	10
Delivery (speed, eye contact, clarity, audibility, tone)	10
Use of visual aids uses handout or other visual aids, relevant to content	10
Structure: (logical, easy to follow, provides headings, each section relates to overall purpose)	10
Response to questions: willing to answer questions, actively seeks questions	10

SDC61T33 (Pr) INTERNSHIP & PROJECT

Number of Credits /Semester: 28
Total Hours/ Semester: 840 Hrs
Examination: 2.5 Hrs

Course Evaluation:

Internship 200 Marks [Internal: 40, External: 160]
Project 200 Marks [Internal: 40, External: 160]

Course Objectives

To get full time industrial exposure and experience real time live projects
To work as a Software Engineer applying the knowledge in the field of testing, designing, programming and maintenance to cater to the specific needs of the people

Course Outcomes:

- CO 1:** Ability to integrate existing and new technical knowledge for industrial application
- CO2:** Acquire interpersonal, communication and other critical skills in the job interview process.
- CO3:** Develop work habits and attitudes necessary for job success
- CO4:** Real time work experience helps to get placed easily

Course Outlines

Each student shall undergo an internship and also do an individual Project and submit towards the end of the internship

The students are required to do the Internship in IT Firms, Govt/Private organizations, Software development companies or any other organizations which related to their work of study under the supervision of a Department guide.

- Each student should submit a synopsis of the project work they intend to do to their concerned guide for approval before the commencement of their project.

The student has to make regular discussions with the guide throughout the life time of the Internship and project

The Internship will be reviewed periodically every month by the department guide.

A valid certificate as Internship certificate from the organization should be produced as a proof that the work is carried out in the respective organization.

At the end of the semester the candidate shall submit the hard copy and soft copy of Internship report and project report to the department.

The evaluation of the Internship and Project will be done separately by an External Examiner appointed by the University and the evaluation process follows 80% external assessment and 20 % internal assessment.

The mark distribution for the Internship and Project shall be in the following pattern

Mark Distribution for Internship

Distribution	External	Internal
Report	100	*30
Viva	60	10
Total	160	40

Mark Distribution for Project

Distribution	External	Internal
Report (Design, Presentation)	100	*30
Viva	60	10
Total	160	40

*Review based Split up

Review I =10; Review II= 10; Review III= 10 = Total 30

APPENDIX A

Mark Split Up For Practical's, Term Paper and Projects/ Internship

In order to get uniformity in the mark distribution of Practical sessions, Term Paper, Mini Project and Main Project, the following criteria shall be followed by the Examiners.

For Practical's (LAB) - External Evaluation

Distribution	Marks (60)	Marks (80)
Algorithm/Flowchart/Coding	30	50
Output / Result	10	10
Record	10	10
Viva	10	10
Total	60	80

For Practical's (LAB)- Internal Evaluation

Distribution	Marks(15)	Marks (20)
Problem Solving/Coding	5	10
Regularity/ Attendance	5	5
Rough Record	5	5
Total	15	20

For Project Work

Distribution	Internal (20)	External (80)
Design and Development	5	40
Presentation	5	20
Record	5	10
Viva	5	10
Total	20	80

For Internship

Distribution	Internal (20)	External (80)
Report	50	50
Presentation	20	20
Viva	10	10
Total	20	80

TermPaper- Internal Evaluation (6th Semester)

Distribution	Marks (SO)
Content (sets out relevant issues, explains key terms, confident with material, aids understanding)	10
Delivery (speed, eye contact, clarity, audibility, tone)	10
Use of visual aids uses handout or other visual aids, relevant to content	10
Structure: (logical, easy to follow, provides headings, each section relates to overall purpose)	10
I Response to questions: willing to answer questions, actively seeks questions	10

For Internship & Project Evaluation (6th Semester)

Mark Distribution for Internship

Distribution	External	Internal
Report	100	*30
Viva	60	10
Total	160	40

Mark Distribution for Project

Distribution	External	Internal
Report (Design, Presentation)	100	*30
Viva	<u>160</u>	10
t-T_o_t_a_l	---, 160	40

