SCHEME & SYLLABUS
Programme: MCA

Post Graduate (P.G.) Programme as per NEP
National Higher Education Qualifications Framework (NHEQF) Level 6.5

Programme Code: PG001

(Academic Session 2024-25 onwards)

Department of Computer Science and Applications

UICAIS

Sant Baba Bhag Singh University

ABOUT THE DEPARTMENT

The Department of Computer Science and Applications   strives for excellence in creating, applying and imparting knowledge in computer science through comprehensive educational programs, research & dissemination through scholarly publications and service to professional societies, the community, the state and the nation. The department imparts quality education ranging from the expertise in traditional software development to the modern computing technologies.

SALIENT FEATURES OF THE DEPARTMENT

Research oriented curriculum designed to enable students to acquire all the skills needed to collect and analyze the data.

The Institute draws upon its strength of highly qualified well trained faculty, state of art infrastructure and innovative teaching methodology.

Elective courses that bridge the gap between industry requirements and academia.

Hands-on experience in most of the courses of computer applications so as to impart practical knowledge in the relevant field.

To keep the students at par with the emerging technologies prevailing in the market, the institute is furnished with various specialized research labs and software labs.

MCA (MASTER OF COMPUTER APPLICATIONS)

The program is designed to build programming skills for developing efficient and resource optimized software/website/cloud/mobile applications.

VISION

To prepare well groomed & technically proficient computer professionals to meet up with the demands of challenging industry and societal needs

MISSION

- To establish industry-academia interaction to facilitate the students to work proficiently in the industrial environment.
- To empower the youth in rural communities with computer education.
- Adopt the best pedagogical methods and provide the best facility, infrastructure and an ambience conducive to imbibe technical knowledge and practicing ethics.

ELIGIBILITY CRITERIA

Passed BCA/ Bachelor Degree in Computer Science Engineering or equivalent degree or passed B.Sc./ PGDCA/ B.Com./ B.A. with Mathematics at 10+2 level or at graduation level (**with additional bridge courses** as per the norms of the concerned University) obtained at least 55% marks (45% marks in case of candidates belonging to reserved category). If a student is earning 36-40 Credits in two semesters is able to get Post Graduate Diploma.

DURATION

1 Year/ 2 Years

CAREER PATHWAYS

The program is designed to meet the growing requirement of qualified professionals not only in the IT industry but also in other industries. MCA post graduates are hired both by Government and Private firms. They can take-up a career as a Programmer, Software - Tester, Analyst, Engineer, Administrator and more. The growing number of educational institutes also offers a large number of opportunities for computer professionals to work as lecturers.

- **Corporate Jobs**

  Multiple options or sub-pathways designed according to the competency of the students to prepare them for specific sectors/job profiles as per needs of industry.

- **Government Jobs**

Courses to prepare students for Civil services, Public Sector Undertakings and jobs in the Government sector.

- **Higher Studies**

  This pathway prepares students for competitive examinations such as GATE, UGC-NET, CAT, MAT etc. and helps in their progression in higher studies / research.

- **Entrepreneurship**

  To set up new ventures

PROGRAMME EDUCATIONAL OBJECTIVE (PEO)

PEO 1: To progress their career productively in software industry, academia, research, entrepreneurial pursuit, government, consulting firms and other Information Technology enabled services.

PEO 2: To achieve peer-recognition; as an individual or in a team; by adopting ethics and professionalism and communicate effectively to excel well in cross culture and interdisciplinary teams.

PEO 3: To continue a lifelong professional development in computing that contributes in self and societal growth.

PROGRAMME OUTCOMES (PO)

PO1: Computational Knowledge - Apply knowledge of computing, Mathematics, Principles of Accounting, Management and Fundamentals of Software Engineering appropriate to the discipline.

PO2: Problem Analysis – Identify and analyze problems and formulate the requirements appropriate to its solution.

PO3: Design Development of Solutions – Design, implement and evaluate a computer-based system to meet the desired needs.

PO4: Conduct Investigations of Complex Computing Problems – Conduct investigations and experiments to analyze and interpret data of complex applications to find valid solutions.

PO5. Modern Tool Usage – Select and apply current trends, techniques and modern tools that suit the computing requirements like UML diagrams.

PO6. Professional Ethics - Understand professional, ethical, security and social issues, work with appropriate societal and environmental considerations.

PROGRAMME SPECIFIC OUTCOMES (PSO)

PSO1: Solve and work with a professional context pertaining to ethics, social, cultural and cyber regulations.

PSO2: Involve in perennial learning for a continued career development and progress as a computer professional.

PSO3: Function effectively both as a team leader and team member on multi-disciplinary projects to demonstrate computing and management skills.

PSO4: Communicate effectively and present technical information in oral and written reports.

PSO5: Utilize the computing knowledge efficiently in projects with concern for societal, environmental, and cultural aspects.

PSO6: Function competently as an individual and as a leader in multidisciplinary projects.

