GANDHI INSTITUTE OF TECHNOLOGY AND MANAGEMENT (GITAM)
(Deemed to be University)
VISAKHAPATNAM * HYDERABAD * BENGALURU

Accredited by NAAC with A^+ Grade

REGULATIONS AND SYLLABUS

OF

Master of Computer Application

(w.e.f. 2020-21 admitted batch)

Master of Computer Applications (M.C.A)
REGULATIONS
(W.e.f. 2020-21 admitted batch)

1. ADMISSION

Admission into 2 year M.C.A program of GITAM University is governed by GITAM University admission regulations.

2. ELIGIBILITY CRITERIA

Passed BCA/Bachelor Degree in Computer Science Engineering or Equivalent Degree

OR

Passed B.Sc/B.Com/B.A with Mathematics at 10+2 level or graduation level (with additional bridge Courses as per the norms of the concerned University).

Obtained at least 50% marks (45%marks in case of candidates belonging to reserved category) in the qualifying examination.

Admission into M.C.A (Master Computer Applications) will be based on an All India GITAM Science Admission Test (GSAT) conducted by GITAM University and the rule of reservation, wherever applicable.

3. CHOICE BASED CREDIT SYSTEM

Choice Based Credit System (CBCS) is introduced with effect from the admitted Batch of 2015-16 based on UGC guidelines in order to promote:

Student Centered Learning

Cafeteria approach

Inter-disciplinary learning

Learning goals/ objectives and outcomes are specified leading to what a student should be able to do at the end of the program.

4. STRUCTURE OF THE PROGRAM

The Program Consists of

Foundation Courses (compulsory) which give general exposure to a Student in communication and subject related area.

Core Courses (compulsory).

Discipline centric electives which are supportive to the discipline give expanded scope of the subject give their disciplinary exposure nurture the student skills

Open electives are of general nature either related or unrelated to the discipline.

Practical Proficiency Courses, Laboratory and Project work.

Each course is assigned a certain number of credits depending upon the number of contact hours (lectures/tutorials/practical) per week.

In general, credits are assigned to the courses based on the following contact hours perweek per semester.

One credit for each Lecture / Tutorial hour per week.

One credit for two hours of Practical per week.

Eight credits for project.

The curriculum of the Four Semesters M.C.A program is designed to have a total of88 credits for the award of M.C.A degree.

5. MEDIUM OF INSTRUCTION

The medium of instruction (including examinations and project reports) shall be in English.

6. REGISTRATION

Every student has to register himself / herself for each semester individually at the time specified by the Institute / University.

7. ATTENDANCE REQUIREMENTS

A student whose attendance is less than 75% in all the courses put together in any semester will not be permitted to attend that end - semester examination and he/she will not be allowed to register for subsequent semester of study. He/she has to repeat the semester along with his / her juniors

However, the Vice Chancellor on the recommendation of the Principal / Director of the Institute/School may condone the shortage of attendance to the students whose attendance is between 66% and 74% on genuine grounds and on payment of prescribed fee.

8. EVALUATION

The assessment of the student's performance in a Theory course shall be based on two components: Continuous Evaluation (40 marks) and Semester-end examination (60 marks).

A student has to secure an aggregate of 40% in the course in continuous and semester end examinations the two components put together to be declared to have passed the course, subject to the condition that the candidate must have secured a minimum of 24 marks (i.e. 40%) in the theory component at the semester-end examination.

Practical / Viva voce etc. course are completely assessed under Continuous Evaluation for a maximum of 100 marks and a student has to obtain a minimum of 40% to secure Pass Grade. Details of Assessment Procedure are furnished below in Table 1.

Table 1: Assessment Procedure

S. No.	Component of assessment	Marks allotted	Type of Assessment	Scheme of Examination
1	Theory	40	Continuous evaluation	(i) Three mid semester examinations shall be conducted for 15 marks each. The performance in best two shall be taken into consideration. (ii) 5 marks are allocated for quiz. (iii) 5 marks are allocated for assignments.
		60	Semester-end examination	The semester-end examination shall be for a maximum of 60 marks.
	Total	100		
2	Practical	100	Continuous evaluation	60 marks for performance, regularity, record/ and case study. Weightage for each component shall be announced at the beginning of the semester. 40 marks (30 marks for experiment(s) and 10 marks for practical Viva-voce.) for the test conducted at the end of the Semester conducted by the concerned lab Teacher.
	Total	100		
3	Project work	200	Project evaluation	150 marks for evaluation of the project work dissertation submitted by the candidate. 50 marks are allocated for the project Viva-Voce. The project work evaluation and the Viva-Voce shall be conducted by one external examiner outside the University and the internal examiner appointed by the Head of the Department.

9. RETOTALING &REVALUATION

Re-totaling of the theory answer script of the semester-end examination is permitted on request by the student by paying the prescribed fee within one week after the announcement of theresults.

Revaluation of the theory answer scripts of the semester-end examination is permitted on request by the student by paying the prescribed fee within one week after the announcement of theresult.

10. PROVISION FOR ANSWER BOOK VERIFICATION &CHALLENGE EVALUATION:

If a student is not satisfied with his/her grade after revaluation, the student can apply for, answer book verification on payment of prescribed fee for each course within one week after announcement of revaluationresults.

After verification, if a student is not satisfied with revaluation marks/grade awarded, he/she can apply for challenge valuation within one week after announcement of answer book verification result/ two weeks after the announcement of revaluation results, which will be valued by the two examiners i.e., one Internal and one External examiner in the presence of the student on payment of prescribed fee. The challenge valuation fee will be returned, if the student is succeeded in the appeal with a change for a bettergrade.

11. SUPPLEMENTARY EXAMINATIONS & SPECIAL EXAMINATIONS:

The odd semester supplementary examinations will be conducted on daily basis after conducting regular even semester examinations in April/May.

The even semester supplementary examinations will be conducted on daily basis after conducting regular odd semester examinations during November/December

A student who has completed his/her period of study and still has **"**F**"** grade in final semester courses is eligible to appear for Special Examination normally held during summer vacation.

12. PROMOTION TO THE NEXT YEAR OF STUDY

A student shall be promoted to the next academic year only if he/she completes the academic requirements of 60% of the credits till the previous academic year.

Whenever there is a change in syllabus or curriculum, he/she has to continue the course with new regulations after detention as per the equivalency established by the BoS to continue his/her further studies

13. BETTERMENT OF GRADES

A student who has secured only a pass or second class and desires to improve his/her class can appear for betterment examinations only in **'**n**'** (where **'**n**'** is no.of semesters of the program) theory courses of any semester of his/her choice, conducted in summer vacation along with the Special Examinations.

Betterment of Grades is permitted **'**only once**'**, immediately after completion of the program of study.

14. REPEAT CONTINUOUS EVALUATION

A student who has secured 'F' grade in a theory course shall have to reappear at the subsequent examination held in that course. A student who has secured 'F' grade can improve continuous evaluation marks upto a maximum of 50% by attending special instruction classes held during summer.

A student who has secured 'F' grade in a practical course shall have to attend Special Instruction classes held during summer.

A student who has secured 'F' grade in a combined (theory and practical) course shall have to reappear for theory component at the subsequent examination held in that course. A student who has secured 'F' grade can improve continuous evaluation marks upto a maximum of 50% by attending special instruction classes held during summer.

The RCE will be conducted during summer vacation for both odd and even semester students. Student can register a maximum of 4 courses. Biometric attendance of these RCE classes has to be maintained. The maximum marks in RCE be limited to 50% of Continuous Evaluation marks. The RCE marks are considered for the examination held after RCE except for final semester students.

RCE for the students who completed course work can be conducted during the academic semester. The student can register a maximum of 4 courses at a time in slot of 4 weeks. Additional 4 courses can be registered in the next slot.

A student is allowed to Special Instruction Classes (RCE) 'only once' per course.

15. GRADING SYSTEM

Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester in each course. The letter grades and the corresponding grade points are as given in Table 2.

Table 2: Grades & Grade Points

Sl.No.	Grade	Grade Points	Absolute Marks
1	O (outstanding)	10	90 and above
2	A+ (Excellent)	9	80 to 89
3	A (Very Good)	8	70 to 79
4	B+ (Good)	7	60 to 69
5	B (Above Average)	6	50 to 59
6	C (Average)	5	45 to 49
7	P (Pass)	4	40 to 44
8	F (Fail)	0	Less than 40
9	Ab. (Absent)	0	-

A student who earns a minimum of 4 grade points (P grade) in a course is declared to have successfully completed the course, subject to securing an average GPA (average of all GPAs in all the semesters) of 5 at the end of the Program to declare pass in the program.

Candidates who could not secure an average GPA of 5 at the end of the program shall be permitted to reappear for a course(s) of their choice to secure the same.

16 GRADE POINT AVERAGE

A Grade Point Average (GPA) for the semester will be calculated according to the formula:

$$GPA = \frac{[C*G]}{C}$$

Where

C = number of credits for the course,
G = grade points obtained by the student in the course.

To arrive at Cumulative Grade Point Average (CGPA), a similar formula is used considering the student's performance in all the courses taken, in all the semesters up to the particular point of time.

CGPA required for classification of class after the successful completion of the program is shown in Table 3.

Table 3: CGPA required for award of Class

Class	CGPA Required
First Class with Distinction	**≥ 8.0***
First Class	**≥ 6.5**
Second Class	**≥ 5.5**
Pass Class	**≥ 5.0**

In addition to the required CGPA of 8.0 or more the student must have necessarily passed all the courses of every semester in first attempt.

17. ELIGIBILITY FOR AWARD OF THE M.C.A DEGREE

Duration of the program: A student is ordinarily expected to complete M.C.A program in Four semesters of two years. However, a student may complete the program in not more than Four years including study period.

However the above regulation may be relaxed by the Vice Chancellor in individual cases for cogent and sufficient reasons.

A student shall be eligible for award of the M.C.A Degree if he / she fulfills all the following conditions.

Registered and successfully completed all the courses and projects.

Successfully acquired the minimum required credits as specified in the curriculum corresponding to the branch of his/her study within the stipulated time.

Has no dues to the Institute, hostels, Libraries, NCC / NSS etc, and

No disciplinary action is pending against him / her.

The degree shall be awarded after approval by the Academic Council.

18. DISCRETIONARY POWER

Not with standing anything contained in the above sections, the Vice Chancellor may review all exceptional cases, and give his decision, which will be final and binding.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PO1: To continue a lifelong professional development in computing that contributes in self and societal growth

PO2: Strengthen intellectual growth and the capacity to develop creative and responsible solutions to unique and changing problems. (EMPL)

PO3: Pursue advanced education, research and development, and other creative and innovative efforts in the field of Architecture. (SKILL).

PROGRAM OBJECTIVES(POs)

PO1: To progress their career productively in the software industry, academia, research, entrepreneurial pursuit, government, consulting firms, and other Information Technology enabled services.

PO2: To achieve peer recognition as an individual or in a team; by adopting ethics and professionalism and communicating effectively to excel well in cross-culture and inter-disciplinary teams.

PO3: Should be able to stimulate artistic sensitivity and creative powers. (SKILL)

PO4: Acquire leadership capabilities necessary for the competent practice of architecture and lifelong learning. (ETPR)

Program Outcomes (POs)

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: To Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis, and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning of the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO1: Ability to pursue careers in IT industry, research and development in allied areas related to computer science.

PSO2: Comprehend, explore and build up computer programs in areas to meet the demands of industry requirements using modern tools and technologies.

PSO3: Analyze the societal needs to provide novel solutions through technological based research.

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Master of Computer Applications (M.C.A.)
Scheme of Instruction
I SEMESTER

SNo	Course Code	Course Title	**Category**	**L**	**T**	**P**	**C**	**Remarks**
1	20SCA 701	Discrete Mathematics	PC	3	1	0	4	
2	20SCA 703	Object Oriented Programming with C++	PC	3	1	0	4	
3	20SCA 705	Web Programming	PC	3	1	0	4	
4	20SCA 707	Operating Systems	PC	3	1	0	4	
5	VDC111	Venture Discovery	SSE	3	0	0	2	
Practical's								
6	20SCA 721	Object Oriented Programming with C++ Lab	PP	0	0	3	2	
7	20SCA 723	Web Programming Lab	PP	0	0	3	2	
8	20SCA 725	Operating Systems Lab	PP	0	0	3	2	
		Total					24	

II SEMESTER

SNo	Course Code	Course Title	Category	L	T	P	C	Remarks
1	20SCA 702	Probability and Statistics	PC	3	1	0	4	
2	20SCA 704	Data Structures using C++	PC	3	1	0	4	
3	20SCA 706	Database Management Systems	PC	3	1	0	4	
4	20SCA 708	Object Oriented Software Engineering	PC	3	1	0	4	
5	20SAE 702	Technical Communication Skills	AEC	3	1	0	3	
Practicals								
7	20SCA 722	Data Structures using C++ Lab	PP	0	0	3	2	
8	20SCA 724	Database Management Systems Lab	PP	0	0	3	2	
		Total					23	

III SEMESTER

SNo	Course Code	Course Title	Category	L	T	P	C	Remarks
1	20SCA 801	Object oriented programming with JAVA	PC	3	1	0	4	
2	20SCA 803	Design and Analysis of Algorithm	PC	3	1	0	4	
3	20SCA 805	Data mining	PC	3	1	0	4	
4	20SCA 841 20SCA 843 20SCA 845	Generic Elective – I (a) Artificial Intelligence (b) Cloud Computing (c) Network Security	GE	3	1	0	4	
5	SSE 801 SSE 803	Skill Enhancement Digital Marketing Management Information System	SEC	3	0	0	3	
Practical's								
6	20SCA 821	Object oriented programming with JAVA Lab	PP	0	0	3	2	
7	20SCA 824	Data Analysis using R Lab	PP	0	0	3	2	
		Total					23	

IV SEMESTER

SNo	Course Code	Course Title	Category	L	T	P	C	Remarks
1	20SCA842 20SCA844 20SCA846	Generic Elective – II (a) Machine Learning (b) Block Chain Technologies (c) Cyber Security	GE	3	1	0	4	
2	20SCA848 20SCA850 20SCA852	Generic Elective – III (a) Big Data Analytics (b)Python Programming (c) Advanced Java Programming	GE	3	1	0	4	
Practical's								
3	20SCA868 20SCA870 20SCA872	(a)Big Data Analytics Lab (b)Python Programming Lab (c)Advanced Java Programming Lab	pp	0	0	3	2	
4	20SCA891	Project	PP	0	0	3	8	
		Total					18	

Total Credits: 24+23++23+18= 88

MCA I SEMESTER

20SCA 701 : DISCRETE MATHEMATICS

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Preamble :

Discrete Mathematics is required to observe mathematical structures in the object one work with, and know their properties. This type of ability is essential for software engineers, data scientists, data analysts, and decision scientists. This course helps to understand the concepts and results in Mathematical Logic, Set Theory, Relations, Functions, Lattices, Boolean Algebra, and Graph Theory.

Course Objectives:

- To understand the difference between primitive statement and compound statement.
- To learn the basic concept and applications of theory of inference for the statement calculus and predicate calculus.
- To develop an ability to define a set , relation and a function with their properties.
- To attain an ability to implement features of lattices and Boolean algebra.
- To understand the concept of graphs , directed graphs, and trees.

UNIT - I

Mathematical Logic: Statements and Notation, Connectives, Normal Forms, The Theory of Inference for the Statement Calculus, The Predicate Calculus, Inference Theory of the Predicate Calculus. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Understand the connectives used for statements (L1)
- Explain disjunctive normal form and conjunctive normal form(L3)
- Explain direct method to solve inference theory statements(L3)
- Symbolize the predicate statements(L4)
- Extend the inference theory of statement calculus to theory of the predicate calculus(L2)

UNIT - II

Set Theory: Basic Concepts of Set Theory, Relations and Ordering.

Functions: Definitions and Introduction, Composite of Functions, Inverse Functions, Binary and n-ary Operations, Characteristic Function of a Set. (10)

Learning Outcomes

By the end of this Unit, the student will be able to

- Define various sets , various relations, and various orderings(L1)
- Compare different types of functions and their properties(L2)
- Define functions(L1)
- Define characteristics function of a given set(L1)

UNIT - III

Lattices : Definition and Examples, Properties of Lattices, Sub lattices, Direct Product and Homomorphism, Some Special Lattices. (10)

Learning Outcomes

By the end of this Unit, the student will be able to

- Define the lattice and its properties(L1)

- Explain the Hasse diagram(L2))
- Extend the concept of lattice to Boolean algebra(L2)
- Outline the different types of lattices(L2)

UNIT - IV

Boolean Algebra: Definition and Examples, sub algebra, Direct product and Homomorphism, Boolean Functions, Boolean forms and free Boolean Algebras, Values of Boolean expressions and Boolean functions, Representation of Boolean functions, Minimization of Boolean functions, Karnaugh maps. (10)

Learning Outcomes

By the end of this Unit, the student will be able to

- Define Boolean algebra, Sub Boolean algebra with examples(L1)
- Explain the need of Boolean functions(L2)
- Evaluate Boolean expressions and Boolean functions(L5)
- Explain representation of Boolean functions(L2)
- Explain minimization of Boolean functions using Karnaugh Maps(L2)

UNIT - V

Graph Theory: Graphs, Multi graphs, Directed Graphs, Complete, Regular and Bipartite Graphs, Planar Graphs, Tree Graphs, Labeled and Weighted Graphs, Basic Definitions, Sub-graphs, Isomorphic Graphs, Paths, Connectivity, The Bridges of Konigsberg, Traversable Multi-graphs. Rooted Trees, Sequential Representation of Directed Graphs, Warshall's Algorithm and Shortest Path (Minima) Algorithm only. (10)

Learning Outcomes

By the end of this Unit, the student will be able to

- Explain the concept of graph, directed graph, and trees(L1)
- Summarize different types of graphs(L2)
- Define various types of traversable graphs(L1)
- Explain the concept of rooted trees(L1)
- Explain the Warshall's algorithm to find path matrix with an example(L1)
- Explain Shortest path algorithm with an example(L1)

Text Books:

1. Discrete Mathematical Structures with applications to computer science by J.P. Tremblay and R. Monohar, Tata McGraw – Hill.
2. Discrete Mathematics by Seymour Lipschutzand Marc Lipson, Schaum's outlines, Tata McGraw Hill.
3. Introductory Methods of Numerical Analysis by S.S Sastry, Prentice – Hall India.