***Review based Split up**

Review I = 10 ; Review II = 10; Review III = 10 = Total 30

(Appendix B)

Guidelines for Project Report & Layout

Cover Page and First Page

<PROJECT TITLE>

(A PROJECT REPORT)

Submitted by

<NAME>

For the award of the Degree of

Department of Vocational Studies (B.Voc)

In Software Development

(University of Calicut)

<College LOGO>

Under The Guidance of

<NAME>

**Dissertation in partial fulfilment of requirements for the Award of
Degree in Multimedia**

<<NAME OF THE DEPARTMENT>>

«NAME OF THE INSTITUTION» (AFFILIATED
TO THE UNIVERSITY OF CALICUT)

«ADDRESS»

MONTH YEAR

<College Name>

<College LOGO>

CERTIFICATE

This is to certify that the project report entitled TITLE HERE submitted by «Name of the Student» (Register Number:) to University of Calicut for the award of the degree of Vocational Studies in Software Development of Calicut University during the year 2022 -2023.

Principal

Head of the Department

Project Guide

PROJECT EVALUATION REPORT OF THE EXAMINERS

Certified that the candidate was examined by us in the Project Viva Voce Examination held on and his/her Register Number is

Examiners:

1.

2.

DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person or material which has been accepted for the award of any other degree or diploma of the university or other institute of higher learning, except where due acknowledgment has been made in the text.

Signature:

NAME HERE

DATE

REg.No

New Page/

TO WHOM SO EVER IT MAY CONCERN

This is to certify that <NAME><Reg.No:> B.Voe in Software Development <2th/4th/6th> semester student of <College Name>, has done the project work on the topic "<Project Title>" under guidance of <NAME>. towards the fulfilment of the award of Degree in Software Development. During the period of <Month/ Date/ Year>

During the tenure of the project, her conduct was good and satisfactory. We wish her all the best for future endeavors

ACKNOWLEDGEMENT

I would like to thank

NAME

New Page/

SYNOPSIS

My project is focusing on the ..、

UST OF CONTENTS

S.NO

CONTENTS

PAGENO

SI.NO CONTENTS

1. INTRODUCTION

SYSTEM OVERVIEW
OBJECTIVES OF SYSTEM

2. SYSTEM ANALYSIS

EXISTING SYSTEM
PROPOSED SYSTEM
ADVANTAGES OF PROPOSED SYSTEM
REQUIRMENT ANALYSIS
IDENTIFICATION OF NEED
PRELIMINARY IVESTIGATION
FEASABILITY STUDAY
PROJECT PLANING
PROJECT SCHEDULING
SOFTWARE REQUIRMENT SPECIFICATION
SOFTWARE ENGINEERING PARADAIGRAM
DATA MODELS

3 . SYSTEM DESIGN

FUNDAMENTAL DESIGN CONCEPT
INPUT DESIGN
 OUTPUT DESIGN
DATABASE DESIGN
CODE DESIGN

4. SYSTEM

TESTING SYSTEM
TESTING UNIT
TESTING
INTEGRATION TESTING
VALIDATION TESTING

5. SYSTEM IMPLEMENTATIONS AND

SYSTEM IMPLIMENTAIONS

SYSTEM MAINTANCE

6. CONCLUSION

The purpose of this section is to provide a summary of the whole project. In this context, it is similar to the Abstract, except that the Abstract puts roughly equal weight on all report chapters, whereas the Conclusion chapter focuses primarily on the findings, conclusions and/or recommendations of the project.

7. FUTURE ENHANCEMENTS

8. BIBLIOGRAPHY

Ideas or contents taken from other sources should be properly cited. It is important that you give proper credit to all work that is not strictly your own, and that you do not violate copyright restrictions.

References should be listed in alphabetical order of authors' surname, and should give sufficient and accurate details..

9. APPENDIX

SCRRENSHOTS

DATABASE TABLES

DATAFLOW DAIGRAM

ACTIVITY DAIGRAM

CLASS DAIGRAM

APPENDIX C - EXTERNAL EVALUATION (THEORY)

Question Paper Type I

Scheme of Examinations:

The external QP with 80 marks and Internal examination is of 20 marks. Duration of each external examination is 2.5 Hrs. The pattern of External Examination is as given below. The students can answer all the questions in Sections A&B. But there shall be Ceiling in each section.