Reference Books:

1. Discrete Mathematics and its Applications by Kenneth H.Rosen, Tata McGraw – Hill.
2. Numerical Methods for Engineers by Steven C. Chopra and Raymond P.Canale, McGraw Hill

Course Outcomes :

At the end of the Course, the student is

- Able to learn about the connectives used for statements and normal forms(L1)
- Able to explain direct method to solve inference theory statements(L2)

- Able to extend the inference theory of statement calculus to theory of the predicate calculus(L2)
- Able to define various sets , various relations, and various orderings(L1)
- Compare different types of functions and their properties (L5)
- Able to explain the lattice and its properties(L5)
- Able to learn about Boolean algebra and Boolean functions(L1)
- Explain the concept of graph, directed graph, and trees(L2)
- Able to summarize different types of graphs(L2)
- Able to explain the concept of rooted trees (L5)

MCA I SEMESTER

20SCA 703: OBJECT ORIENTED PROGRAMMING WITH C++

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Preamble:

Object Oriented Programming (OOP) is a programming model where programs are organized around objects and data rather than action and logic. OOP allows decomposition of a problem into a number of entities called objects and then builds data and functions around these objects. The major purpose of C++ programming is to introduce the concept of object orientation to the C programming language. C++ is a statically-typed, free-form, (usually) compiled, multi paradigm, intermediate-level general-purpose middle-level programming language.

Course Objectives

To enable the student to understand the importance of Principles of Object Oriented Programming

- To discuss OOP concepts, data types, variables, structure of C++ program(L6)
- To explain classes, objects, inline functions, Constructors, object to functions(L2)
- To built Arrays, Pointers, References, and the Dynamic Allocation Operators(L3)
- To discuss Function Overloading, Copy Constructors, and Default Arguments(L6)
- To make use of student learn inheritance, extending classes, pointers, virtual functions and polymorphism and templates(L3)
- To explain managing console, I/O operations, working with files and exception handling(L2)

UNIT –I

Overview of C++: The Origins of C++, What Is Object-Oriented Programming? Encapsulation, Polymorphism, Inheritance, Some C++ Fundamentals, A Sample C++ Program, A Closer Look at the I/O Operators, Declaring Local Variables, No Default to int, The bool Data Type, Old-Style vs. Modern C++, The New C++ Headers, Namespaces, Working with an Old Compiler, Introducing C++ Classes , Function Overloading, Operator Overloading, Inheritance, Constructors and Destructors, The C++ Keywords, The General Form of a C++ Program .

Classes and Objects: Classes and Objects , Classes, Structures and Classes Are Related, Unions and Classes Are Related Anonymous Unions, Friend Functions, Friend Classes, Inline Functions, Defining Inline Functions Within a Class, Parameterized Constructors, Constructors with One Parameter: A Special Case, Static Class, Static Data Members, Static Member Functions, When Constructors & Destructors are Executed, Scope Resolution Operator, Nested, Local Classes, Passing Objects to Functions, Returning Objects, Object Assignment. (10)

Learning Outcomes

By the end of the unit the student will be able to

- Discuss the principles of Object Oriented Programming (L6)
- Make use of Variables , Data Types, Header Files (L3)
- Discuss various concepts of classes, objects, Friend Classes and Friend Objects (L6)
- Explain various constructors, static data and functions, static classes (L2)
- Demonstrate the Operator Overloading, Operator Precedence, and Control Structures (L2)

UNIT –II

Arrays, Pointers, References, and the Dynamic Allocation Operators: Arrays of Objects , Creating Initialized vs. Uninitialized Array, Pointers to, Type Checking, C++Pointer The this Pointer, Pointers to Derived Types, Pointers to Class, Reference Parameters, Passing References to Objects, Returning References Independent References, References to Derived Types, Restrictions to References, A Matter of Style, C++'s Dynamic Allocation, Initializing Allocated Memory, Allocating Arrays, Allocating objects, The nothrow, The Placement Forms of new and delete.

Function Overloading, Copy Constructors, and Default Arguments: Function Overloading, Copy Constructors, and Default Arguments, Function Overloading, Overloading Constructor Functions, Overloading a Constructor to Gain Flexibility, Allowing Both Initialized and Uninitialized Objects, Copy Constructors, Finding the Address of an Overloaded Function, The overload Anachronism Default Function Arguments, Default Arguments vs. Overloading, Using Default Arguments Correctly, Function Overloading and Ambiguity. (10)

Learning Outcomes

By the end of the unit the student will be able to

- Explain about the Arrays, Pointers to Arrays functions (L2)
- Differentiate the Call by Reference, and Return By Reference (L4)
- Learn the Inline functions, Default arguments, and const Arguments(L2)
- Practice Recursion, Function overloading, Friend and virtual functions, and Math Library Functions(L3)
- Demonstrate the Classes and Objects (L3)
- Understand the Member Function, Pointer To Members, and Local Classes(L2)

UNIT –III

Operator Overloading: Operator Overloading , Creating a Member Operator Function, Creating Prefix and Postfix Forms of the Increment and Decrement Operators , Overloading the Shorthand Operators, Operator Overloading Restrictions , Operator Overloading Using a Friend Function, Using a Friend to Overload ++ or – – , Friend Operator Functions Add Flexibility, Overloading new and delete Overloading new and delete for Arrays, Overloading the nothrow Version of new and delete, Overloading Some Special Operators,. Overloading [ ], Overloading (Overloading –>,Overloading the Comma Operator .

Inheritance: Inheritance, Base-Class Access Control, Inheritance and protected Members, Protected Base-Class Inheritance, Inheriting Multiple Base Classes, Constructors, Destructors, and Inheritance, When Constructor and Destructor Functions Are Executed , Passing Parameters to Base-Class Constructors, Granting Access , Virtual Base Classes. (10)

Learning Outcomes

By the end of the unit the student will be able to

- Learn the Constructors and Destructors. (L1)
- Understand the Construction of Two Dimensional Arrays.(L2)
- Know the Operator Overloading and Type Conversions(L2)
- Practice the Manipulation of Strings (L3)

UNIT –IV

Virtual functions: Virtual Functions and Polymorphism, Virtual Functions, calling a Virtual Function Through a Base Class Reference, The Virtual Attribute Is Inherited, Virtual Functions Are Hierarchical, Pure Virtual Functions, Abstract Classes.

Templates: Templates, Generic Functions, A Function with Two Generic Types, Explicitly Overloading a Generic Function, Overloading a Function Template, Using Standard Parameters with Template Functions, Generic Function Restrictions, Applying Generic Functions, A Generic Sort, Compacting an Array Generic Classes, An Example with Two Generic Data Types, Applying Template Classes: A Generic Array Class, Using Non-Type Arguments with Generic Classes, Using Default Arguments with Template Classes, Explicit Class Specializations. (10)

Learning Outcomes

By the end of the unit the student will be able to

- Demonstrate the Virtual Base Classes and Abstract Classes (L2)
- Discuss Pointers, Virtual Functions and Polymorphism (L6).
- Explain Virtual Constructors and Destructors (L2).
- Demonstrate Templates (L2)

UNIT-V

Exception Handling: Exception Handling, Exception Handling Fundamentals, Catching Class Types, Using Multiple catch Statements, Handling Derived-Class Exceptions, Exception Handling, Catching All Exceptions, Restricting Exceptions, Rethrowing an Exception, Understanding terminate( ) and unexpected( ) Setting the, and Unexpected Handlers, The uncaught exception( ) Function, The exception and bad exception Classes, Applying Exception Handling .

Files and I/O : C++ File I/O and the File Classes, Opening and Closing a File, Reading and Writing Text Unformatted and Binary I/O , Characters vs. Bytes, put( ) and get( ), read( ) and write(), More get( ) Functions, getline( ), Detecting EOF, The ignore( ) Function, peek( ) and putback( ), flush( ), Random Obtaining the Current File Position, I/O Status, Customized I/O and Files. (10)

Learning Outcomes

By the end of the unit the student will be able to

- Make use of Managing Console I/O Operations(L3)
- Discuss various concepts related to Files (L6)
- Discuss Exception Handling and its Concepts (L6)
- Demonstrate throwing, catching and rethrowing exceptions(L2)

Text Book:

1. The C++ Complete Reference by Herbert Schildt, 4th Edition, 2017
2. Mastering C++ by Venugopal K R, RajkumarBuyya , Tata McGraw Hill, 2nd edition, 2013.
3. C++ Programming Language by BjarneStroustrup, Addison-Wesley Professional, 4th edition, 2013.

4. C++ Primer by Barbara E Moo, Stanley B. Lippman , JoseeLajoie, Pearson Education, 4th edition, 2007.

Course Outcomes:

At the end of the Course, the student is

- Able to understand the basic concepts and benefits of OOP(L2)
- Able to know the Principles of Object Oriented Programming(L1)
- Able to demonstrate on class, object, functions, constructors and pointers(L2)
- Able to practice the File concepts(L3)
- Able to learn template concepts(L1)
- Understand the Console I/O operations(L2)

MCA I SEMESTER
20SCA 705: WEB PROGRAMMING

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Preamble: This course enables the students to associate with developing websites for hosting via intranet or internet. The web development process includes web design, web content development, client-side scripting, server-side scripting. Web development is the coding or programming that enables website functionality as per the owner's requirements.

Course Objectives:

- Design static web page using Markup languages(L6)
- Develop web applications using style sheets(L6)
- Make use of Java script for designing web applications with dynamic effects(L3)
- Test form input entry and adding dynamic content to web applications(L6)
- Explain about the various concepts of PHP(L5)
- Design various Functions and Forms using PHP Form Elements (L6)

UNIT-I

Introduction to HTML: Information files creation, Web Server, Web Client/Browser, Hyper TextMarkup Language, Commonly used HTML Commands.

Lists: Types of lists

Adding Graphics to HTML Documents: Using the Attributes- Border, Width, and Height, Alignand Alt Attributes.

Tables: Introduction, The Caption Tag, Using the width and boarder, Cellpadding, Cellspacing,Using Background-Color property, Using the Colspan and Rowspan Attribute (12)

Learning Outcomes:

By the end of this unit, the student will be able to

- Illustrate various HTML commands, Web Servers and Lists(L3)
- List out various Lists in HTML Documents (L1)
- List out the different attributes in graphics. (L1)
- Discuss various Table tags and its attributes. (L3)

UNIT – II

Linking Documents: Links, Images as Hyperlinks.

FRAMES: Introduction to Frames.

CSS2 - Introduction, Syntax, Selectors, Color Background Cursor, Text Fonts, Lists Tables, BoxModel, Display Positioning, Floats.

Dynamic HTML: Ca20SCAding Style Sheets, Class, Using the TAG, External Style Sheets, Using the TAG. (12)

Learning Outcomes:

By the end of this unit, the student will be able to

- Illustrate Various HTML Documents using Frames and Linking Documents (L3)
- Demonstrate various concepts of Ca20SCAding Style Sheets (L2)
- Developthe Dynamic HTML tags(L3)

UNIT – III

Introduction To JavaScript: JavaScript in web pages, The Advantages of JavaScript, WritingJavaScript into HTML, Basic Programming Techniques, Operators and Expressions in JavaScript, JavaScript Programming Constructs, Conditional Checking, Super controlled-endless loops, Functions in Java Script, User Defined Functions ,Placing Text in Browser , Dialog Boxes.

The JavaScript Document Object Model: Introduction, the JavaScript assisted style sheets DOM(JSSS DOM). (12)

Learning Outcomes:

By the end of the unit the student is able to

- Explain various concepts of Java Script (L2)
- Demonstrate various the basic programming techniques in Java Script (L3)
- Explain various functions in Java Script (L2)
- Discuss various Dialog Boxes in Java Script with Examples (L6)
- Explain about various concepts of JSSS DOM (L2)

UNIT-IV

Understanding Objects in HTML: Browser Objects, Handling (Web page) Events Using JavaScript. Forms used by a Web Site: The form Object, Other Built-in objects in JavaScript, User Defined Objects.

PHP: Getting Started, The Basics of PHP, Data Types, variables, Constants, Operators, Arrays, Conditional Statements, Iterations. (10)

Learning Outcomes:

After completion of this unit, the student will be able to

- Demonstrate the different Web Page Handling events using JavaScript (L1)
- Construct web pages using different objects in JavaScript (L3)
- Explain about various components of PHP (L2)
- Learn the basic constructs of PHP, built in functions (L2)
- Make use of PHP for web application development (L3)

UNIT –V

Functions: User Defined Functions, Built –in Functions, PHP Server Variables. Working with Forms Introduction to HTML Form Tags and Elements, Form Elements, Adding elements to form, Uploading files to the Web Server using PHP. (10)

Learning Outcomes:

After completion of this unit, student will be able to

- Make Use of various Functions, Server variables in PHP (L2)
- Demonstrate HTML forms using PHP(L2)

Text Book:

1. Web Enable Commercial Application Development Using HTML, Javascript, DHTML and PHP by Ivan Bayross, BPB Publications, 4th revised edition, 2010.
2. Complete Reference HTML by T. A. Powell, 3rd edition, TMH, 2003,
3. The Complete Reference - PHP by Steven Holzner, Tata McGraw Hill, 2008.
4. Web Technology and Design by Xavier, C, New Age International, 2013.

Course Outcomes:

At the end of the Course, the student is

- Design web pages by HTML Documents and its related Concepts (L6)
- Develop Web Pages by HTML Documents using Linking Documents and Frames (L6)
- Construct web pages by Java Script and JSSS DOM(L6)
- Develop a dynamic web pages by the use of java script(L6)
- Construct web pages using PHP(L6)

MCA I SEMESTER

20SCA 707: OPERATING SYSTEMS

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Preamble:

An operating system is an essential part of any computer system. This course will introduce the basic concepts of Operating system services, process management, memory management, device management, , file management, Disk and I/O. This course also will helps in learning the virtual memory concepts and synchronization.

Course Objectives:

- To know the evolution, types, structure, services and functions of operating systems. (L2)
- To learn concepts of process, threads, and techniques involved in process scheduling (L2)
- To understand process synchronization, deadlocks algorithms (L2)
- To understand the concepts and implementation of Memory management policies and virtual memory. (L2)
- To understand the structure and organization of the file system, I/O System (L2)

UNIT - I

Introduction: Introduction to Operating Systems, Computer System Architecture, operating System Structure, Operating System Operations, Distributed Systems, Special Purpose Systems, Computing Environments, Open-Source Operating Systems.

System Structures: Operating System Services, User Operating Systems, System Interface, System Calls, Types of System Calls, System Programs, Operating System Design and Implementation Operating System Structure,Virtual Machines. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Learn the system structure and operating system structure (L1)
- Understand operating system services (L2)
- List system calls and classify system calls (L1)
- Explain System programs (L2)
- Describe operating system structure and virtual machines (L5)

UNIT - II

Process Concept: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication, Communication in Client Server Systems.

Multithreaded Programming: Overview, Multithreading Models, Thread Libraries, Threading Issues, Operating System Examples.

Process Scheduling: Basic Concepts, Scheduling Criteria and Algorithms, Thread Scheduling, Multiple Processor Scheduling, Real Time CPU Scheduling. (12)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Learn process concept (L1)

- Understand process scheduling (L2)
- Describe inter process communication (L6)
- Know multithreading (L1)
- Analyze scheduling algorithms(L4)

UNIT -III

Synchronization: Background, Critical Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock. (12)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Define critical section problem (L1)
- Analyze Peterson's Solution (L4)
- Understand semaphores (L2)
- Learn the classic problems of Synchronization(L1)
- Determine Deadlock characterization (L5)

UNIT - IV

Memory Management Strategies: Background, Swapping, Contiguous Memory Allocation, Paging, Structure of the Page Table, Segmentation.

Virtual Memory Management: Background, Demand Paging, Copy on Write, Page replacement, Allocation of Frames, Thrashing, Other Considerations. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Learn memory allocation concepts (L1)
- Understand the concepts of paging, and the structure of page table(L2)
- Know Segmentation (L1)
- Interpret Demand paging (L2)
- Apply page replacement algorithms (L3)

UNIT - V

File System: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, Protection.

Implementing File Systems: File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance.

Mass Storage Structure: Disk Structure, Disk Scheduling, Disk Management.

I/O Systems: I/O Hardware**-** polling, interrupts, DMA. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Learn the file concept, access methods (L1)
- Understand the structure of directory and disk (L2)
- Know file sharing and protection (L1)
- Elaborate file system and directory implementation(L6)
- Discuss different allocation methods (L6)

Text Book:

1. Operating System Concepts by Abraham Silberschatz, Peter B. Galvin, Greg Gagne, Wiley Publications, 8th edition, 2012.

Reference Books:

- Operating Systems by Achyut S. Godbole, Tata McGraw Hill, 3rd edition,2010.
- Operating Systems: Internals and Design Principles by William Stallings, Pearson Education, 7th edition,2011.
- Operating Systems: A Concept-based Approach by Dhamdhere, D.M., McGraw Hill, 2nd edition, 2006.

Course Outcomes:

At the end of the Course, the student is

- Understand the role of operating systems and operating system structure (L2)
- Understand Operating system services, design and implementation (L2)
- Apply the concepts of process, scheduling and multithreading. (L3)
- Analyze critical section, semaphores and synchronization. (L4)
- Apply Deadlock detection and prevention mechanisms. (L4)
- Understand file system, directory structures, Allocation methods of File System. (L2)
- Understand Disk Scheduling, I/O Systems, DMA. (L2)

I SEMESTER

VDC 111: VENTURE DISCOVERY

Hours per week: 3 Examination: 100 Marks

Credits: 2

Preamble: India as part of its Make in India initiative has been focusing on creating incubation center's within educational institutions, with an aim to generate successful start-ups. These start-ups will become employment creators than employment seekers, which is the need of the hour for our country.

This common course for all the disciplines is a foundation on venture development. It is an experiential course that lets students venture and find out what is a business, financial and operating models of a business are. How to design and prototype a solutions that meets their customers' needs and generate revenue for the business.

LEARNING OBJECTIVES

Discover who you are – Values, Skills, and Contribution to Society.
Gain experience in actually going through the innovation process.
Conduct field research to test or validate innovation concepts with target customers.
Understand innovation outcomes: issues around business models, financing for start-ups, intellectual property, technology licensing, corporate ventures, and product line or service extensions.

On successful completion of this course, students will be able to:

	Learning Outcome	Assessment
1	Understand conceptual framework of the foundation of a venture	A1, A2
2	Understand the concept of purpose, mission and value-add service offered by a venture	A3
3	Analyze design and positioning of the product	A3
4	Demonstrate prototyping	A3
5	Analyze business, revenue and operating models	A3

Course Outline

Unit I (6 sessions)

Personal Values: Defining your personal values, Excite & Excel, Build a Team, Define purpose for a venture. Four stages: Personal Discovery, Solution Discovery, Business Model Discovery, Discovery Integration.

Unit II (6 sessions)

Solution Discovery: Craft and mission statement, Experience design, Gaining user insight, Concept design and positioning, Product line strategy, Ideation & Impact.

Unit III (6 sessions)

Business Model Discovery: Prototyping solutions, Reality Checks, Understand your industry, Types of business models, Define Revenue Models, Define Operating Models

Unit IV (6 sessions)

Discovery Integration: Illustrate business models, Validate business models, Define company impact

Unit V (6 sessions)

Tell a Story: Can you make money, Tell your venture story.

Assessment methods

Task	Task type	Task mode	Weightage (%)
A1. Assignments	Individual	Report/Presentation	20
A2. Case / Project/Assignment	Groups* or Individual	Presentations/Report/Assignment	40
A3. Project	Individual/Group	Report/Pitch	40

Transferrable and Employability Skills

	Outcomes	Assessment
1	Know how to use online learning resources: G-Learn, online journals, etc.	A1 & A2
2	Communicate effectively using a range of media	A1 & A2
3	Apply teamwork and leadership skills	A2
4	Find, evaluate, synthesize & use information	A1 & A2
5	Analyze real world situation critically	A3
6	Reflect on their own professional development	A3
7	Demonstrate professionalism & ethical awareness	A2
8	Apply multidisciplinary approach to the context	A2

Learning and teaching activities

Mixed pedagogy approach is adopted throughout the course. Classroom based face to face teaching, directed study, independent study via G-Learn, case studies, projects and practical activities (individual & group)

Teaching and learning resources

Soft copies of teaching notes/cases etc. will be uploaded onto the G-learn. Wherever necessary, printouts, handouts etc. will be distributed in the class. Prescribed text book will be provided to all. However you should not limit yourself to this book and should explore other sources on your own. You need to read different books and journal papers to master certain relevant concepts to analyze cases and evaluate projects. Some of these reference books given below will be available in our library.

Prescribed Modules:
Access to NU-IDEA online modules will be provided.

Referential text books and journal papers:

Personal Discovery Through Entrepreneurship, Marc H. Meyer and Chaewon Lee, TheInstitute of Enterprise Growth, LLC Boston, MA.

Suggested journals:

Vikalpa, Indian Institute of Management, Ahmedabad
Journal of General Management, Mercury House Business Publications, Limited
Harvard Business Review, Harvard Business School Publishing Co. USA

MCA I SEMESTER

20SCA 721: OBJECT ORIENTED PROGRAMMING WITH C++ LAB

Hours per week: 3 Examination: 100 Marks

Credits: 2

Objective: To make the student learn object oriented concepts, programming with C++. To practice functions, classes and work with file and exception handling.

1. Write program to demonstrate classes and objects
2. Write a program to demonstrate different types of Constructors
3. Write program to demonstrate for friend class and friend functions
4. Write program for inline function, Static function, Static Classes
5. Write program to demonstrate for passing objects to a function, returning objects to function
6, Write a program to demonstrate Function Overloading
7. Write a program to demonstrate Copy Constructor
8. Write a program to demonstrate Default Arguments to a Function
8. Write a program to demonstrate different types of operator overloading
9 Write a program to demonstrate single inheritance
10 Write a program to demonstrate Multiple and Multilevel Inheritance
11. Write a program to demonstrate virtual base class
12. Write a program to demonstrate virtual functions
13. Write a program to demonstrate Generic Functions
14. Write a program to demonstrate Generic Classes
15. Write a program to demonstrate Try and catch block
16. Write a program to demonstrate Multiple catch Statements

Text Book :

1. C++ : The Complete Reference by Herbert Schildt 4th Edition, 2017

Reference Books:

1. Object Oriented Programming in C++ by E. Balaguruswamy, 4rd Edition, Tata McGraw Hill Publication.
2. Let Us C++ by YashavantP.Kanetkar, 2nd Edition, BPB Publications.

Course Outcomes:

After completing the course student will be able to:

- Understand the class concept (L2).
- Analyze the friend function (L4).
- Use of inline function (L3).
- Differentiate between function overloading and operator overloading (L3).
- Use of exceptional mechanism (L3).

MCA I SEMESTER

20SCA 723: WEB PROGRAMMING LAB

Hours per week: 3 Examination: 100 Marks

Credits: 2

Objective: To learn the basics in web designing using HTML, CSS, and Java Script, PHP

1. Write a HTML document to demonstrate Basic Formatting Tags Formatting tags.
2. HTML document to demonstrate Ordered lists, unordered Lists, definition Lists.
3. Write HTML document to demonstrate Graphics and its attributes
4. Write an HTML document to create table header rows, data rows, caption and attributes of the table tag.
5. Write an HTML document to cell padding and cell spacing, Bgcolor, Colspan and Row span attribute.
6. Write an HTML document using frameset and the targeting named frames.
7. Write HTML document to demonstrate Linking Documents
8. Write CSS Program to demonstrate Create Style Sheet Background, Text Format, Controlling Fonts.
9. Write CSS Program to demonstrate Create Margin Attributes and List Attributes .
10. Write CSS Program to demonstrate various Box Model properties
11. Write a JavaScript to demonstrate different data types.
12. Write a JavaScript to demonstrate different operators.
13. Write a JavaScript to demonstrate for loop and while loop.
14. Write a JavaScript to demonstrate arrays.
15. Write a JavaScript to demonstrate dialog boxes.
16. Write a JavaScript to demonstrate user defined functions.
17. Write a JavaScript to demonstrate built-in functions.
18. Write a JavaScript to demonstrate various controls like Text Field, Button, Password Elements.
19. Write a JavaScript to demonstrate various controls Choice, Multiple Choice Options Radio Button, Check Box.
20. Write PHP Program to demonstrate variables, constants in PHP
21. Write PHP Program to demonstrate control statements.
22. Write PHP Program to demonstrate Arrays in PHP.

Text Book:

1. Web Enable Commercial Application Development Using HTML, Java script, DHTML and PHP by Ivan Bayross, BPB Publications, 4th revised edition, 2010 .

Reference Books:

1. Complete Reference HTML by T. A. Powell, 3rd edition, TMH, 2003.
2. HTML, XHTML, and CSS Bible by Steven M. Schafer, Wiley India, 5th Edition.
3. Beginning CSS: Ca20SCAding Style Sheets for Web Design by Ian Pouncey, Richard York, Wiley India.
4. Web Technology and Design by Xavier, C, New Age International, 2013.

Course Outcomes:

Upon completion of the course, the student is able to

- Design static HTML Pages(L6)
- Develop a dynamic webpage by the use of DHTML, Java Script.(L6)
- Make Use of various PHP features(L3)

MCA I Semester

20SCA 725: Operating Systems Lab

Hours per week: 3 Examination: 100 Marks

Credits: 2

Objective: To introduce the linux environment to the student and to practice various unix utilities, shell programming and to execute various operating systems programs in unix environment.

Unix Utilities – Introduction to Unix file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, cp, mv ln, rm, unlink, mkdir, rmdir, du, df, mount, umount find, unmask, ulimit, ps, who, finger, arp, ftp, telnet, rlogin, text processing utilities and backup utilities, detailed commands to be covered are cat, tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm., cmp, diff, tr, awk, tar,cpio.

1. Study about the General Purpose Utilities.
   a) Banner b) cal c) date d) calendar e) tty f) bc g) spell &fspell
2. Write a shell program using if, nested if
3. Write a shell program using switch case
4. Write a shell program to find the Sum of digits in a 3 digit number using while loop.
5. Write a shell program to print first 'n' terms of Fibonacci series using for loop

Programs on Processes:

1. Chain of processes.
2. Fan of processes.

Programs on Process Scheduling:

1. FCFS scheduling algorithm
2. Round Robin scheduling algorithm
3. Priority scheduling algorithm (Pre-emptive, Non Pre-emptive)
4. Shortest job First scheduling algorithm (Pre-emptive, Non Pre-emptive)

Reference Books:

1. Unix Concepts and Applications by Sumitabha Das, Tata McGraw Hill, 4th edition,2006.
2. Unix networking program by Stevens W. Richard,2005.
3. Advanced Unix programming by H.J.Rechkind, Pearson Education, 2nd edition,2004.

Course Outcomes:

After completing the course student will be able to:

- Understand Unix utilities (L2)
- Demonstrate unix commands(L2)
- Learn shell programming(L1)
- Implement in vi editor environment(L4)
- Develop scheduling algorithms(L5)

II SEMESTER

20SCA 702: PROBABILITY AND STATISTICS

Hours per week: 4 End Examination: 60Marks

Credits: 4 Sessional: 40 Marks

Preamble: Probability theory is important when it comes to evaluating statistics. Probability and Statistics for Computer Science treats the most common discrete and continuous distributions, showing how they find use in decision and estimation problems, and constructs computer algorithms for generating observations from the various distributions.

Course Objectives:

- To understand the difference between discrete and continuous random variables and probability. (L2)
- To evaluate problems on discrete and continuous probability distributions. (L5)
- To learn the basic concept and applications of correlation and regression. (L2)
- Ability to implement various sampling techniques. (L3)
- To understand the concept of testing of hypothesis for large, small samples. (L2)
- Ability to explore certain statistical concepts in practical applications of computer science areas. (L4)

UNIT - I

Probability: Sample Space, Events, Axiomatic Approach to Probability, Conditional Probability Independent Events, Baye's Formula with Applications.

Random Variables: Continuous and Discrete Random Variables, Distribution Function of a random variable, Expectation, Variance, Coefficient of Variation, Moment Generation Function. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to

- List the difference between discrete and continuous random variables (L1)
- Define sample space of an experiment and probability (L1)
- Evaluate the problems on probability and Baye's formula (L5)
- Evaluate distribution function of random variable (L5)
- Evaluate the problems on moment generating function(L5)

UNIT - II

Probability Distribution: Discrete Distributions, Binomial, Poisson and Geometric Distributions, Continuous Distributions, Uniform, Normal, Exponential. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Compare Binomial and poison distributions (L5)
- Illustrate the Geometric distribution (L2)
- Explain the difference between discrete and continuous probability distributions (L1)
- Apply normal distributions to various problems (L3)
- Compare normal distributions with other distributions (L5)

UNIT - III

Correlation and Regression: Correlation Coefficient, Rank Correlation Coefficient of

Determination, Linear Regression, Methods of Least Squares, Fitting of the Curve of the Form

$ax + b$, $ax^2 + bx + c$, ab^x , ax^b and ae^{bx}. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to

- To learn the basic concept and applications of correlation and regression (L1)
- Apply rank correlation coefficient to rank the quality (L3)
- Evaluate problems on correlation coefficient and rank correlation coefficient (L5)
- Explain the need of fitting of the curves(L1)
- Use of methods of least squares to fit a curve(L1)

UNIT - IV

Sampling Theory: Concepts of Sampling, Methods of Sampling, Simple Random Sampling, Systematic Sampling and Stratified Random Sampling (Descriptions Only), Concepts of Sampling Distributions and Standard Error, Point Estimation (Concepts only), Interval Estimation of Mean and Proportion. (10)

Learning Outcomes

By the end of this Unit, the student will be able to

- Explain the concept of sampling (L1)
- Summarize different methods of sampling (L2)
- Evaluate standard error (L5)
- Explain the concepts of sampling distributions (L1)
- Evaluate interval estimation of mean and proportion (L5)

UNIT - V

Test of Hypotheses: Critical Region, Two Types of Errors, Level of Significance, Large Sample Tests for Mean & Proportion, Exact Tests Based on t, F and Chi – Square Distributions. (10)

Learning Outcomes

By the end of this Unit, the student will be able to

- Compare two types of errors. (L5)
- Explain the concept of critical region. (L2)
- Test the hypothesis of large samples for mean. (L4)
- Apply the concept of t distribution for small samples. (L3)
- Explain the concepts of F and chi-square distributions. (L2)

Text Book:

1. Fundamentals of Mathematical Statistics by S.C. Gupta & V.K. Kapoor, Sultan Chand & Sons, 2002.

Reference Books:

1. Probability and Statistics for Engineers by Irwin Millor and John E.Freund, PHI.

2. Probability and Statistics, Spiegel, TMH.

3.P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).

Course Outcomes:

After completing the course student will be able to:

- Able to understand the difference between discrete and continuous random variables and probability (L2)
- Define sample space of an experiment, Evaluate the problems on probability and Baye's formula (L2)
- Explain the difference between discrete and continuous probability distributions (L2)
- Summarize different methods of sampling (L2)
- Test the hypothesis of large samples for mean (L4)

II SEMESTER

20SCA 704: DATA STRUCTURES USING C++

Hours per week: 4 End Examination: 60 Marks

Credits:4 Sessionals: 40 Marks

Preamble: Data Structure is a way of collecting and organizing data in such a way that can perform operations on these data in an effective way. It is about rendering data elements in terms of some relationship, for better organization and storage in different ways. This course will help in understanding various strategies require to solve a problem effectively and efficiently.

Course Objectives:

1. To make the student understand the linear and non linear data structures, Array operations. (L2)
2. To learn sorting and searching techniques and its efficiency. (L2)
3. To Understand basic concepts and operations involved in stacks, queues. (L2)
4. To master the implementation of linked data structures such as linked lists and binary trees. (L3)
5. To be familiar with some graph algorithms such as shortest path and minimum cost spanning tree. (L3)

UNIT -I

Fundamental Concepts: Introduction to Data Structures, Types of Data Structures, Relationship among data, data structures and algorithms, Implementation of data structures, Analysis of Algorithms, Complexity of algorithms: Space complexity, Time complexity Definition.

Linear Data Structure using Arrays: Sequential Organization, Linear Data Structure Using Sequential Organization: Array ADT, Memory Representation, Class Array, Multidimensional Arrays, Concept of Ordered List, Single Variable Polynomial: Representation, evaluation, Addition, Multiplication, Sparse Matrix: Representation, Addition, Transpose, String Manipulation Using Array, Pros and Cons of Arrays.

Searching: Search Techniques: Sequential search, Binary search, Hashed search.

Sorting: Types of sorting, General sort concepts, Bubble sort, Insertion sort, Selection sort, Quick sort, Merge sort, Heap sort. (15)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Learn the types of data structures(L1)
- Know the analysis of algorithms by learning the time and space complexities.(L1)
- Develop and run the linear data structures i.e., Arrays programs using C++(L6)
- Demonstrate the programs for polynomials, sparse matrix(L3)
- Experiment different searching and sorting techniques(L3)

UNIT - II

Stacks: Primitive operations, Stack Abstract Data Type, Representation of Stacks, Using Sequential Organization, Multiple Stacks, Applications of Stacks – Expression Evaluation and Conversion, Processing of Function Calls.

Queues: Concept of Queues, Queue as Abstract Data Type, Realization of Queues Using Arrays, Circular Queue, Multi queues, Deque, Priority Queue, Applications of Queues: Job

scheduling. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Understand the concepts Stack and its operations (L2)
- Experimenting the representation of stack using array and linked lists (L3)
- Demonstrate expression of evaluation and its conversion(L3)
- Understand the concepts Queue and its operations (L2)
- Learn the concepts of Queue, Circular queue, Deque and priority queue (L1)

UNIT -III

Linked Lists: Introduction, Linked List: Comparison of sequential and Linked Organizations, Terminology, Primitive operations, Realization of Linked Lists using arrays and dynamic memory management, Dynamic memory management in C++, Linked List Abstract Data Type, Linked List Variants, Doubly Linked List: Creation, Deletion, Insertion, Traversal, Circular Linked List, Linked Stack, Linked Queue. (10)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Know the concepts of Linked Lists (L1)
- Comparison of Sequential and Linked Organization (L4)
- Understand the concepts of Dynamic memory management and its representation (L2)
- Demonstration of Linked list, Doubly linked lists creation, insertion and traversal in C++ (L3)
- Develop Circular Linked list, Linked Stack and Linked Queue (L6)

UNIT - IV

Trees: Introduction, Basic terminology, General trees, Representation of a general tree, Types of Trees, Binary Tree, Properties, Binary Tree Abstract Data Type, Realization of a Binary Tree, Insertion of a Node in Binary Tree, Binary Tree Traversal (recursive traversals), Formation of binary tree from its traversals, Binary Search Tree: Inserting a node, Searching for a key, Deleting a node, Binary Tree and Binary Search Tree, Applications of Binary Trees: Expression tree, Decision tree, Huffman's coding.

Heaps: Basic Concepts, Implementation of Heap, Heap as Abstract Data Type. (8)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Learn the basic terminology of general tree and its representation (L1)
- Understand the different types of trees (L2)
- Demonstrate binary tree insertion, traversals (L3)
- Experiment Binary Search Tree insertion, searching for a key (L3)
- Learn the basic concepts of Heap and its implementation (L1)

UNIT - V

More on Linked Lists: Copying a linked list, Computing the length of a linked list, reversing singly linked list without temporary storage, concatenating two linked lists, Erasing the linked list.