Section A

Short answer type carries 2marks each-15 questions Ceiling-25

Section B

Paragraph/Problem type carries 5marks each- 8questions Ceiling-35

Section C

Essay type carries 10marks (2 out of 4) 2X10=20

Total 80

Question Paper Type II

Scheme of Examinations:

The external QP with 60 marks and Internal examination is of 15 marks. Duration of each external examination is 2 Hrs. The pattern of External Examination is as given below. The students can answer all the questions in Sections A & B. But there shall be Ceiling in each section.

Section A

Short answer type carries 2marks each- 12 questions Ceiling-20

Section B

Paragraph/Problem type carries 5marks each- 7questions Ceiling-30

Section C

Essay type carries 10marks (1 out of 2) 1X10=10

Total 60

APPENDIX D :- MODEL QUESTION PAPERS

BVOC DEGREE EXAMINATION

SDC1IT01: Discrete Mathematics

Time : 2.5 Hours

Total: 80 Marks

PART A: Short answer type carries 2 marks each

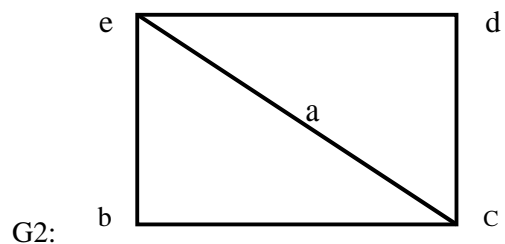
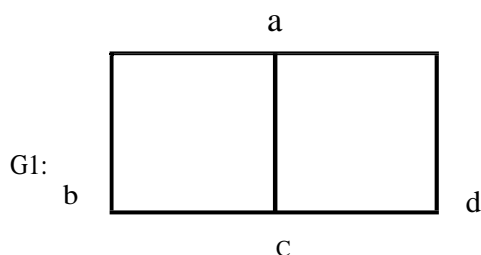
(Ceiling - 25)

1. What is the difference between equal set and equivalent set? Write example.
2. Draw truth table of $P \vee Q \vee \sim R$.
3. State Demorgan's law.
4. What is automatic control system?
5. Define walk and trail.
6. What is Euler graph?
7. Define bipartite graph with example.
8. What are the properties of trees?
9. Define cutset.
10. Draw Kuratowski's first graph
11. Prove the tautology. $P \wedge Q \rightarrow Q$
12. Check whether the relation R is equivalence or not.
 $A = \{1, 2, 3\}$ $R = \{(1, 1), (2, 2), (3, 3), (1, 2), (2, 1)\}$
13. Define Conjunction.
14. Define Planar graph
15. Draw any digraph with 5 vertices and 10 edges.

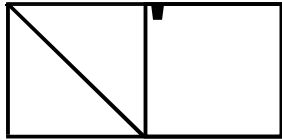
PART B: Paragraph type carries 5 marks each

(Ceiling - 35)

1. Find upper bounds and lower bounds of A . (relation is subset) $P = \{ \{a\}, \{b\}, \{c\}, \{ab\}, \{ac\}, \{abc\} \}$ $A = \{ \{c\}, \{ab\} \}$
2. Write any 4 properties of boolean algebra.
3. Show that following graphs are isomorphic or not.



4. Write the adjacency matrix of following graph.



5. Find the centre of the following tree.



6. What is a spanning tree? Draw an example diagram.

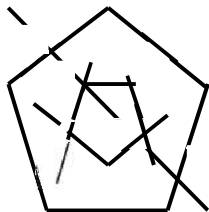
7. Draw a planar graph and its dual graph.