Graphs: Introduction, Graph Abstract Data Type, Graph Representation, Graph t raversals, Spanning Trees: Prim's,Krushkal's Algorithm. (7)

Learning Outcomes:

By the end of this Unit, the student will be able to

- Learn more concepts on LinkedList (L1)
- Demonstrate how to concatenate two linked lists (L3)
- Experiment the representation of Sparse Matrix (L3)
- Understand the concepts of Graph, Graph traversals (L2)
- Develop applications of graphs in finding the shortest path (L6)

Text Books:

1. Data Structures using C++ by Varsha H.Patil, Oxford University Press,2012.

Reference Books:

1. Data Structures Algorithms and Applications in C++ by SartajSahani, University Press, 2nd Edition, 2011.
2. Data Structures Using C and C++ by YedidyahLangsam, Moshe J Augenstein and Aaron M Tenenbaum, PHI, 2nd Edition, 2009.
3. Data Structures and Algorithm Analysisin C++by Mark Allen Weiss, Pearson Education, 3rd edition, 2007.
4. Data Structures and Algorithms in C++ by Adam Drozdek, Cengage Learning, 4th Edition, 2013 .

Course Outcomes:

After completing the course student will be able to:

- Assess how the choice of data structures and algorithm design methods impacts the performance of programs. (L5)
- Choose the appropriate data structure and algorithm design method for a specified application. (L3)
- Solve problems using data structures such as linear lists, stacks, queues, binary trees, heaps, binary search trees, and graphs. (L3)
- Know the strength and weakness of different data structures. (L5)

II SEMESTER

20SCA 706: DATABASE MANAGEMENT SYSTEMS

Hours per week: 4 End Examination: 60 Marks

Credits:4 Sessionals: 40 Marks

Preamble: Database Management System course is intended to deliver students the elementary concepts of a database management system and make them to design E-R and implement a database application built over those concepts. It also introduces advanced level areas like transaction processing, concurrency control and recovery management

Course Objectives:

- To learn introductory concepts of databases, database systems, architecture and classification. (L1)
- To develop conceptual modelling, semantic data modelling and defining constraints on the relational model (L3)
- To Design relational Data model and perform relational model operations (L3)
- To demonstrate the creation, altering and modification of database with SQL, Learning the techniques for evaluating relational schemas for design quality (L2)
- To Analyze the concepts of transaction processing, concurrency control and database recovery (L4)

UNIT - I

Introduction and Conceptual Modelling, Databases and Database Users: Introduction, Characteristics of Database Approach, Actors on the Scene, Workers behind the Scene, Advantages of using DBMS Approach.

Database System, Concepts and Architecture: Data Models, Schemas and Instances, Three Schema Architecture and Data Independence, Database Language and Interfaces, The Database System Environment, Centralized and Client/Server Architecture of Database Management Systems, Classification of Database Management Systems. (10)

Learning Outcomes:

By the end of this unit, the student will be able to

- Learn the introductory concepts of databases (L1)
- Analyze the characteristics of database approach (L4)
- Understand the database system environment (L2)
- Know the three schema architecture (L1)
- Find the different database architectures (L1)

UNIT - II

Data Modeling Using The ER Model: High Level Conceptual Data Models for Database Design, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraint, Weak Entity Types, ER Diagrams, Naming Conventions and Design Issues. The Enhanced Entity Relationship model, UML Class Diagrams, Relationship Types of Degree Higher Than Two.

The Relational Data Model and Relational Database Constraints: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraints Violations. (12)

Learning Outcomes:

By the end of this unit, the student will be able to

- Learn introduction to Data Models and conceptual modelling (L1)
- Understand the introductory concepts: Entity, Attributes and Relationship (L2)
- Draw an Entity Relationship diagram (L6)
- Know the UML class diagrams (L1)
- Summarize relational model concepts, constraints and database schema (L2)

UNIT – III

The Relational Algebra: Unary Relational Operations - SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations - JOIN and DIVISION; Additional Relational Operations, Examples of Queries in Relational Algebra.

Relational Database Design By ER And EER To Relational Mapping: Relational Database Design using ER to Relational Mapping, Mapping EER Model Constructs to Relations. (8)

Learning Outcomes:

By the end of this unit, the student will be able to

- Learn relational algebra operations (L1)
- Understands Unary and Binary operations (L2)
- Develop relational algebra expressions (L6)
- Know the concepts of JOIN and DIVISION (L1)
- Transform ER to Relational Model (L4)

UNIT – IV

SQL-Schema Definition, Constraints, Queries and Views: SQL Data Definition and Data types, Specifying Constraints in SQL, Schema Change Statements in SQL, Basic Queries in SQL, More Complex SQL Queries, INSERT, DELETE, UPDATE Statements in SQL, Additional Features of SQL, Specifying Constraints As Assertions and triggers, Views, Additional features of SQL.

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relational Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of 2nd and 3rd Normal Forms, Boyce-Codd Normal Form

Relational Database Design Algorithms and Further Dependencies: Properties of relational Decomposition, Algorithms for Relational Database Schema design, Multi valued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form. (12)

Learning Outcomes:

By the end of this unit, the student will be able to

- Learn Database Language –SQL(L1)
- Practice DDL, DML and DCL commands(L3)
- Demonstrate all built in arithmetic, aggregate, string, date and conversion functions(L3)
- Understand the concepts of functional dependencies(L1)
- Define Normalization and its normal forms(L1)

UNIT – V

Transaction Processing Concepts: Introduction to Transaction Processing, Transaction and System Concepts, Desirable properties of transactions, Characterizing Schedules based on recoverability, Characterizing Schedules based on serializability

Concurrency Control Techniques: Two Phase Locking, Time Stamp Ordering, Multi version concurrency control, Optimistic Concurrency control

Database Recovery Techniques: Recovery concepts, Recovery Techniques based on Deferred and Immediate Update, Aries Recovery algorithm (10)

Text Books:

1. Fundamentals of Database Systems by Ramez Elmasri and Shamkant B. Navathe, Pearson education, 5th edition, 2009.

Reference Books:

1. Database Concepts by Abraham Silberschatz, Henry F Korth, S.Sudarshan, TMH, 6th edition,2014**.**

2. An Introduction to Database Systems by C.J. Date, Addison Wesley, 8thedition, 2008.

3. Database Management Systems by Raghu Ramakrishnan, Johannes Gehrke, TMH, 2nd edition, 2000.

Course Outcomes:

After completing the course student will be able to:

- Understand the introductory concepts of databases and its architecture. Define program-data independence, data models for database systems, database schema and database instances. (L1)
- Analyze database requirements and determine the entities involved in the system and their relationship to one another. Develop the logical design of the database using data modeling concepts such as entity-relationship diagrams, Enhance Entity Relationship modeling. (L4)
- Convert the ER-model to relational tables, populate relational database &formulate relational algebra queries to extract information to satisfy business reporting requests (L6)
- Analyze table designs for excessive redundancy and retrieving the data as per user requirements.(L5)
- Understand Transaction processing, protocols used to assure ACID properties and Recovery techniques to recover from crashes (L1)

II SEMESTER
20SCA 708: OBJECT ORIENTED SOFTWARE ENGINEERING

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Preamble: This course will emphasize on the systematic application of scientific and technological knowledge, methods, and experience to the design, implementation testing, and documentation of software.

Objective: The aim of this course is to train the students on Object Oriented Software Engineering features. It helps the students to develop projects using object oriented analysis, design and testing techniques.

UNIT-I

Software Engineering: Software related problems, software engineering, concepts, development activities.

Modelling: Concepts, Modelling with UML. (10)

Learning Outcomes: By the end of the unit the student will be able to

- Define software engineering (L1)
- Understand the concepts of software engineering(L2)
- Illustrate the various development activities(L2)
- Outline the concepts of modelling with UML(L2)

UNIT-II

Project Organization & Communication: Project Organization & communication concepts and their activities.

Requirements: Requirements elicitation & its activities and managing requirements elicitation.

Analysis: Analysis overview, concepts, activities and managing analysis. (10)

Learning Outcomes: By the end of the unit the student will be able to

- Understand about Project organization and the various communication concepts(L2)
- Illustrate requirement activities (L2)
- Explain the various analysis concepts(L5)

UNIT-III

System Design: Decomposing the System: System Design overview, System design concepts, and System design Activities, and managing System Design

System design: Addressing design goals: An overview of system design activities and concepts UML Development diagram, System design goals, Managing system design. (10)

Learning Outcomes: By the end of the unit the student will be able to

- Explain the system design concepts(L2)
- Identify the various system design activities(L3)
- Illustrate how to manage system design(L2)
- Build UML diagrams(L3)

UNIT-IV

Object Design: Reusing Pattern Solutions: An overview of object design Reuse Concepts, Solution objects, inheritance and design patterns.

An Object Design: Specifying Interfaces: An overview of interface specification, interface specifications concepts & its activities and Managing object design. (10)

Learning Outcomes: By the end of the unit the student will be able to

- Illustrate object design reuse concepts (L2)
- Understand various design patterns (L2)
- Understand the overview of interface specifications (L2)
- Manage object design (L3)

UNIT-V

Testing: Testing concepts, activities and managing testing.

Project Management -Introduction, An overview of project management, Project Management Concepts, Project Management Activities. (10)

Learning Outcomes: By the end of the unit the student will be able to

- Understand the testing concepts(L2)
- Demonstrate the various testing activities and manage them.(L1)
- Illustrate Project management concepts and its activities.(L2)

Text Book:

1. Object-Oriented Software Engineering: Using UML, Patterns and Java, Bernd Bruegge and Allen H. Dutoit, 2nd Edition, Pearson Education Asia.

Reference Books:

1. Object-Oriented Software Engineering: Practical software development using UML and Java Timothy C. Lethbridge and Robert Laganiere , McGraw-Hill Higher education
2. An Introduction to Object Oriented Systems Analysis and Design with UML and the Unified Process, Stephen R Schach, Tata McGraw-Hill

Course Outcomes:

After completing the course student will be able to:

- Understand the concepts of software engineering(L2)
- Illustrate requirement activities (L2)
- Identify the various system design activities(L3)
- Understand the various design patterns (L2)
- Demonstrate the various testing activities and manage them.(L1)

II SEMESTER

20SAE 702: TECHNICAL COMMUNICATION SKILLS

Hours per week: 4 End Examination: 60 Marks
Credits: 3 Sessionals: 40 Marks

Preamble: Communication skills in the work front place an important role in shaping one's career. Therefore, professionals need to refine their communicative skills to be able to effectively interact with superiors, subordinates, peers, suppliers and customers successfully. The course has been designed to suit the purpose.

Objective:

- To make the students learn the formation of sentences and improve the communication skills.
- To familiarize the students with the use of English in communication and help them to acquire the ability to expand their linguistic resources to enhance communicative competence.
- To develop listening, speaking, reading and writing skills in such a way that they improve the ability to exchange information, grasp and express ideas, feelings etc., with clarity and confidence.
- To make them interview ready and to increase the employability of the students by improving their overall communicative efficiency.

UNIT - I

Features of Indian English: Correction of sentences, Structures, Tenses, ambiguity, idiomatic distortion and Misappropriation. (8)

Learning Outcomes:

By the end of the unit, the student will be able to:

- Understand the features of Indian English(L2)
- Identify incorrect sentences in English and write their correct form(L3)
- Use structures and tenses accurately(L4)
- Point out distorted idiomatic expressions and use their write form(L4)

UNIT - II

Informal conversation Vs Formal expression: Features of good communication, Different flows of communication, Verbal and Nonverbal communication, Barriers to effective communication –ways to overcome the barriers. (10)

Learning Outcomes:

By the end of the unit, the student will be able to:

- Comprehend the characteristics of good communication(L1)
- Figure out the different flows of communication in an organization and their uses(L3)
- Understand the importance of verbal communication and use oral and written communication effectively(L2)
- Relate the significance of non-verbal communication in the entire communication process(L2)
- Become aware of the obstacles that hinder effective communication to take place and the different strategies to overcome them(L5)

UNIT - III

Types of Communication: Oral, aural, Writing and reading, Word-Power, Vocabulary, Jargon rate of speech, pitch, tone, Clarity of voice, Group discussion, Personality traits, types of group discussion, Team player, Leadership qualities. (12)

Learning Outcomes:

By the end of the unit, the student will be able to:

- Learn and appreciate the different types of communication and their uses(L1)
- Amass strong comprehensive vocabulary that is useful for specific purposes integrate the techniques of speech such as pitch, intonation, clarity and rate of speech(L2)
- Prioritize the personality traits and skills required to effectively participate in a G.D(L6)

UNIT - IV

Formal and informal interviews: Ambiance and polemics, interviewing in different settings and for different purposes e.g., Eliciting and giving information, Preparation for a job interview, Personality traits assessment, Recruiting, Performance appraisal. (12)

Learning Outcomes:

By the end of the unit, the student will be able to:

- Analyze the purpose of interviews(L4)
- Assess the processes involved in different types of interviews(L5)
- Plan how to prepare for an interview(L3)
- Prepare how to answer common interview questions(L6)

UNIT - V

Technical presentations: Types of presentation, Video conferencing, Participation in meetings, chairing sessions. Letter-writing, business letters, Proforma, Format, Style, Effectiveness, Promptness, Analysis of sample letters collected from industry, email. (12)

Learning Outcomes

By the end of the unit, the student will be able to:

- Overcome nervousness prior to any presentation(L1)
- Prepare and structure good presentations that deliver effective messages(L4)
- Facilitate and participate in a video conference effectively(L5)
- Evaluate the roles and responsibilities of a member in the meeting(L5)
- Produce skills in leadership, time management, decision making and communicate effectively with members in a meeting(L6)
- Write a business letter, which includes appropriate greetings, heading, closing and a professional tone(L5)

Text Book:

1. Essentials of Business Communication by Rajendra Pal & J S KorlahaHi, S.Chand Sons.
2. Advanced Communication Skills by V. Prasad, Atma Ram Publications.

Course Outcomes:

After completing the course student will be able to:

- Learn the formation of sentences and improve the communication skills(L1)
- Understand the importance of verbal communication and use oral and written communication effectively(L2)
- Integrate the techniques of speech such as pitch, intonation, clarity and rate of speech(L6)
- Produce skills in leadership, time management, decision making and communicate effectively with members in a meeting(L3)
- Interview ready & to increase employability of students by improving their overall communicative efficiency.(L4)

II SEMESTER

20SCA 722: DATA STRUCTURES USING C++ LAB

Hours per week: 3 Examination: 100 Marks

Credits: 2

Objective: The aim of this lab to make the student understand linear and nonlinear data structures, to apply the data structures and algorithms in real time applications.

1. Implementation of Linear Search, Binary Search.
2. Implementing the following sorting methods.
   a.Bubble sort , b. Insertion sort, c. Selection Sort, d. Quick Sort, e. Merge Sort
3. Implementation of Polynomial Addition using Arrays.
4. Implementation of Sparse Matrix addition and Multiplication using Arrays
5. Array implementation of stack.
6. Array implementation of Queue.
7. Implementation to convert infix expressions to post fix notation, prefix notation.
8. Simple expression evaluator that can handle +,-, /,*.
9. Singly Linked List operations – insertion, deletion, display, reversal
10. Implementation of Linked Stack Operations.
11. Implementation of Linked Queue Operations.
12. Implementation of circular queue ADT using an array.
13. Implementation of Doubly LinkedList.
14. Implementation of Circular LinkedList.
15. Implementation of Binary Tree, Binary Search Tree creation, traversals.
16. Implementation of Binary Search Tree operations, insertion all cases and deletion all cases.
17. Implementation of Graph Traversals.

Reference Books:

1. Data Structures through C++ by Varsha H Patil, Oxford University Press, New Edition, 2011.
2. Data Structures through C in depth by S.K. Srivastva and DeepaliSrivastva,BPB publications,2004.
3. Data Structures and Algorithms in C++ by Adam Drozdek, Cengage Learning, 4th edition, 2013.

Course Outcomes:

After completing the course student will be able to:

- Demonstrate the various searching techniques. (L3)
- Differentiate between different sorting techniques. (L4)
- Implement the operations on Stacks, Queues using Arrays and its applications (L3)
- Develop programs on operations of Linked List , stacks, queues using linked lists(L6)
- Create and perform operations on binary search trees and its traversals (L6)
- Implement Graph Traversal techniques (L3)

II **SEMESTER**

20SCA 724 : DATABASE MANAGEMENT SYSTEMS LAB

Hours per week: 3 Examination: 100 Marks

Credits: 2

Objective: The aim of this lab is to make the student learn the concepts of SQL. Demonstrates on various DDL,DML and DCL statements. Student also will learn PL/SQL

1. Creation, altering and dropping of tables using SQL.
2. Implementing integrity Constraints on tables.
3. Implementing DML Operations using SQL- Insert, Delete, Update.
4. Simple Queries to access data from Tables using Select Statement and where condition using Distinct, And, Or, Not and Order By Operators.
5. Queries Using Built in Functions:
    i. Arithmetic Functions: Sign, Abs, Ceil, Floor, Exp, Power, Log, Sqrt,
    ii. String Functions: Concat, Lpad, Rpad, Ltrim, Rtrim, Lower, Upper, Initcap, Length, Substr and Instr.
    iii. Date Functions: Sysdate, Next_Day, Add_Months, Last_Day, Months_Between, Least, Greatest, Trunc, Round
    iv. Aggregate Functions: Count, Sum, Avg, Max And Min, Group by, Having,
    v. Queries Using Conversion Functions: To_Char, To_NumberandTo_Date
    vi. Queries Using Set Operators: Union, Intersect, Minus
    vii. Queries Using Joins, Natural Join, Innerjoin, OuterJoin.
6. Queries Along with Sub Queries and Correlated Queries using Any, All, In, Exists, Notexists.
7. Creating Other Schema Objects**:** Defining Views, Creating Views, using Views to Change Data, Dropping Views, Creating Indexes andSequences.
8. Using DCL Commands: Commit andRollback.
9. Creation of Simple PL/SQL Program which includes Declaration Section, Executable Section, Select ... intoClause
10. Develop Programs that include Features of Nested If andCase.
11. Develop Programs using While Loop, For Loop, Nested Loops

Text Books:

1. SQL, PL/SQL The programming languageofORACLE by Ivan bayross, BPB publications, 4th edition, 2009.
2. Programming Oracle triggers and Stored Procedures by Kevin Owens, PHI, 3rd Edition, 2003.

Course Outcomes:

After completing the course student will be able to:

- Experiment with DDL, DML, DCL commands. (L3)
- Apply entity integrity (primary key) and referential integrity(foreign key) concepts. (L2)
- Understand the Practice all arithmetic, string, date and aggregate functions. (L3)
- Construct simple queries, sub queries and complex queries. (L6)
- Create other schema objects like views, indexes and sequence (L6)
- Develop PL/SQL programs. (L6)

III **SEMESTER**

20SCA 801: Object Oriented Programming with JAVA

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Preamble: The aim of the course is to make the students learn object oriented concepts. This course covers preliminaries and makes the students learn how to program in java using Basic Concepts, Inheritance, Interfaces, Packages, Threads, I/Os, Applets, Swings, Event Handling, Collections and allow the students to implement effectively.

Course Objectives:

- To introduce the object oriented programming concepts.
- To understand object oriented programming concepts, and apply them in solving problems.
- To introduce the principles of inheritance and polymorphism; and demonstrate how they relate to the design of abstract classes.
- To introduce the implementation of packages and interfaces.
- To introduce the concepts of exception handling and multithreading.
- To introduce the design of Graphical User Interface using applets and swing controls.

UNIT – I

Introduction to Object-oriented concepts- Object-Oriented concepts, An Overview of Java, Data types, Variables and Arrays, operators, expressions, control statements, Classes, and Methods , String Handling, Inheritance, Constructors, Creating Multilevel hierarchy, super uses, using final with inheritance, Polymorphism, method overriding, abstract classes, Object class, forms of inheritance-benefits of inheritance, costs of inheritance. (10)

Learning Outcomes:

By the end of the unit the student will be able to

- Learn the OOP techniques.(L1)
- Understands the concepts of Classes and Instances. (L2)
- Practice the concepts of Inheritance, Polymorphism and method overriding.(L3)
- Demonstrate the concepts of Constructors, Creating Multilevel hierarchy, and super uses. (L2)

UNIT – II

Packages- Defining a Package, Class path, Access protection, importing packages. Interfaces- defining an interface, implementing interfaces, Nested interfaces, applying interfaces, variables in interfaces and extending interfaces.

Stream based I/O(java.io) – The Stream classes-Byte streams and Character streams, Reading console Input and Writing Console Output, File class, Reading and writing Files, Random access file operations. (10)

Learning Outcomes:

By the end of the unit the student will be able to

- Understand the concepts of Package, CLASSPATH, Access protection.(L2)
- Design interfaces, Nested interfaces. (L6)
- Demonstrate File class, Reading and writing Files (L2)

UNIT - III

Exception handling - Fundamentals of exception handling, Exception types, Termination or resumptive exception models, Uncaught exceptions, using try and catch, multiple catch clauses, nested try statements, throw, throws and finally, built- in exceptions, creating own exception sub classes. **Multithreading-** Differences between thread-based multitasking and process-based multitasking, Java

thread model, creating threads, thread priorities, synchronizing threads, inter thread communication. (12)

Learning Outcomes:

By the end of the unit the student will be able to

- Learn the concepts of Exception handling and Exception types. (L1)
- Understand the concepts of throw, throws and built- in exceptions(L2).
- Differentiate process-based multitasking and Java thread model(L4)
- Summarize synchronizing threads and inter thread communication. (L2)

UNIT – IV

The Collections Framework (java.util)- Collections overview, Collection Interfaces, The Collection classes- Array List, Linked List, Hash Set, Tree Set, Priority Queue, Array Deque. Accessing a Collection via an Iterator, Using an Iterator, The For-Each alternative, Map Interfaces and Classes, Comparators, Collection algorithms, Arrays, The Legacy Classes and Interfaces- Dictionary, Hashtable , Properties, Stack, Vector More Utility classes, String Tokenizer, Bit Set, Date, Calendar, Random, Formatter, Scanner (10)

Learning Outcomes:

By the end of the unit the student will be able to

- Learn the concepts of Collection Interfaces.(L1)
- Understand Collection classes- Array List, Linked List and Hash Set. (L2)
- Explain the concepts of Map Interfaces and Classes and Comparators (L5)
- Discuss about Utility classes, String Tokenizer, Bit Set, Date and Calendar. (L6)

UNIT - V

GUI Programming with Swing– Introduction, limitations of AWT, MVC architecture, components, containers. Understanding Layout Managers, Flow Layout, Border Layout, Grid Layout, Card Layout, Grid Bag Layout. Event Handling- The Delegation event model- Events, Event sources, Event Listeners, Event classes, Handling mouse and keyboard events, Adapter classes, Inner classes, Anonymous Inner classes. A Simple Swing Application,

Applets – Applets and HTML, Security Issues, Applets and Applications, passing parameters to applets. Creating a Swing Applet, Painting in Swing, A Paint example, Exploring Swing Controls- JLabel and Image Icon, JText Field, The Swing Buttons- JButton, JToggle Button, JCheck Box, JRadio Button, JTabbed Pane, JScroll Pane, JList, JCombo Box, Swing Menus, Dialogs. (12)

Learning Outcomes:

By the end of the unit the student will be able to

- Learn the concepts of MVC architecture, components, containers. (L1)
- Understand Layout Managers (L2)
- Design Flow Layout, Border Layout, Grid Layout, Card Layout and Grid Bag Layout (L6)
- Compare Adapter classes, Inner classes and Anonymous Inner classes. (L5)
- Illustrate Applet and Swing Controls (L2)

Text Books:

1. Java The complete reference, 9th edition, Herbert Schildt, McGraw Hill Education (India) Pvt. Ltd.
2. Understanding Object-Oriented Programming with Java, updated edition, T. Budd, Pearson Education.

Reference Books:

1. An Introduction to programming and OO design using Java, J. Nino and F.A. Hosch, John Wiley & sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. Object Oriented Programming through Java, P. Radha Krishna, Universities Press.

4. Programming in Java, S. Malhotra, S. Chudhary, 2nd edition, Oxford Univ. Press.
5. Java Programming and Object oriented Application Development, R. A. Johnson, Cengage Learning.

Course Outcomes:

After completing the course student will be able to:

- Understand the need of object oriented programming using Java programming language.(L2)
- Define classes, invoking methods, class libraries. (L2)
- Learn the concepts of exception handling and Exception types. (L1)
- Identify the concepts of synchronizing threads and inter thread communication. (L2)
- Define the concepts of Collection Interfaces.(L2)
- Understand the concepts of Collection classes- Array List, Linked List and Hash Set (L3)
- Identify concepts of Map Interfaces and Classes and Comparators.(L2)
- Understand the need of the concepts of – Applets, and Swing Controls. (L2)

III SEMESTER

20SCA 803: DESIGN AND ANALYSIS OF ALGORITHMS

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Preamble: This core course covers good principles of algorithm design, elementary analysis of algorithms, and fundamental data structures. The emphasis is on choosing appropriate data structures and designing correct and efficient algorithms to operate on these data structures.

Course Objectives:

- To Introduce Students, The Concepts Of Algorithm Analysis
- To Find Out The Space And Time Complexity Of Different Algorithms.

Different Design Techniques Such As Greedy Method, Divide And Conquer, Backtracking, Dynamic Programming, Branch And Bound Are

- To Be Studied For Finding The Solution To The Different Problems.
- To Solve Problems Independently And Think Critically
- To Understand, Estimate The Performance Of Algorithm.

UNIT – I

Introduction To Algorithms: Algorithm Specification, Performance Analysis, Introduction To Randomized Algorithms. Divide And Conquer: The General Method, Binary Search, Finding Maximum & Minimum, Quick Sort, Selection, Strassen's Matrix Multiplication. (10)

Learning Outcomes:

By the end of the unit the student will be able to

- Know The Concepts Of Space And Time Complexity Of Different Algorithms (L1)
- Understand Divide And Conquer Methods(L2)
- Find Maximum And Minimum Paths Using General Method, Binary Search(L1)
- Demonstrate On Quick Sort, Selection Sort And Strassen's Matrix Multiplication.(L2)

UNIT – II

Greedy Method: General Method, Knapsack Problem, Tree Vertex Splitting, Job Sequencing With Deadlines, Minimum Cost Spanning Trees, Single Source Shortest Paths. (10)

Learning Outcomes:

By the end of the unit the student will be able to

- Define Knapsack Problem And Tree Vertex Splitting (L1)
- Understand Job Sequencing With Deadlines (L2)
- Learn Minimum Cost Spanning Trees, Single Source Shortest Paths.(L1)

UNIT – III

Dynamic Programming: The General Method, Multistage Graphs, All Pairs Shortest Paths, Optimal Binary Search Trees, String Editing, Reliability Design, the Traveling Sales Person Problem. (10)

Learning Outcomes:

By the end of the unit the student will be able to

- Compare Multistage Graphs, And All Pairs Shortest Paths (L5)
- Design Optimal Binary Search Trees (L6)
- Understand String Editing And Reliability Design (L2)
- Illustrate The Traveling Sales Person Problem (L2)

UNIT – IV

Basic Traversal And Search Techniques: Techniques For Graphs, Connected Components And Spanning Trees, Bi-Connected Components and DFs. **Back Tracking**: General Method, Eight Queens Problem, Sum Of Subsets, Graph Coloring, Hamiltonian cycles. (10)

Learning outcomes:

By the end of the unit the student will be able to

- Learn techniques for graphs, connected components and spanning trees (L1)
- List bi-connected components and DFs (L1)
- Understand the general method and eight queens problem (L2)
- Illustrate sum of subsets, graph colouring and Hamiltonian cycles (L2)

UNIT – V

Branch and Bound: The method, 0/1 knapsack problem, traveling salesperson problem algebraic problems: the general method, evaluation and interpolation. np hard and np complete problems: basic concepts. (10)

Learning outcomes:

By the end of the unit the student will be able to

- Explain the concepts of the method, 0/1 knapsack problem(L2)
- Explain the concepts of traveling salesperson problem algebraic problems.(L2)
- Explain the concepts of the general method, evaluation and interpolation. (L2)
- Illustrate Np hard and Np complete problems(L2)

Text Book:

1. Fundamentals of Computer Algorithms By Ellis Horowitz, SartajSahni, Sanguthevar Rajasekaran, University Press, 2nd Edition, 2008.

Reference Books:

1. Fundamentals of AlgorithmicsBy G. Brassard AndP.Bratley, Phi, 2011.

2. Introduction to Algorithms By T.H. Cormen, C.E. Leiserson, R.L.Rivest, 3rd Edition, PHI,2010.

3. Introduction to Design Analysis of Algorithms By AnanyLevitin, 2nd Edition, Pearson Publications, 2009.

Course Outcomes:

After completing the course student will be able to:

- Understand the concepts of algorithm analysis (L2)
- Analyze the space and time complexity of different algorithms(L4)
- Implement the experiment of different sorting techniques(L3)
- Design binary search trees(L6)
- Illustrate Np hard and Np complete problems(L3)

III SEMESTER
20SCA 805: DATA MINING

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Preamble: Data mining is the process of discovering patterns in large data sets involving methods at the intersection of machine learning, statistics, and database systems. This course covers supervised, un supervised learning techniques and also anomaly detecting techniques.

Course Objectives:

- To introduce the basic concepts and techniques of data mining.
- To understand the process of analyzing hidden patterns of data into meaningful information, which is collected and stored in database warehouses, for efficient analysis.

UNIT – I

Introduction: What is Data Mining? Kind of data on which mining is done, Kinds of patterns can be mined, and Technologies used, Kinds of Applications targeted, Major Issues of Data mining.

Getting to Know Your Data: Data Objects and Attribute, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity (15)

Learning Outcomes:

By the end of this unit, the student will be able

- To Define Data mining (L1)
- Identify the challenges in data mining (L3)
- Analyze various data mining tasks (L4)
- Illustrate the steps in data pre-processing (L2)
- Compare the measures of similarity ad dissimilarity (L5)

UNIT - II

Data Pre-processing: An Overview, Data Integration, Data Reduction, Data Transformation and Data Discretization.

Data Warehouse and OLAP Technology for Data Mining: Data Warehouse basic concepts, Data warehouse modeling, Data warehouse design and usage, Implementation, Generalization by Attribute oriented Induction. (15)

Learning Outcomes:

By the end of this unit, the student will be able to

- Illustrate the Data integration and reduction techniques(L2)
- Explain the Data transformation and discretization techniques. (L2)
- Explain the various data warehouse concepts (L2)
- Construct the various data warehouse modelling and design(L6)
- Explain the Attribute Oriented induction (L4)

UNIT – III

Mining Frequent patterns: Associations and Correlations: Basic Concepts, Frequent Item set Mining Methods, Interesting Patterns and Pattern evaluation methods. (8)

Learning Outcomes:

By the end of this unit, the student will be able to

- Explain the various associations rules(L2)
- Understand the correlation techniques(L2)
- Build the various frequent item set (L6)
- Identify interesting patterns.(L1)
- Identify the various pattern evaluation methods(L1)

UNIT - IV

Classification:Basic Concepts, Decision Tree Induction, Bayesian Classification, Rule based Classification, Model Evaluation & Selection, Techniques to improve classification Accuracy. (10)

Learning Outcomes:

By the end of this unit, the student will be able to

- To know how a decision tree classifier works?(L1)
- Illustrate how model over fitting is done(L2)
- Identify model evaluation techniques(L1)
- Methods of comparing classifiers(L6)
- Explain the various model selection and evaluation techniques(L4)

UNIT - V

Cluster Analysis: Requirements, Overview, Partitioning Methods, Hierarchical Methods, Density based Methods, Grid-based Methods, Evaluation of Clustering.

Outlier Detection: Types of Outliers & Challenges in outlier detection, Outlier detection methods, Statistical Approaches, Proximity based approaches, Cluster & Classification based approach. (15)

Learning Outcomes:

By the end of this unit, the student will be able to

- Explain the basic concepts of clustering(L1)
- Identify the various clustering methods(L1)
- Evaluate the clustering techniques(L1)
- Explain the type of outliers(L1)
- Identify the various outlier detection methods(L1)

Text Books:

1. Data Mining Concepts and Techniques by Jiawei Han, Michelin Kamber, and Jian Pei, Elsevier Publications,3rd Edition, 2013.

Reference Books:

1. Introduction to Data Mining by Pang- Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education, Low Price Edition.

2. Insight to Data Mining Theory and Practice by K.P.Soman, ShyamDiwakar and V. Ajay, Prentice Hall of India, 2006.

Course Outcomes:

After completing the course student will be able to:

- Define data mining and analyze data mining tasks (L1)
- Understand association rules(L2)
- Identify model evaluation techniques(L3)
- Identify methods for comparing classifiers(L6)
- Evaluate clustering techniques(L5)

III SEMESTER
GENERIC ELECTIVE I
20SCA 841:ARTIFICIAL INTELLIGENCE

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Preamble: This course enables the students to think critically about what makes humans intelligent, and how computer scientists are designing computers to act more like us. Artificial Intelligence (AI) is the study of how to make computers make things which at the moment people do better. AI plays an important role in the design and development of systems with intelligent behaviour.

Course Objectives:

- To learn introductory concepts of AI,AI problems and Techniques(L1)
- To understand different search techniques(L2)
- To Illustrate difference between procedural and declarative knowledge(L2)
- To Explain the issues in knowledge representation(L5)
- To Illustrate Bayesian networks and fuzzy logic(L2)

UNIT-1

Introduction to Artificial Intelligence: Artificial Intelligence, AI Problems, AI Techniques, The Level of the Model, Criteria For Success. Defining the Problem as a State Space Search, Problem Characteristics, Production Systems, Production System Characteristics, search Issues in the Design of Search Programs, Un-Informed Search, BFS, DFS; Heuristic.

Search Techniques: Generate-And- Test, Hill Climbing, Best-First Search, A * Algorithm, Problem Reduction, AO*Algorithm, Constraint Satisfaction, Means-Ends Analysis. (12)

Learning Outcomes:

By the end of the unit the student will be able to

- Explain what is artificial intelligence (L2)
- Define the production system characteristics(L1)
- Illustrate various search techniques(L2)

UNIT-II

Knowledge Representation: Procedural Vs Declarative Knowledge, Representations and Mappings, Approaches to Knowledge Representation, Issues in Knowledge Representation, Logic Programming Forward Vs Backward Reasoning,

Symbolic Logic: Propositional Logic, First Order Predicate Logic: Representing Instance and is a Relationships, Computable Functions and Predicates, Syntax & Semantics of FOPL, Normal Forms, Unification &Resolution, Representation Using Rules, and Natural Deduction. (12)

Learning Outcomes:

By the end of the unit the student will be able to

- Illustrate difference between procedural and declarative knowledge(L2)
- Explain the issues in knowledge representation (L2)
- Explain propositional logic and first order predicate(L2)
- Describe representation using rules.(L6)

UNIT-III

Reasoning under Uncertainty: Introduction to Non-Monotonic Reasoning, Truth Maintenance Systems, Statistical Reasoning: Bayes Theorem, Certainty Factors & Rule-Based Systems, Bayesian Probabilistic Inference, Bayesian Networks, Dempster-Shafer Theory, Fuzzy Logic & Fuzzy Systems. (10)

Learning Outcomes:

By the end of the unit the student will be able to

- Explain the non-monotonic reasoning(L2)
- Illustrate statistical reasoning(L2)
- Illustrate Bayesian networks and fuzzy logic.(L2)

UNIT-IV

Experts Systems: Overview of an Expert System, Structure of an Expert Systems, Different Types of Expert Systems- Rule Based, Model Based, Case Based and Hybrid Expert Systems, Knowledge Acquisition and Validation Techniques, Black Board Architecture, Knowledge Building System Tools, Expert System Shells. (10)

Learning Outcomes:

By the end of the unit the student will be able to

- Understand the expert systems (L2)
- Illustrate knowledge validation and acquisitions (L2)
- Explain various system building tools(L2)

UNIT-V

Natural Language Processing: Role of Knowledge in Language Understanding, Approaches Natural Language Understanding, Steps in The Natural Language Processing, Syntactic Processing and Augmented Transition Nets, Semantic Analysis (8)

Learning Outcomes: By the end of the unit the student will be able to Explain natural language processing, Illustrate the various steps in NLP, Apply the syntactic and semantic analysis

Learning Outcomes:

By the end of the unit the student will be able to

- Understand language and natural language processing (L2)
- Identify semantic analysis (L2)
- Illustrate various steps in NLP(L2)
- Apply syntactic and semantic analysis (L3)

Text Book:

1. Artificial Intelligence by Elaine Rich, McGraw-Hill Publications,3rd edition,2017

References:

1. Artificial Intelligence : A Modern Approach by Stuart Russell, Peter Norwig Pearson Education Publications, 3rdedition , 2018.
2. Artificial Intelligence by George F Luger, Pearson Education Publications, 5th edition, 2008.