8. Differentiate connectivity and separativity.

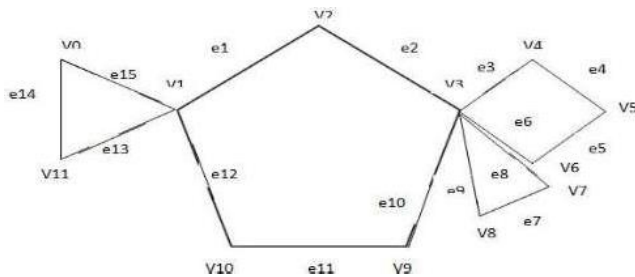
PART C : Answer any 2 question

{ 2*10=20}

1. Solvethetravelingsalesmanproblem.



2. Find Euler tour using Fleury's algorithm.



3. Explain different types of relations with examples.

4. Show that for any two sets A & B, $A - (A \cap B) = A - B$. Also explain set operations with Venn diagram

BVOC DEGREE EXAMINATION

SDC1IT02 : Fundamentals of Computer & Programming in C

Time: 2.5 Hours

Total: 80 Marks

PART A: Short answer type carries 2 marks each

(Ceiling - 25)

1. Write the order of precedence of arithmetic operators.
2. Write the tokens in C language.
3. Define algorithm.
4. Write 3 types of array.
5. Write any 4 string manipulation function.
6. What is recursion?
7. Write all storage classes in C language.
8. Draw memory reservation diagram of structure.
9. What is a pointer?
10. Write syntax of any 2 method for dynamic memory allocation.
11. Briefly explain symbolic constants.
12. What is local and global variable?
13. Specify the use of printf() and scanf() functions.
14. What are function prototypes?
15. List any 4 bit-wise operators.

PART B: Paragraph type carries 5 marks each

(Ceiling - 35)

1. Explain type conversion in detail with example.
2. Explain structure of a C program with example.
3. Explain 3 types of looping with example.
4. Write a program to access elements from a 1D array.
5. Briefly explain the difference between structure and union with example.
6. Write a program to find the sum of 2 variables by implementing function.
7. What all are the types of computer languages? Explain briefly.
8. What is an operator?

PART C : Answer any 2 question

(2*10=20)

1. Write algorithm, flowchart and program to find area of circle.
2. Write a program showing file manipulation function.
3. Write a program to add two matrix.
4. What is the call by value vs call by reference with example code and diagram?

BVOC DEGREE EXAMINATION

SDC2IT07: Database Management System

Time: 2.5 Hours

Total : 80 Marks

PART A: Short answer type carries 2 marks each

{ Ceiling - 25)

1. List any eight applications of DBMS.
2. Define the terms data and information
3. What are the disadvantages of file processing system?
4. Give the levels of data abstraction?
5. Define instance and schema?
6. Define the terms 1) physical schema 2) logical schema.
7. What is conceptual schema?
8. Define data model?
9. What is storage manager?
10. What are the components of storage manager?
11. List the data structures implemented by the storage manager.
12. What is a data dictionary?
13. Explain application of DBMS.
14. List various users of DBMS & specify their roles.
15. Explain GROUP BY clause with example.

PART B : Paragraph type carries 5 marks each

(Ceiling - 35)

1. Briefly discuss the different layers of ANSI SPARC architecture . Define physical and logical data independence. How does this architecture help in achieving these?
2. Define the terms entity, attribute, role and relationship between the entities, giving examples for each of them.
3. What are the three data anomalies that are likely to occur as a result of data redundancy? Can data redundancy be completely eliminated in database approach? Why or why not?
4. Construct an ER diagram for a hospital with a set of patients and a set of medical doctors. Associate with each patient a log of the various tests and examinations conducted.
5. Convert following ER - diagram into a relational database (the primary keys are underlined)
6. Describe five main functions of a database administrator.
7. Differentiate database schemes and instances.
8. What is deadlock? How to prevent deadlock?

PART C: Answer any 2 questions

{ 2*10=20)

1. Write note on entity -relationship data model. Explain the different notations for expressing entity relationships using ER diagrams, with a suitable example.
2. Explain the three different groups of data models with examples
3. Explain the following terms:-
 - (a) Data Redundancy and consistency
 - (b) Explain Referential Integrity
 - (c) Data atomicity
 - (d) Domain constraints
 - (e) Data models
4. Explain specialization and generalization concepts in ER diagram with Suitable example.