Course Outcomes:

After completing the course student will be able to:

- Learn introductory concepts of AI,AI problems and Techniques (L1)
- Understand different search techniques(L3)
- Illustrate difference between procedural and declarative knowledge(L2)
- Explain the issues in knowledge representation(L2)
- Apply syntactic and semantic analysis (L3)

III SEMESTER
20SCA 843: CLOUD COMPUTING

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Preamble: Cloud computing is a model for enabling ubiquitous, convenient, on-demand access to a shared pool of configurable computing resources. Cloud computing enables increasing number of IT services to be delivered over the Internet. The cloud platform enables business to run successfully without dedicated hardware, software and services. This course will make the student learn the concepts of cloud computing and will understand how to run applications on cloud.

Course Objectives:

- To learn the concept of cloud computing (L1)
- To understand the concepts of virtualization(L2)
- To know the different services provided by cloud (L1)
- To analyze the cloud computing architecture (L4)
- To demonstrate on different types of clouds i.e., AWS and Google(L3)

UNIT – I

Introduction: Cloud Computing at a Glance, The Vision of Cloud Computing, defining a Cloud, A Closer Look, Cloud Computing Reference Model, Characteristics and Benefits, Challenges Ahead, Historical Developments, Distributed Systems, Virtualization, Web 2.0, Service-Oriented Computing, Utility-Oriented Computing, Building Cloud Computing Environments, Application Development, Infrastructure and System Development, Computing Platforms a Technologies, Amazon Web Services (AWS), Google App Engine, Microsoft Azure, Hadoop, Force.com and Salesforce.com, Manjra soft Aneka. (8)

Learning Outcomes:

By the end of this unit, the student will be able to

- Learn the introductory concepts of cloud (L1)
- Analyze the characteristics and benefits of cloud(L4)
- Differentiate service oriented computing and utility oriented computing (L4)
- Understand cloud computing environment (L2)
- Know the different cloud providers i.e., AWS, Google App Engine, MS Azure etc., (L2)

UNIT - II

Virtualization: Introduction, Characteristics of Virtualized Environments, Taxonomy of Virtualization Techniques, Execution Virtualization, Other Types of Virtualization, Virtualization and Cloud Computing, Pros and Cons of Virtualization, Technology Examples, Xen: Paravirtualization, VMware: Full Virtualization, Microsoft Hyper-V. (8)

Learning Outcomes:

By the end of this unit, the student will be able to

- Know the characteristics of virtualized environment (L1)
- Understand virtualization techniques(L2)
- Analyze the Pros and Cons of virtualization (L4)
- Learn different types of virtualization techniques(L1)

- Illustrate VMware (L2)

UNIT – III

Cloud Computing Architecture: Introduction Cloud Reference Model, Architecture Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Dentition, Cloud Interoperability and Standards, lability and Fault Tolerance, Security, Trust, and Privacy, Organizational Aspects. (8)

Learning Outcomes:

By the end of this unit, the student will be able to

- Learn cloud reference model(L1)
- Understand Architecture (L2)
- Analyze different services(L4)
- List different types of clouds (L1)
- Know the security and privacy issues(L1)

UNIT - IV

Discovering the AWS Development Environment: Starting Your AWS Adventure, Defining the AWS Cloud, Discovering IaaS, Determining Why You Should Use AWS, Considering the AWS-Supported Platforms. Obtaining Development Access to Amazon Web Services: Discovering the Limits of Free Services, Considering the Hardware Requirements, Getting Signed Up, Testing Your Setup, Choosing the Right Services, Getting a Quick Overview of Free-Tier Services, Matching AWS Services to Your Application, Considering AWS Security Issues. (10)

Learning Outcomes:

By the end of this unit, the student will be able to

- Learn introduction to AWS cloud(L1)
- Understand how it provides IaaS\ (L2)
- Develop its services (L6)
- Know the supported platforms (L1)
- Analyze Security issues (L4)

UNIT - V

Starting the Development Process: Considering AWS Communication Strategies, Defining the Major Communication Standards, Understanding How REST Works, Creating a Development Environment, Choosing a Platform, Obtaining and Installing Python, Working with the Identity and Access Management Console, Installing the Command Line Interface Software, Configuring Using CLI, Configuring Using Node.js, Configuring Using a Desktop Application, Creating a Virtual Server Using EC2, Getting to Know the Elastic Compute Cloud (EC2), Working with Elastic Block Store (EBS) Volumes, Discovering Images and Instances.

Performing Basic Development Tasks : Understanding AWS Input/Output, Considering the Input /Output Options, Working with JSON, Working with XML, Working with Amazon API Gateway, Developing Web Apps Using Elastic Beanstalk, Considering Elastic Beanstalk (EB) Features, Deploying an EB Application, Updating an EB Application, Removing Unneeded Applications, Monitoring Your Application Using Amazon CloudWatch. (12)

Learning Outcomes:
By the end of this unit, the student will be able to

- Understands how REST works (L2)
- Develops environment by choosing the platform(L6)
- Configures using CLI, using Node.js and using Desktop application (L6)
- Know Elastic Cloud Computing Practices working with JSON, XML and Amazon API (L1)

Text Books:

1. Mastering Cloud Computing by Rajkumar Buyya, Christian Vecchiola, S ThamaraiSelvi, Tata McGraw Hill Education Private Limited, 2013.
2. AWS for Developers- Dummies by John Paul Mueller, John Wiley & Sons Inc.publications, 2017.

Reference Books:

1. Cloud Computing Concepts Technology Architecture by Thomas Erl, Pearson Education, 2014.
2. Cloud Computing Explained by John Rhoton , Recursive Press, 2009.

Course Outcomes:

After completing the course student will be able to:

- What is the introductory concepts of cloud computing(L1)
- Understands the services provided by the cloud(L2)
- Analyze Service oriented computing and Utility computing (L4)
- Demonstrate different virtualization techniques (L2)
- Learn how to obtain access to AWS(L1)
- Demonstrate how to work with JSON, XML and Amazon API (L2)

III SEMESTER

20SCA 845: NETWORK SECURITY

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Preamble: This course deals with concepts, measures and algorithms for the protection of information infrastructure and preservation of the confidentiality, integrity and availability of information against cyber threats and different types of malware

Course Objectives:

- To learn Security attacks, services and mechanisms(L1)
- To understand symmetric key encryption algorithms(L2)
- To analyse public key encryption and hash algorithms(L4)
- To discuss various security protocols (L6)
- To analyse various malicious software(L4)

UNIT- I

Introduction: Computer Security Concepts, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Standards. Symmetric Encryption and Message Confidentiality: Symmetric Encryption Principles, Symmetric Block Encryption Algorithms, DES, AES, Stream. (10)

Learning Outcomes:

By the end of the unit the student will be able to

- Explain the OSI architecture(L2)
- Identify he model for network security(L3)
- Make use of Build various encryption algorithms(L6)

UNIT – II

Public-Key Cryptography and Message Authentication: Approaches to Message Authentication, Secure Hash Functions, Message Authentication Codes, Public Key Cryptography Principle, PublicKey Cryptography Algorithms, RSA, Diffie Hellman key Exchange, Digital Signatures. Key Distribution and User Authentication: Symmetric Key Distribution Using Symmetric Encryption, Kerberos, Key Distribution Using Asymmetric Encryption. (10)

Learning Outcomes:

By the end of the unit the student will be able to

- Analyze the authentication codes(L4)
- Understands various public key and cryptography algorithms(L2)
- Solve the various problems in algorithms(L3)

UNIT - III

Transport-Level Security: Web Security Issues, Secure Sockets Layer (SSL), Transport Layer Security (TLS), HTTPS, Secure Shell (SSH).

Wireless Network Security: Wireless Security, Mobile Device Security, IEEE 802.11 Wireless LAN Overview, IEEE 802.11i Wireless LAN Security. (10)

Learning Outcomes:

By the end of the unit the student will be able to

- Explain the various web security issues(L2)

- Understand various security protocols and mobile security issues.(L2)

UNIT –IV

Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME.IP Security: IP Security Overview, IP Security Policy, Encapsulating Security Payload, Combining Security Associations, Internet Key Exchange and Cryptographic Suites.

Learning Outcomes:

By the end of the unit the student will be able to

- Explain the security policies(L2)
- Understand various security associations and suites.(L2)

UNIT - V

Malicious Software: Types of Malicious Software, Propagation, Infected Content, Viruses Propagation, Vulnerability Exploit, Worms, Propagation, Social Engineering, SPAM, Trojans, Payload – System Corruption, Payload, Attack Agent, Zombie, Bots, Payload, Information Theft, Keyloggers, Phishing, Spyware, Payload, Stealthing, Backdoors, Rootkits Distributed Denial of Service Attacks. (10)

Learning Outcomes:

By the end of the unit the student will be able to

- Explain malicious software (L2)
- Illustrate how spam and other attacks work.(L2)

Text Books:

1. Network Security Essentials, Applications and Standards, 5th edition, William Stallings, Pearson Education, 2013.

Reference Books:

1. Cryptography & Network Security, Behrouz A. Forouzan, Tata McGraw-Hill, New Delhi, 2007.
2. Network Security: Private Communication in a Public World, Kaufman, Pearson Education Asia,New Delhi, 2002.
3. Cryptography and Network Security: AtulKahate, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003.

Course Outcomes:

After completing the course student will be able to:

- Learn Security attacks, services and mechanisms(L1)
- Understand symmetric key encryption algorithms(L2)
- Analyze public key encryption and hash algorithms(L4)
- Discuss various security protocols (L2)
- Analyze various malicious software(L4)

III SEMESTER

20SSE 801: DIGITAL MARKETING

Hours per week: 4 Examination: 100 Marks

Credits: 3

Preamble: The course is introduced to enable the students to understand the components of digital marketing, different channels for digital marketing, serch engine marketing.

Course Objectives:.

- To understand the digital marketing(L2)
- To analyse various channels of digital marketing(L4)
- To assess different digital marketing plans(L5)
- To categorize social networking(L4)

Understanding Digital Marketing: Components of Digital Marketing, Need and Scope of Digital Marketing, Benefits of Digital Marketing, Digital Marketing Platforms and Strategies, Comparison of Marketing and Digital Marketing, Digital Marketing Trends.

Channels of Digital Marketing: Digital Marketing, Website Marketing, Search Engine Marketing, Online Advertising, Email Marketing, Blog Marketing, Social Media Marketing, Audio, Video and Interactive Marketing, Online Public Relations, Mobile Marketing, Migrating from Traditional Channels to Digital Channels.

Marketing in the Digital Era: Segmentation – Importance of Audience Segmentation, How different segments use Digital Media – Organizational Characteristics, Purchasing Characteristics, Using Digital Media to Reach, Acquisition and Retention of new customers, Digital Media for Customer Loyalty.

Digital Marketing Plan: Need of a Digital Marketing Plan, Elements of a Digital Marketing Plan – Marketing Plan, Executive Summary, Mission, Situational Analysis, Opportunities and Issues, Goals and Objectives, Marketing Strategy, Action Plan, Budget, Writing the Marketing Plan and Implementing the Plan. .

Search Engine Marketing and Online Advertising: Importance of SEM, understanding Web Search – keywords, HTML tags, Inbound Links, Online Advertising vs. Traditional Advertising, Payment Methods of Online Advertising – CPM (Cost-per-Thousand) and CPC (Cost-per-click), Display Ads - choosing a Display Ad Format, Landing Page and its importance.

Social Media Marketing: Understanding Social Media, Social Networking with Facebook, LinkedIn, Blogging as a social medium, Microblogging with Twitter, Social Sharing with YouTube, Social Media for Customer Reach, Acquisition and Retention. Measurement of Digital Media: Analyzing Digital Media Performance, Analyzing Website Performance, Analyzing Advertising Performance.

Text Books:

1. B2B Digital Marketing by Michael Miller, 1e, Pearson, 2014.
2. Digital marketing by Vandana Ahuja,Oxford University Press 2015
3. Social Media Marketing by Michael R Solomon, Tracy Tuten, Pearson, 1e, 2015.
4. E-Marketing by Judy Strauss & Raymond Frost, Pearson, 2016
5. Online marketing – A customer led approach by Richard Gay, Alan Charles worth, Rita Esen,

Course Outcomes:

After completing the course student will be able to:

- Understand the applications of digital marketing in the globalized market (L2)

- Identify Channels of Digital Marketing(L2)
- Know about digital marketing plan (L1)
- Learn Search engine marketing (L1)
- Infer Online Advertising(L2)

III SEMESTER

20SSE 803: MANAGEMENT INFORMATION SYSTEMS

Hours per week: 4 Examination: 100 Marks

Credits: 3

Preamble: Information Systems have become pervasive: Social Media, Mobility Analytics and Cloud have transformed organization and society. MIS helps the students at all levels to learn how to use and manage information technologies to revitalize business processes, improve business decision making and gain competitive advantage

Course Objective:

- To provide systematic knowledge of the Management Information Systems (L3)
- To understand on how to use and manage information system in order to revitalize business processes, improve business decision making, and gain competitive advantage. (L2)

Management Information System in Digital form: Definition, Role, impact, MIS and User, Management as a Control System, Management Effectiveness and MIS, Organization as a system.

E-Business Enterprise: Introduction, E-business, E-Commerce, E- Communicaiton, E- Collaboration, Real Time Enterprise.

Strategic Management of Business Performance: Essentiality of Strategic Planning, Tools of Planning, Strategic Management, Three approaches to development of Strategy, Classes and Types of Strategy.

Decision Making: Decision Making Concepts, Process, Decision Analysis by Analytical Modeling, Behavioural Concepts in Decision Making, Organizational Decision Making, MIS and Decision Making .

Development Process of MIS: Development of Long Range Plans of the MIS, Determining the Information Requirement, Development and Implementation of the MIS, Management of Information Quality in the MIS, Organization for Development of MIS, Development Process Model.

Management of Global Enterprise: Enterprise Management System, Enterprise Resource Planning System, ERP Model and Modules, Benefits of the ERP, ERP product Evaluation, ERP Implementation, Supply Chain Management , Information Management in SCM, Customer Relationship Management, EMS and MIS.

Text Books:

1. Management Information Systems: A Global Digital Enterprise Perspective, Waman S Jawadekar, Fifth Edition, TMH,2017.

2. Management Information System- Kenneth C. Laudon, Jane P Laudon, Pearson, 14th Edition, 2016.

3. Information Systems for Modern Management, Murdick, Robert G, PHI, 3rd Edition.

Course Outcomes:

After completing the course student will be able to:

- Define the key terms, use and function of information systems. (L1)
- Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making. (L2)
- Analyze how information technology impacts a firm. (L4)
- Interpret how to use information technology to solve business problems and in Decision Making. (L5)

III SEMESTER

20SCA 821: OBJECT ORIENTED PROGRAMMING WITH JAVA LAB

Hours per week: 3 Examination: 100 Marks

Credits: 2

Objective: The aim of this lab is to make the students learn the basic concepts of Java programming. This course covers preliminaries and makes the students learn how to program in java using Basic Concepts, Inheritance, Interfaces, Packages, Threads, I/Os, Applets, Swings, Event Handling, Collections and allow the students to implement effectively.

1. To find the average and sum of the N numbers Using Command line argument.
2. To Demonstrate Type Casting.
3. To find the number of arguments to provide at runtime.
4. To Test the Prime number.
5. To calculate the Simple Interest and Input by the user.
6. To create a simple class to find out the Area and Perimeter of rectangle and box using super and this keyword.
7. To design a class account using the inheritance and static that show all function of bank (withdrawal,deposite).
8. To design a class using abstract methods and classes.
9. To create a package that access the member of external class as well as same package.
10. Import the user define package and access the Member variable of classes that contained by Package.
11. To show the partial implementation of Interface.
12. To create a thread that implement the Runnable interface.
13. To create a file and write data into it using the methods OutputStream class
14. To accept specified number of characters as input and converts them into uppercase characters
15. To illustrate creation of threads using runnable class.(start method start each of the newly created thread. Inside the run method there is sleep() for suspend the thread for 500 milliseconds).
16. To create a class MyThread in this class a constructor, call the base class constructor, using super and starts the thread. The run method of the class starts after this. It can be observed that both main thread and created child thread are executed concurrently
17. To get the reference to the current thread by calling currentThread() method
18. Write a program for example of try and catch block. In this check whether the given array size is negative or not.
19. Write a program for example of multiple catch statements occurring in a program.
20. Write a program to describe usage of throws clause.
21. To create a new array list, add some colors (string) and print out the collection
22. To iterate through all elements in a linked list
23. To append the specified element to the end of a hash set.
24. To demonstrate Banner Applet.
25. To demonstrate different control on applets.
26. To demonstrate the Mouse Event Handlers.

27. To create an AWT based application
28. Implement the flow layout And Border Layout.
29. Implement the GridLayout,CardLayout
30. Handle an event in a Swing program
31. Perform a simple Swing-based applet
32. Demonstrate an icon-based JButton

Text Books:

1. Java The complete reference by Herbert Schildt, McGraw Hill Education Pvt. Ltd, 9th edition.
2. Understanding Object-Oriented Programming with Java by T. Budd, Pearson Education.

Course Outcomes:

After completing the course student will be able to:

- Write programs for solving real world problems using java collection frame work.(L3)
- Write the practice programs using abstract classes.(L3)
- Construct the experiment on multithreaded programs.(L3)
- Demonstrate GUI programs using swing controls in Java.(L2)
- Demonstrate on files.(L2)

III SEMESTER

20SCA 824: DATA ANALYSIS USING R LAB

Hours per week: 3 Examination: 100 Marks

Credits: 2

Objective: The aim of this course is to have gain knowledge in latest and advanced features of R programming. It explains in detail how to perform various data analysis functions using R Programming.

1. The R Programming Environment: Basic R Language, Basics of R, including syntax, some tidy data principles and processes, and how to read data into R.

2. Data Manipulation: Summarize, filter, merge, and otherwise manipulate data in R, including working through the challenges of dates and times.

3. Text Processing, Regular Expression, & Physical Memory: Using R tools and packages to deal with text and regular expressions. Learn how to manage and get the most from your computer's physical memory when working in R.

Building Data Visualization Tools:

Welcome to Building Data Visualization Tools:

2. Plotting with ggplot2: creating and customizing ggplot2 plots.

3. Mapping and interactive plots:Creating simple and dynamic maps with ggplot2 and ggmap, how to overlay data, and how to create chloropleth maps of US counties.

4. The grid Package: The grid package in R implements the primitive graphical functions that underlay the ggplot2 plotting system.

Course Outcomes:

After completing the course student will be able to:

- Understand the basics of r programming(L3)
- Demonstrate use of basic functions. (L2)
- Conceptualize and create loops to solve different types of problems. (L3)
- Create their own customized functions.(L4)
- Construct data frames and figures for descriptive statistics.(L3)

MCA IV SEMESTER
20SCA 842 : MACHINE LEARNING

Hours per week: 4 Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Preamble : Machine Learning is an application of artificial intelligence (AI) that provides systems the ability to automatically learn and improve from experience without being explicitly programmed. Machine learning focuses on the development of computer programs that can access data and use it learn for themselves which is used in decision-making processes based on data inputs.

Course Objectives:

- To understand the basic theory underlying machine learning concepts(L1)
- To formulate machine learning problems corresponding to different applications(L6)
- To understand a range of machine learning algorithms along with their strengths and weaknesses.(L2)

UNIT - I

Introduction: What is human Learning , Types of Human Learning, Problems not to be solved using machine Learning, Applications of Machine Learning, Tools in Machine Learning, Issues in Machine Learning.

Preparing to Model: Machine Learning Activities, Basis types of Data in Machine Learning, Exploring structured data, Data Quality and Remediation, Data Preprocessing. (10)

Learning Outcomes:

By the end of the unit, the student is able to

- Identify basic data types in Machine learning. (L3)
- Develop methods for exploring structured data (L3)
- Relate data quality and remediation (L1)

UNIT-II

Modelling & Evaluation: Introduction, selecting a model, training a model, Model representation and Interpretability, Evaluating Model performance, Improving model performance.

Feature Engineering: Introduction, Feature Transformation, Subset selection. (8)

Learning Outcomes:

By the end of the unit, the student is able to

- Learn how to select a model. (L1)
- Interpret Model Performance. (L2)
- Select the subset. (L3)

UNIT-III

Introduction, Importance of Bayes Theorem, Bayes theorem and concept learning, Bayesian Belief Network.

Supervised Learning: KNN, Decision Tree, Random forest model, Support vector Machines, Regression. (10)

Learning Outcomes:

By the end of the unit, the student is able to

- Demonstrate the importance of Bayes Theorem.(L2)
- Make use of Bayesian Belief Networks(L3)
- Analyze KNN, Random Forest (L4)

UNIT-IV

Unsupervised Learning: Supervised Vs Unsupervised Learning, Applications of Unsupervised Learning, Clustering, Association Rule.

Basic Neural Networks: Neural Network, Understanding Biological Neuron, Exploring Artificial Neuron, Types of activation function, Early implementation of ANN, Architecture of Neural Networks, Learning process in Artificial Neural Networks, Back Propagation, Deep Learning. (12)

Learning Outcomes:

By the end of the unit, the student is able to

- Compare Supervised Learning and Unsupervised Learning.(L2)
- Construct Artificial Neural Network.(L3)
- Make use of Deep Learning.(L3)

UNIT-V

Other Types of Learning: Introduction, Representation Learning, Active Learning, Instance Based learning, Association Rule Learning, Ensemble Learning Algorithm, Regularization algorithm. (8)

Learning Outcomes:

By the end of the unit, the student is able to

- Outline Learning (L2)
- Develop Instance based Learning (L3)
- Utilize regularization algorithm. (L3)

Text Book:

- Machine Learning by Subramanian, Chandra Mouli, Amit Kumar Das , SaikantDutt, Pearson Publications, I edition, 2018.

Reference Book:

- Machine Learning by Tom Mitchell, McGraw Hill, 2007

Course Outcomes:

After completing the course student will be able to:

- Understand the basic concepts machine learning algorithms (L3)
- Develop the ability to formulate machine learning techniques to respective problems (L3)
- Apply machine learning algorithms to solve problems of moderate complexity (L4)

MCA IV SEMESTER

20SCA 844 : BLOCK CHAIN TECHNOLOGIES

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Preamble: Blockchain is the ingeniously simple technology that powers Bitcoin. It is a public ledger to which everyone has access, but which no single person controls. It allows for companies and individuals to collaborate with an unprecedented degree of trust and transparency. It is cryptographically secure, but fundamentally open.

Course Objectives:

- To introduce the concept of Block chain (L2)
- To demonstrate the cryptographic Hash function and digital signature (L3)
- To narrate Ethereum block chain and decentralized applications (L3)

UNIT – I

Introduction: What is Blockchain (BC), public ledgers, BC as public ledgers; BC history - Bitcoin and Cryptocurrency, BC 2.0, Smart contracts; BC architecture – Blocks in BC, transactions and distributed consensus; BC conceptualization - The Chain and the Longest Chain, Cryptocurrency to Blockchain 2.0, Permissioned Model of Blockchain. (12)

Learning Out Comes:

At the end of the unit, the student is able to

- Understand Bitcoin and Cryptocurrency (L2)
- Demonstrate Permissioned Model of Blockchain. (L3)

UNIT -II

Cryptographic Primitives: Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency. (10)

Learning Out Comes:

At the end of the unit, the student is able to

- Spell Cryptographic Hash Function.(L1)
- Summarize Hash pointer and Merkle tree(L2)
- Interpret Digital Signature. (L3)

UNIT - III

Distributed consensus : Distributed consensus in open environments, Consensus in a Bitcoin network; Bitcoin Consensus - Proof of Work (PoW) – basic introduction, HashcashPoW, Beyond Consensus in Bitcoin - BitcoinPoW, Attacks on PoW and the monopoly problem, Proof of Stake, Proof of Burn and Proof of Elapsed Time; Consensus in Bitcoin (The Miners) - The life of a Bitcoin Miner, Mining Difficulty, Mining Pool. (12)

Learning Out Comes:

At the end of the unit, the student is able to

- Explain Bitcoin Consensus - Proof of Work. (L2)
- Infer Consensus in Bitcoin. (L2)
- Classify the life of a Bitcoin Miner. (L2)

UNIT - IV

Smart contracts - I : Smart contracts, Solidity, REMIX IDE, EthereumBlockchain, Ethereum Virtual Machine.

Smart contracts –II : Decentralized applications (Dapps), Truffle development, Design improvements, Application models and standards. (12)

Learning Out Comes:

At the end of the unit, the student is able to

- Make use of Ethereum Blockchain. (L2)
- Construct Decentralized Applications(L3)

UNIT - V

Use Cases: Blockchain for Voting, Government Use-cases – Public distribution system, Blockchain for Tax Payments, Blockchain for Managing Land Registry Records, Other Block Chain Frame Works: IBM Hyperledge fabric

Research Aspets in Block Chain: Consensus protocols, Identity management, Strong and weak synchronization, avoiding forks, Mining improvements. (10)

Learning Out Comes:

At the end of the unit, the student is able to

- List the use case of block chain for Voting. (L3)
- Evaluate Blockchain for Tax Payments.(L3)

Text Books:

1. Drescher, Daniel. "Blockchain basics",A Non-Technical Introduction in 25 Steps Apress, 2017.
2. Mougayar, William. "The business blockchain: promise, practice, and application of the next Internet technology", John Wiley & Sons, 2016.
3. Dannen, Chris. "Introducing Ethereum and Solidity", Berkeley: Apress, 2017.
4. Prusty, Narayan. "Building Blockchain Projects", Packt Publishing Ltd, 2017.
5. Pilkington, Marc. "Blockchain technology: principles and applications" Research handbook on digital transformations, 2016.
6. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, Steven Goldfeder. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press, 2016.
7. Swan, Melanie, "Blockchain: Blueprint for a new economy", O'Reilly Media, Inc., 2015.
8. Antonopoulos, Andreas M. "Mastering Bitcoin: unlocking digital crypto currencies", O'Reilly Media, Inc., 2014.

Course Outcomes:

After completing the course student will be able to:

- Understand the structure of a block chain and why/when it is better than a simple distributed database Understand Level (L2)
- Analyze the incentive structure in a block chain based system and critically assess its functions, benefits and vulnerabilities Evaluate Level (L5)

- Evaluate the setting where a block chain based structure may be applied, its potential and its limitations Apply Level (L3)
- Attain awareness of the new challenges that exist in monetizing businesses around block chains and smart contracts Analyze Level (L4)
- Describe and apply the differences between the most prominent blockchain structures and permissioned block chain service providers, as well as rising alliances and networks Apply Level (L3)

MCA IV SEMESTER
20SCA 846 : CYBER SECURITY

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Preamble: India needs to develop and propagate global best practices for data security and privacy protection. Cyber attacks on corporate and government infrastructure do take place and likely will continue. Cyber criminals have different motives but they command the resources and steal sensitive information of military and other information.

Course Objectives:

- To introduce the concept of Cyber Crime and information Security (L2)
- To explain how the frauds happen on mobile and wireless devises (L2)
- To explain the tools and methods used in Cyber Crime(L5)
- To identify Legal Perspectives in Cyber Crimes(L2)

UNIT-I

Introduction to cyber-crime: Definition & Origin of the Word, Cyber Crime and Information Security, Who are Cyber Criminals, Classification of cyber Crimes, Cyber Crime – Legal and Indian perspective, Cyber Crime and Indian ITA 2000, Global Perspective on cyber-crimes.

Cyber offences: Introduction, How criminals plan the attacks, Social engineering, Cyber talking, Cyber Café and Cyber Crimes.

Botnets: The fuel for Cyber Crimes, Attack Vector, Cloud Computing. (10)

Learning Outcomes:

By the end of the unit, the student is able to

- Spell who are Cyber Criminals (L2)
- Relate Cyber Talking, Cyber-crimes (L2)
- Choose Cloud Computing (L3)

UNIT-II

Cybercrime-Mobile and Wireless Devices: Proliferation of mobile and wireless devices, Trends in mobility, Credit card Frauds in Mobile and Wireless computing Era, Security Challenges posted by Mobile Devices, Registry settings for mobile devices, Authentication Service Security, Attacks on mobile/cell phones

Mobile Devices: Security Implications for Organizations, Devices – Related Security Issues, Organizational Security Policies & Measures in mobile computing era, Laptops. (10)

Learning Outcomes:

By the end of the unit, the student is able to

- Identify Credit card Frauds in Mobile and Wireless computing Era.(L3)
- Demonstrate Attacks on mobile phones(L2)
- Make use of Security Policies.(L3)

UNIT-III

Tools and Methods used in Cyber Crime: Proxy servers and Anonymigers, Phishing, Password Cracking, Key Loggers, and Spywares, Virus and Worms, Trojan Horses & Backdoors Steganography, DOS & DDOS Attacks, SQL Injection, Buffer Overflow, Attacks on wireless networks. (12)

Learning Outcomes:

By the end of the unit, the student is able to

- Demonstrate, Password Cracking, Key Loggers, and Spywares. (L3)

- Compare Virus and Worms (L4)
- Interpret DOS & DDOS Attacks, SQL Injection. (L2)

UNIT-IV

Cyber Crimes and Cyber Security Legal Perspectives: Cybercrime and Legal Landscape around the World, Cyber Laws Indian Context, Indian IT Act challenges to Indian Law & Cyber Crime Scenario in India Consequences of Not Addressing the Weakness in IT Act, Digital Signature & Indian IT Act, Cyber Crime & Punishment. (12)

Learning Outcomes:

By the end of the unit, the student is able to

- Name Cyber Laws Indian Context.(L1)
- Summarize Digital Signature & Indian IT Act.(L2)
- Analyze Cyber Crime and Punishment. (L4)

UNIT-V

Understanding Cyber Forensics: Historical Background, Digital Forensics Science, Need For Computer Forensics, Cyber Forensics & Digital Evidence, Forensic Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Computer Forensics & Steganography, Relevance of OSI 7 Layer Model to Computer Forensics, Forensics & Social Networking Sites, Challenges in Computer Forensics, Special Tools & Techniques, Forensics Auditing, Anti Forensics. (12)

Learning Outcomes:

By the end of the unit, the student is able to

- Identify the need for Cyber Forensics. (L2)
- Develop Forensics Life Cycle.(L3)
- Discover relevance of OSI 7 Layer Model to Computer Forensics.(L3)

Text Book:

- Understanding Cyber Crimes, Computer Forensics & Legal Perspective by Sunit Belapure, Nina Godbole ,Wiely India , 2011

Reference Book:

- Cyber Security Essentials by Charles J.Brooks, Christopher Grow, Philip Craig , MC Grawhill, 2018

Course Outcomes:

After completing the course student will be able to:

- Understand key terms and concepts in cyber law, cyber crimes, trademarks and domain theft.(L2)
- Determine computer technologies, digital evidence collection, and evidentiary reporting in forensic acquisition. (L3)
- Summarize Digital Signature & Indian IT Act (L3)

MCA IV SEMESTER
20SCA 848: BIG DATA AND ANALYTICS

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Preamble: Big data is a term used for massive mounds of structured, semi-structured and unstructured data that has the potential to be mined for information. Organizations worldwide have realized the value of the immense volume of data available, and are trying their best to manage, analyse, and unleash the power of data to build strategies and develop a competitive edge. At the same time, the advent of the technology has led to the evolution of a variety of new and enhanced job roles.

Course Objectives:

- To explain the definition of Bigdata.(L2)
- To show the Hodoop Ecosystem (L1)
- To make use of HDFS(L3)
- To infer Cassandra, Hive, Pig on Hadoop(L3)

UNIT-I

Classification of digital data, Characteristics of Data, Evolution of Big Data, Definition of Big Data, Challenges of big data, Definition of big data, other characteristics of big data, Business Intelligence Vs Big Data, Warehouse environment and Hadoop Environment, Classification of Analytics, Challenges facing big data, Importance of big data Analytics, Data Science, Terminology used in Big data environment, Tools for Analytics. (10)

Learning outcomes:

By the end of the unit, the student is able to

- Define Big data(L1)
- Understand characteristics of data and Big data(L2)
- Compare Business intelligence and Big data(L2)
- Assess ware house environment and Hadoop environment(L5)

UNIT-II

NoSQL: Types of No SQL data bases, Advantages, Use of NoSQL, vendors of NoSQL, SQL Vs NoSQL, Comparisons of SQL, NoSQL& New SQL

Hadoop: Features, Advantages, Overview of Hadoop Ecosystem, Hadoop distribution, HadoopVs SQL, Integrated Hadoop Systems, Cloud based Hadoop Systems. (10)

Learning outcomes:

By the end of the unit, the student is able to

- Learn types of NO SQL databases
- Analyze SQL vs NOSQL
- Understand Hadoop ecosystem
- Compare Hadoop and SQL

UNIT – III

Introduction to Hadoop: History, Overview, RDBMS Vs Hadoop, Distributed Computing Challenges, Use Case of Hadoop, Hadoop Distributors, HDFS, Processing Data with Hadoop, Managing resources and Applications with Hadoop YARN, Interacting with Hadoop Eco System. (10)

Learning outcomes:

By the end of the unit, the student is able to

- Explain distributed computing challenges (L1)
- Understand HDFS (L2)
- Apply Hadoop for applications (L3)

- Learn YARN (L4)

UNIT – IV

Introduction to Mongo DB: What is Mongo DB, Why Mongo DB, Terms Used, Data Types in Mongo DB, Mongo DB Query Language.

Introduction to Cassandra: Apache Cassandra, Features of Cassandra CQL Data types, CQLSH, Key Spaces, CRUD, Collections, Using a counter, Time to Live, Alter Commands, Import- Export, Querying System Tables. (10)

Learning outcomes:

By the end of the unit, the student is able to

- Understand MongoDB(L2)
- Develop database using MongoDB (L4)
- Apply MongoDB query language (L3)
- Learn Apache Cassandra(L1)
- Make use of alter commands, import, export and querying(L3)

UNIT – V

Introduction to HIVE: History, Features, Workflows, Data Units, Architecture, Data types, File Format, HQL, RC File implementation, User defined function.

Introduction to Pig: Anatomy, Pig on Hadoop, Use case of Pig, Pig Latin Overview, Data types, Running Pig, Execution modes in Pig, HDFS Commands, Relational Operators, Eval Function, Complex Data Types. (10)

Learning outcomes:

By the end of the unit, the student is able to

- Learn the tools of Hadoop i.e., Hive and Pig (L1)
- Understand the concepts of files and functions in Hive(L2)
- Analyze Hive and Pig(L4)
- Apply HDFS commands, relational operators and Eval function(L3)

Text Book:

1. Big data and Analytics by SemaAcharya ,SubhashiniChellappan , Wiely Publications, 2019.

Course Outcomes:

After completing the course student will be able to:

- Define Big data (L1)
- Understand NoSQL (L2)
- Compare SQL and NoSQL (L3)
- Summarize the concept in MongoDB (L2)
- Elaborate on Hive and Pig (L6)

MCA IV SEMESTER
20SCA 850 : PYTHON PROGRAMMING

Hours per week: 4 End Examination: 60 Marks
Credits: 4 Sessionals: 40 Marks

Preamble: This course focuses on developing the python programming to do a variety of programming tasks where the students are encouraged to develop applications. At the end of the course the student will be developing adequate skills in programming and will be known to understand the implementation of various applications using python.