BVOC DEGREE EXAMINATION

SDC2IT06 Programming in Java

Time: 2.5 Hours

Total: 80 Marks

PART A: Short answer type carries 2 marks each

{Ceiling - 25}

1. List out Java Keywords.
2. Write about one of the SELECTION statements of Java.
3. . Write the usage of break and continue statements
4. List out the properties of static variables and methods
5. What is a package
6. write about NEW operator
7. Define class and write the syntax of a class
8. List out Thread properties
9. List out some of the source of errors in programming.
10. Define an applet?
11. Define an interface?
12. List the different awt components in Java?
13. What are weak and strong entities? How are they represented in E-R diagram?
14. What is meant by Data Independence?
15. What is DBMS?

PART B: Paragraph type carries 5 marks each

{Ceiling - 35}

1. Explain Byte code concept of Java. (b) Explain for loop with an example.
2. Explain data type conversion and casting feature of java with an example.
3. Explain use of command line arguments.
4. Explain about abstract classes and abstract methods.
5. Explain life cycle of a Thread.
6. Explain briefly about access modifiers and their usage.
7. Explain about try-catch functionality in Exception Handling
8. What is an Entity Relationship diagram, describe its components using suitable example.

PART C: Answer any 2 questions

{ 2*10=20}

1. Explain the concept of importing packages in java with example.
2. Discuss the concept inheritance with an example. Explain 3 types of inheritance in Java.
3. Draw an E-R diagram for Library Management System.
4. What is structured query language? How the DDL and DML are different? Explain.

BVOC DEGREE EXAMINATION
SDC3IT11: Software Engineering

Time :2 Hours

Total : 60 Marks

PART A: Short answer type carries 2 marks each

(Ceiling - 20)

1. Define maintenance.
2. What is RAD.
3. What is meant by feasibility study
4. Define object oriented design.
5. What is meant by a test driver and test stub?
6. What is meant by a risk?
7. What are the Characteristics for a good design.
8. What is a pseudocode.
9. What are different software quality frameworks?
10. Explain computer system engineering.
11. Explain spiral model.
12. Explain cohesion and coupling.

PART B : Paragraph type carries 5 marks each

(Ceiling - 30)

1. Explain UNIT testing.
2. Explain Software requirement specification process.
3. Explain classical waterfall model.
4. Explain the types of user interfaces.
5. Differentiate Re Engineering and reverse engineering.
6. Explain different program analysis tools.
7. What are the characteristics of a good software design?

PART C : Answer any 1 question

(1*10=10)

1. Explain SDLC lifecycle.
2. Define Testing. Explain different types of testing in detail.

SDC3IT13: Basic Networking Concepts

Time : 2.5 Hours

Total : 80 Marks

PART A : Short answer type carries 2 marks each

(Ceiling - 25)

1. Explain digital and analog data?
2. What do you mean by peak amplitude?
3. Compare internet and intranet?
4. What do you mean by burst error?
5. What do you mean by single bit error? write an example?
6. List the classes in classful addressing?
7. What are the key significance of class A?
8. Explain the services of TCP?
9. Explain silly window syndrome?
10. What do you mean by keepalive timers?
11. Compare retransmission and persistence timers?
12. What do you mean by Masquerading?
13. What is client/server network?
14. Define HUB, router.
15. What is the point to point and multipoint connection in NETWORKING?

PART B : Paragraph type carries 5 marks each

(Ceiling - 35)

1. Compare mesh and star topologies?
2. What is the key differences between ring and star topology?
3. Explain transmission impairments.
4. Differentiate ARP and RARP protocols.
5. Explain error detection and error correction?
6. Draw and explain the header format of IPv4?
7. State Dijkstra's algorithm?
8. Illustrate various differences between LAN, WAN and MAN?

PART C : Answer any 2 questions

(2*10=20)

1. What is the significance of switching? Explain switching techniques with neat diagrams.
2. Compare and contrast the header format of TCP and UDP?
3. Explain the Different layers of the OSI model.
4. Explain SMTP.