Course Objectives

- To explain the elementary programming constructs and file operations and use it in Python programming.
- To describe the concepts like strings, conversion of strings to numbers, lists, tuples, dictionaries and use these in python programming.
- To illustrate the functions, recursive functions and object oriented programming concepts in Python.

UNIT – I

Python Basics: Introduction, Data Types in Python, Mutable versus Immutable, Type Casting (also called Type Conversion) in Python, Input to a Python Program. Operators in Python: Introduction Assignment (and reassignment), Overview of Operators

Functions: Introduction, Need of Functions, Basics of Functions, defining your own functions and function syntax, Passing variables in Function Call, Function Arguments, some special functions

Flow control: Introduction, using "if", while loop, for loop, range function, Common Errors in Flow Control. (12)

Learning Outcomes:

By the end of the unit, the student is able to

- Learn basics of Python (L1)
- Understand functions (L2)
- Experiment with different flow controls(L3)

UNIT – II

Strings: Introduction, Creating, Initializing and Accessing Elements of a string, Traversing a String, String Operations, Difference between Functions, Methods and Attributes, String Functions versus String Methods, A Short Note on String Module.

Lists: Introduction, Some basic concepts of Lists, Creating, Traversing, and Slicing Lists, List Functions and Methods, Nested Lists and Using them as matrix. (12)

Learning Outcomes:

By the end of the unit, the student is able to

- Understand String operations(L2)
- Compare string functions and methods(L2)
- Summarize the concept of lists, list functions and nested lists (L2)

UNIT – III

Directories: Introduction, Basics of Dictonary-1, Basic concepts-2, Dictionary Functions and Methods, Dictionary Methods,

Tuples: Introduction, Some basic concepts regarding Tuples, some Additional Topics,

Regular Expression: Introduction, basic concepts of Expressions, Special Characters, Groups of Characters and Anchors, Understanding Re Module, Some Important methods of the Re Module. (12)

Learning Outcomes:

By the end of the unit, the student is able to

- Know the basics of Dictionary (L1)
- Make use of dictionary functions and methods (L3)
- Analyze tuples (L3)
- Understand regular expressions (L2)

UNIT - IV

Object-Oriented Programming with Python: Introduction, basic concepts of Object-Oriented Programming, OOP concepts related specifically to Python, some common "Built in" Attributes and Methods of a Python Modules and classes.

Inheritance and Namespace: Introduction, Basics of Inheritance of Python, Single Inheritance, Multiple Inheritance, Concept of Namespace. (12)

Learning Outcomes:

By the end of the unit, the student is able to

- Define Object oriented programming(L1)
- Relate OOP to Python(L2)
- Utilize python modules and classes (L3)

UNIT-V

File Operations in Python: Introduction, basics of file Operations in Python, Reading and Writing a File, Some more Advanced concepts in File Operations, some useful Methods of the OS Module, Writing small scripts for Inserting Data in a File.

Python Exceptions: Introduction, basic concepts of Exceptions in Python, User-defined Exceptions, Built-in Exceptions. (10)

Learning Outcomes:

By the end of the unit, the student is able to

- Determine file operations and methods (L5)
- Elaborate on exceptions in Python (L6)

Text Book:

1. Python Programming by Anurag Gupta , G.P.BIswas, McGraw Hill, 2019.

Course Outcomes:

After completing the course student will be able to:

- Learn basics of Python (L1)
- Understand functions, String operations and lists (L2)
- Compare string functions and methods(L2)
- Summarize the concept of lists, list functions and nested lists (L2)
- Elaborate on exceptions n Python (L6)

MCA IV SEMESTER

20SCA 852 : ADVANCED JAVA PROGRAMMING

Hours per week: 4 End Examination: 60 Marks

Credits: 4 Sessionals: 40 Marks

Preamble: This course highlights on the advanced java programming, the concepts of connectivity with database, Java applets and applications. The main aim of this course is to provide scalable modular application assembly and portable deployment of J2EE applications into any J2EE product through JSP and Servlets.

Course outcomes:

- To understand the importance of various advanced java features like jdbc, XML, java servlets, jsp.
- To acquainting the student with Hibernate 4.0
- To make the students to develop a web application•

UNIT- I

JDBC Programming: The JDBC Connectivity Model, Database Programming: Connecting to the Database, Creating a SQL Query, Getting the Results, Updating Database Data, Error Checking and the SQL Exception Class, The SQL Warning Class, The Statement Interface, Prepared Statement, Callable Statement The Result Set Interface, Updatable Result Sets, JDBC Types, Executing SQL Queries, Result Set Meta Data, Executing SQL Updates, Transaction Management. (10)

Learning Outcomes:

By the end of the unit, the student is able to

- Definition of JDBC, ODBC, components and architecture
- List major classes and Interfaces
- Demonstrate the communication with databases
- Working with Prepared Statements and Callable statements
- Create a simple application

UNIT – II

Servlet API and Overview: Servlet Model: Overview of Servlet, Servlet Life Cycle, HTTP Methods Structure and Deployment descriptor.

Servlet Context and Servlet Config interface, Attributes in Servlet, Request Dispatcher interface

The Filter API: Filter, Filter Chain, Filter Config,

Cookies and Session Management: Understanding state and session, Understanding Session Timeout and Session Tracking, URL Rewriting. (12)

Learning Outcomes:

By the end of the unit, the student is able to

- Define servlet lifecycle, servlet API
- Understanding Request Processing Workflow
- Applying Generic Servlet Class
- Understand Filter, Filter chain and config
- Understands cookies and session management

UNIT - III

Java Server Pages: JSP Overview: The Problem with Servlets, Life Cycle of JSP Page, JSP Processing, JSP Application Design with MVC, Setting Up the JSP.

Environment, JSP Directives, JSP Action, JSP Implicit Objects, JSP Form Processing, JSP Session and Cookies Handling, JSP Session Tracking, JSP Database Access, JSP Standard Tag Libraries, JSP

Custom Tag, JSP Expression Language, JSP Exception Handling, JSP XML Processing. (12)

Learning Outcomes:

By the end of the unit, the student is able to

- Define JSP life cycle(L1)
- Analyze JSP processing (L3)
- Understand JSP custom tag, exception handling, XML processing (L2)

UNIT – IV

Hibernate 4.0: Overview of Hibernate, Hibernate Architecture, Hibernate Mapping, Types, Hibernate O/R Mapping, Hibernate Annotation, Hibernate Query Language. (10)

Learning Outcomes:

By the end of the unit, the student is able to

- Understand Hibernate Architecture(L2)
- Apply hibernate mapping(L3)
- Analyze hibernate query language(L4)

UNIT – V

Java Web Frameworks: Spring MVC: Overview of Spring, Spring Architecture, bean life cycle, XML. Configuration on Spring, Aspect – oriented Spring, Managing Database, Managing Transaction. (10)

Learning Outcomes:

By the end of the unit, the student is able to

- Know the overview of Spring (L1
- Understand Spring Architecture (L2)
- Analyze bean life cycle (L4)
- Discuss managing database (L6)

Text Books:

1. Black Book "Java Server Programming" J2EE, 1st ed., Dream Tech Publishers, 2008.
2. Complete Reference J2EE by James Keogh, McGraw publication, 2017

Reference Books:

1. Professional Java Server Programming by Subrahmanyam Allamaraju, Cedric Buest, 1.3 edition, Apress Publication.
2. Core Java, Volume II: Advanced Features by Cay Horstmann and Gary Cornell, Ninth edition, 2013, Pearson Publication,
3. Java Persistence with Hibernate by Christian Bauer, Gavin King, 2nd edition, 2015, Manning publication
4. Spring in Action Craig walls, 5thedition, 2018, Manning Publication,
5. Hibernate Recipes, Joeseph etingar, Srinivas Guruju, Gray Mak, 2nd edition, 2015 Aprèss publication
6. Java Server Faces in Action, Kito D. Mann, Manning Publication, 2005

Course Outcomes:

After completing the course student will be able to:

- Understand various tools, and Validation techniques (L2)
- Demonstrate the communication with databases (L2)
- Experiment test strategies in real time applications. (L2)
- Analyse concepts related to Web Services, spring and Hibernate (L4).

IV SEMESTER

20SCA 868: Big Data Analytics Lab

Hours per week: 4 Examination: 100 Marks

Credits: 2

1. Exploring Hadoop Distributed File System (HDFS).
2. Implementation of file system commands using Hadoop file system API.
3. Implementation of HDFS file watchers to monitor the events on specific directory path.
4. MapReduce: Running the Word Count Program, calculating the size of each word, no. of alphabets in the entire dataset.
5. Modern file formats like Parquet, ORC, JSON and avro along with compressions like snappy, gz, bzip2, lzo etc. both with Pig and Hive using partitioning, bucketing, map joins, vectorizations in hive.
6. Preparing hive tables with above said file formats using sqoop & Hcatalog from RDBMS like sql-server.
7. Understanding HA and launching jobs on YARN cluster mode.

Learning Outcomes:

Installation of VM player and Hadoop, Important Configuration files in a Hadoop Cluster, file system commands, Importing Hadoop Jars, Data Loading Techniques (L1)

Learn Data Loading Techniques, how to setup single node Hadoop cluster (L3)

Learn the working of mapreduce on data stored in HDFS (L3)

Understand concepts like Input Splits in map reduce, Combiner & Partitioner on mapr educe using different datasets (L2)

Anatomy of File Read and Write & how mapreduce works (L4)

Understand the different classes in Java, Creating a Jar, Executing the program with data set, transferring the results into new File in HDFS (L3)

Learn Hive DDL – Create/Show/Drop Tables, Internal and External Tables.

Learn Hive DML – Load Files & Insert Data. (L3)

Learn the fundamentals of YARN, which runs processes on a cluster. (L3)

Text Books:

1. Big Data Black Book by Dt Editorial Services, Dreamtech Publications,2016.
2. Hadoop The Definitive Guide by Tom White, O'reilly ,4th Edition,2016.
3. Programming Hive- Jason Rutherglen, Dean Wampler, Edward Capriolo, O'reilly Publisher, 1st edition,2012.

Course Outcomes:

After completing the course student will be able to:

- How to setup single node Hadoop cluster(L1)
- Understand concepts like Input Splits in map reduce, Combiner & Partitioneron mapr educe using different datasets
- Learn Hive DML – Load Files & Insert Data. (L3)
- Learn the fundamentals of YARN, which runs processes on a cluster. (L3)

IV SEMESTER

20SCA 870: Python Programming Lab

Hours per week: 4 Examination: 100 Marks

Credits: 2

Objective: This course focuses on developing the python programming to do a variety of programming tasks where the students are encouraged to develop applications. At the end of the course the student will be developing adequate skills in programming and will be known to understand the implementation of various applications using python.

1. Write a python program that displays the sum of all digits for a user entered number.
2. Write a python function leap year that prints all the leap years between ranges.
   The user will enter lower and upper year boundary inside the function.
3. Write a program that outputs all possible strings formed by using the characters a, c, t, o, and g. a particular character can appear only once and all the characters should be used in the formation of string.
4. Write a python script that takes input from file representing a paragraph, and writes to a file named out.txt with all the stop words (a, an, the) removed.
5. Write a recursive function in python to print a Fibonacci series. The Fibonacci sequence is the series of numbers: 0,1,1,2,3,5,8,13,21,34,…etc
6. Write a program for sorting the integer data by using quick sort.
7. Implement the KNN (K Nearest Neighbours) algorithm in python. Your program should have different functions as follows:

   i) Handle Data: Open the dataset from CSV and split into test/train (datasets). A ratio of 67/33 for train/test is a standard ratio used for splitting data.

   ii) Similarity: Calculate the distance between two data instances. The Euclidean distance is used for calculating the difference. It is defined as the square root of the sum of the squared differences between the two arrays of numbers. Only first 4 attributes are used for calculating the distance.

   iii) Neighbours: Locate k most similar data instances.

   iv) Response: Generate a response from a set of data instances. It is a function for getting the majority voted response from a number of neighbours. It devises a predicted response based on those neighbours.

   v) Accuracy: Summarize the accuracy of predictions. An easy way to evaluate the accuracy of the model is to calculate a ratio of the total correct predictions out of all predictions made, called the classification accuracy.

   vi) Main: Take split = 0.67, k=3.
8. Apply the KNN algorithm in Weka tool on the iris dataset. Compare the results of your implemented algorithm with algorithm of Weka tool. 2. Implement the linear Regression. The data will be taken as input from the file. Select the appropriate dataset from the website https://archive.ics.uci.edu/ml/index.php". Justify the reason why the dataset has been selected. b) Apply the Linear regression in Weka tool on the same dataset. Compare the results of your implemented algorithm with algorithm of Weka tool.

- Clustering: Remove the label column of the Parkinson_dataset.csv dataset and implement the following: a) Perform K-Means clustering and Hierarchical clustering. b) Use Manhattan distance c) Use Average merging Strategy in Hierarchical clustering. d) Use three different K values in K-Mean clustering. e) Validate using RMSE and compare both the techniques
- Logistic regression and SVM : Divide the Parkinson_dataset.csv dataset in training and testing dataset randomly and implement the following:
  a. Classify the disease using Logistic regression and SVM
  b. Find out the accuracy of classification Model.

c. Perform 5-fold cross- validation.

d. Compare the result of both techniques using matplotlib

- Sci-kit learn tool Kit :

Implementation of the following algorithms in scikit-learn

a. Principal components analysis (PCA)

b. Decomposing signals in components (matrix CO5 factorization problems)

c. K-means.

Course Outcomes:

After completing the course student will be able to:

- Learn basic programming in Python(L1)
- Understand python script (L2)
- Experiment the concepts of strings, functions and files using python(L3)
- Demonstrates searching and sorting using python(L3)
- Analyze and discuss the discuss data mining concepts integrating with python(L6)

IV SEMESTER

20SCA 872: ADVANCED JAVA Programming Lab

Hours per week: 4 Examination: 100 Marks

Credits: 2

Objective: This course aims in making the student to learn socket programming, advanced concepts of java, Hibernate and Spring frame work. Student will learn and practice the concepts.

Socket Programming(TCP/UPD)

- Create chat application using either TCP or UDP protocol.
- Implement TCP Server for transferring files using Socket and Server Socket
- Implement any one sorting algorithm using TCP/UDP on Server application and Give
- Input On Client side and client should sorted output from server and display sorted on input side.
- Implement Concurrent TCP Server programming in which more than one client can connect and communicate with Server for sending the string and server returns the reverse of string to each of client
- Write RMI application where client supplies two numbers and server response by summing it. Provide your custom security policy for this application.
- Implement Student information system using JDBC and RMI.

JDBC/Servlet

1. Create Servlet file which contains following functions:

i) Connect ii) Create Database iii) Create Table iv) Insert Records into respective table

v) Update records of particular table of database vi) Delete Records from table.

vii) Delete table and also database.

2. User can create a new database and also create new table under that database. Once database has been created then user can perform database operation by calling above functions. Use following Java Statement interface to implement program:

a) Statement b) Prepared statement c) Callable statement

3. Create Servlet file and study web descriptor file.

4. Create login form and perform state management using Cookies, Http Session and URL Rewriting.

5.Implement Authentication filter using filter API.

6. Create database of student subject-wise data and retrieve all data using JSP and generate xml structure along with DTD and XML Schema definition

7. Apply XSLT (Style) to generated xml document and print your result.

Create web service which provides student information.

8. Create Web Service client which consume above service and display student databy entering studentid.

9. Study and implement Hibernate

10. Study and Implement MVC using Spring Framework.

(C) Design based Problems (DP)/Open Ended Problem:

1.Using J2EE JSP/Servlet API develop student's management system required to manage student's academic activity such as student's profile, student's day to day assignment

submission as per instructions and assignment given by teacher . Provide MVC based interface using spring frame work and do the database design using Hibernet framework and also provide two login roles one for teachers providing assignment and notification for class and other for students to submit their assignments and can view notices published by teachers

2. Develop the students blog and online forum where various group of students can do discussion on various academic and non-academic but technical topics discussions group where all of college teachers can provide comments and likes and dislikes. Use Spring base and Hibernet technology for MVC framework and database design respectively.

Course Outcomes:

After completing the course student will be able to:

- Learn the concepts socket programming(L1)
- Apply JDBC connectivity(L3)
- Develop programs using servelets (L3)
- Demonstrate Filter API (L2)
- Summarize Hibernate (L2)
- Adapt Spring Framework (L6)

IV SEMESTER

20SCA 891 : PROJECT

Hours per week: 4 End Examination: 50 Marks

Credits: 8 Sessionals: 150 Marks

1. Specify the broad topic of the project based on the Machine Learning and Data mining.
2. Study minimum 6 quality research papers based on the selected topic.
3. Do the SWOT analysis of selected research papers/reports.
4. Identify the research problem.
5. Propose your novelty/improvement in terms of algorithm/new feature.
6. Design the architecture for the proposed problem.
7. Design the test bed.
8. Design a set of experiments to be carried out for the proposed problem.
9. Perform the experimental analysis (in Python language only).
10. Prepare your report.

Write a short research paper based on your contribution.

1. Understand the Software Development Automation processes and work to develop a project on software development automation. Understanding Level (Level II)
2. Conduct preliminary literature Review, study different automation tools and find vulnerabilities in the studied literature/tools. Understanding Level (Level II)
3. Analyze and identify the various frameworks, APIs , libraries and tools used for project/ software implementation. Analyzing Level (Level III)
4. Design Software Development Automation software using required frameworks, APIs and libraries. Applying Level (Level IV)
5. Evaluate and validate developed project with respect to various software automation frameworks. Evaluating Level (Level V)
6. Prepare technical detailed report detailing the problem statement, proposed methodology, software specification, design, test plan, and implementation details. Creating Level (Level VI)