BVOC DEGREE EXAMINATION

SDC3IT12: Python Programming

Time : 2.5 Hours

Total : 80 Marks

PART A : Short answer type carries 2 marks each

(Ceiling - 25)

1. What is IDLE?
2. Expressions, and Variables in Python programming language
3. Explain the basic data types available in Python
4. Write Python Program to reverse a number
5. Write notes on compound boolean expressions.
6. Explain if-elif-else statement
7. What is recursion.?
8. Differentiate identifiers and keywords.
9. Explain built in functions.
10. Explain the concept of scope and lifetime of variables in Python programming .
11. Explain function call?
12. What is tuple? How to create and access tuple in python.
13. What are the properties of algorithm?
14. Give the features of python.
15. List the standard data types in python.

PART B: Paragraph type carries 5 marks each

(Ceiling - 35)

1. Discuss the int(), float(), str(), chr() and complex() type conversion functions with examples
2. Explain operator precedence and associativity .
3. Illustrate the different types of control flow statements available in Python
4. Explain mathematical functions, date time functions.
5. Differentiate Simple if statement, if-elif-else statement with an example.
6. How to update and delete dictionary values.
7. Explain ring operations
8. What is a function? Mention the type of function and use with example.

PART C : Answer any 2 questions

(2*10=10)

1. Explain functions and function composition with example
2. Explain tuple and operations in python
3. What is Dictionary? Explain Python dictionaries in detail discussing its operations and methods.
4. What are the basic list operations that can be performed in Python? Explain each operation with its syntax and example.

BVOC DEGREE EXAMINATION

SDC4IT17 - OPERATING SYSTEM

Time: 2.5 Hours

Total: 80 Marks

PART A: Short answer type carries 2 marks each

{Ceiling - 25}

1. What is OS?
2. What is a thread?
3. What is PCB?
4. What are concurrent processes?
5. What do you mean by mutual exclusion?
6. Define distributed system?
7. What is virtual memory?
8. What is a file system?
9. What is a deadlock?
10. Define paging.
11. What is swapping?
12. What do you mean by multiprogrammed systems?
13. What are operating system services?
14. What is Access control?
15. List out any four process control system calls?

PART B: Paragraph type carries 5 marks each

{Ceiling - 35}

1. Briefly explain about OS as resource manager.
2. What is booting?
3. What do you mean by critical region?
4. Explain concurrent processing.
5. Explain spooling.
6. What are the functions of OS.
7. Explain the structure of the OS.
8. Explain FCFS scheduling algorithm with example.

PART C : Answer any 2 questions

(2*10=20)

1. Explain Scheduling algorithms with example in detail.
2. Explain the File management system in OS in detail.
3. What are different types of operating system? Explain them in detail.
4. Explain the basic concepts of segmentation in detail.

BVOC DEGREE EXAMINATION

SDC5IT23: Big data analytics

Time : 2 Hours

Total : 60 Marks

PART A : Short answer type carries 2 marks each

(Ceiling - 20)

- 1 Explain Data Evolution and Data Growth
- 2 Explain Type of Data
- 3 Describe Data Classification
- 4 Influence of Data Science Components in analysis
- 5 Characteristics of Big Data
- 6 Explain anyone application of Big Data PAR
- 7 Explain the need of Data Analytics with a simple scenario
- 8 Explain 360 view of customers on the perspective of big data.
- 9 Illustrate Hadoop ecosystem components.
- 10 Explain SPARK architecture and its advantages.
- 11 Brief about phases in Map Reduce framework.
- 12 What is the basic API concept of Map Reduce?

PART B : Paragraph type carries 5 marks each

(Ceiling - 30)

- 1 Explain the different sources of data with example.
- 2 Explain the Hadoop architecture and its process
- 3 Explain SPARK architecture and its advantages.
- 4 Brief about phases in Map Reduce framework.
- 5 What is the basic API concept of Map Reduce?
- 6 Explain the different big data role.
- 7 Explain the limitations of big data.

PART C : Answer any 1 question

(1*10=10)

- 1 Brief the influencing of big data in Risk and security domain.
- 2 Explain the progress of big data technology in real time applications.

BVOC DEGREE EXAMINATION

SDC5IT24 - MACHINE LEARNING & ARTIFICIAL INTELLIGENCE

Time : 2 Hours

Total : 60 Marks

PART A : Short answer type carries 2 marks each

(Ceiling - 20)

- 1 List out some popular machine learning algorithms?
- 2 Distinguish between classification and regression.
- 3 Write down the limitations of K-means clustering.
- 4 Define structured SVM.
- 5 Mention the applications of Reinforcement learning.
- 6 Illustrate Bayesian Model Comparison
- 7 Explain Probabilistic Principal Component Analysis
- 8 Explain the Bias-Variance Trade off.
- 9 Consider a data set consisting of variables having more than 30% missing values? For example, out of 50 variables, 8 variables have missing values higher than 30%. How will you deal with them?
- 10 Consider a cancer detection data set List out the steps to be performed to build a classification model with 95% accuracy.
- 11 How can you choose a classifier based on training set size?
- 12 Explain Latent Dirichlet Allocation (LDA)

PART B : Paragraph type carries 5 marks each

(Ceiling - 30)

- 13 How is KNN different from K-means clustering?
- 14 Explain about Markov model with an example.
- 15 How will you define the number of clusters in a K-means clustering algorithm?
- 16 What is Back Propagation and Explain it's Working.
- 17 What is the role of Activation function?
- 18 Define structured SVM.
- 19 Mention the applications of Reinforcement learning.

PART C : Answer any 1 question

(1*10=10)

- 1 A doctor knows that Cold causes fever 50% of the time – Prior probability of any patient having cold is $1/50,000$ – Prior probability of any patient having fever is $1/20$. If a patient has fever, what's the probability he has cold?
- 2 Analyze tic-tac-toe moves by applying reinforcement learning?

BVOC DEGREE EXAMINATION
SDC5IT25 : Cloud Computing

Time : 2 Hours

Total : 60 Marks

PART A : Short answer type carries 2 marks each

(Ceiling - 20)

- 1 What do you mean by Cloud ecosystem?
- 2 What is Open Nebula?
- 3 Define Data Security.
- 4 What do you mean by Virtual machine security?
- 5 Elaborate the NIST reference architecture of cloud computing with diagram.
- 6 Describe cloud computing models in detail.
- 7 How to implement the virtualization in various level? Explain with example.
- 8 Elaborate the usage of Google drive with example.
- 9 Explain the various economic constraints of cloud in detail.
- 10 Explain Software as a Service Security in detail.
- 11 Elucidate the Identity management and access control in detail.
- 12 Explain layered cloud architecture development in detail.

PART B : Paragraph type carries 5 marks each

(Ceiling - 30)

- 1 Discuss the mapping applications in detail.
- 2 Write short note on the following
Eucalyptus • OpenStack
- 3 How to adopt cloud architecture for an organization? Explain with example.
- 4 Analyze the role and need of cloud storage providers for running an E-Commerce application for a business.
- 5 How to implement the virtualization in various level? Explain with example.
- 6 Elaborate the usage of Google drive with example.
- 7 Explain the various economic constraints of cloud in detail.

PART C : Answer any 1 question

(1*10=10)

- 8 Explain Cloud security challenges and risks
- 9 Elucidate about Cloud platform for an organization

BVOC DEGREE EXAMINATION

SDC5IT26 MOBILE SOFTWARE DEVELOPMENT USING ANDROID

Time : 2 Hours

Total : 60 Marks

PART A : Short answer type carries 2 marks each

(Ceiling - 20)

1. What is android?
2. List any four fundamental components?
3. What do you mean by intent?
4. What is fragment?
5. What is the use of ADT?
6. What is activity?
7. What is AVD
8. What is a widget?
9. List any two layout managers.
10. What is a popup menu?
11. What is content provider?
12. What is the use of intent?

PART B : Paragraph type carries 5 marks each

(Ceiling - 30)

1. How to implement SQLite database?
2. What do you mean by resource reference Syntax?
3. Describe about the environment setup of android.
4. List any 4 android widgets.
5. What do you mean by spinner?
6. What do you mean by R file?
7. Explain about android button with example

PART C : Answer any 1 question

(1*10=10)

1. What are radio boxes and check boxes in android? Write a sample program to show the use of them.
2. Explain Android SDK stack with a suitable diagram.