INTRODUCTION

The CBCS provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. The basic idea is to look into the needs of the students so as to keep up-to-date with development of higher education in India and abroad. CBCS aims to redefine the curriculum keeping pace with the liberalization and globalization in education. CBCS allows students an easy mode of mobility to various educational institutions spread across the world along with the facility of transfer of credits earned by students.

Curriculum Structure:MCA degree programme will have a curriculum with Syllabi consisting of following type of courses:

  A. **Core Courses:** A course, which should be studied compulsorily by a candidate as a necessary requirement is termed as a core course.

- **Major:** Compulsory Course
- **Minor:** Use their minor course to focus or specialized certain area
- **Skill/ Vocational:** Skill Enhancement
- **Interdisciplinary Course :**Introduce for other course

B. **Elective Course:** Generally a course which can be chosen from a pool of courses and which may be very specific or specialized or advanced or supportive to the discipline/ subject of study or which provides an extended scope or which enables an exposure to some other discipline/subject/domain or nurtures the candidate's proficiency/skill is called an Elective Course.

- **Discipline Specific Elective (DSE) Course:** Elective courses may be offered by the main discipline/subject of study referred to as Discipline Specific Elective. The University/Institute may also offer discipline related Elective courses of interdisciplinary nature (to be offered by main discipline/subject of study).
- **Project:** An elective course designed to acquire special/advanced knowledge, such as supplement study/support study to a project work, and a candidate studies such a course on his own with an advisory support by a teacher/faculty member is called project.

C. **Major Specific Elective courses (MSE):** Elective courses offered under the major: Management/ Economics/History/Sociology/Political science/Philosophy/Public administration shall be referred to as major specific electives.

D. **Open Elective Courses (OE):** Open elective courses offered under the related stream/disciplines (Languages/Performing and visual arts) and those under the unrelated streams/disciplines to seek exposure beyond the main discipline of choice shall be referred to as open elective courses.

Course Scheme MCA (1st Semester)

I.   Theory Courses

Sr. No.	Course Types	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major	CSA501	Linux with Shell Programming	4:0:0	4:0:0	4	4
2	Major	CSA503	MATLAB Tools	4:0:0	4:0:0	4	4
3	Minor	CSA507	Mathematical Foundations of Computer Science	3:0:0	3:0:0	3	3
4	VAC	LAW012	Value Added Course (Consumer Protection Act)	2:0:0	2:0:0	2	2
5	OEC-1		Open Elective Course	4:0:0	4:0:0	4	4

II.   Practical Courses

Sr. No.	Course Types	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major	CSA509	Linux with Shell Programming (P)	0:0:4	0:0:2	4	2
2	Major	CSA511	MATLAB Tools (P)	0:0:4	0:0:2	4	2

Total Credits: 21

Total Contact Hours: 25

III. Open Elective Courses-1 (4 Credits)

Sr. No.	Course Types	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	OE-1	CSA513	Cloud Computing Concepts	4:0:0	4:0:0	4	4
2	OE-1	CSA515	Big Data Analysis	4:0:0	4:0:0	4	4
3	OE-1	CSA517	Ruby Programming	4:0:0	4:0:0	4	4
4	OE-1	CSA519	Data Warehouse and Data Mining	4:0:0	4:0:0	4	4

Course Scheme MCA (2nd Semester)

I.   Theory Courses

Sr. No.	Course Types	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major	CSA502	Advanced JAVA	4:0:0	4:0:0	4	4
2	Major	CSA504	Advanced Computer Networks	4:0:0	4:0:0	4	4
3	Minor	CSA506	Theory of Computation	3:0:0	3:0:0	3	3
4	MDC	MDC007	Managing Innovation and Entrepreneurship	3:0:0	3:0:0	3	3
5	OEC-2		Open Elective-2	4:0:0	4:0:0	4	4

II.   Practical Courses

Sr. No.	Course Types	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major	CSA508	Advanced JAVA (P)	0:0:4	0:0:2	4	2
2	Major	CSA510	Advanced Computer Networks(P)	0:0:4	0:0:2	4	2

Total Credits: 22
Total Contact Hours: 26

Note: Six Weeks Industrial/Institutional training to be evaluated in 3rd Semester.

III. Open Elective Subjects-2 (4 Credits)

Sr. No.	Course Types	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	OE-2	CSA512	Mobile Computing and Wireless Networks	4:0:0	4:0:0	4	4
2	OE-2	CSA514	Search Engine Optimization	4:0:0	4:0:0	4	4
3	OE-2	CSA516	Natural Language Processing	4:0:0	4:0:0	4	4
4	OE-2	CSA518	Computer and Information Security	4:0:0	4:0:0	4	4

Course Scheme MCA (3rd Semester)

I. Theory Subjects

Sr. No.	Course Types	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major	CSA601	Research Methodology -I	4:1:0	4:1:0	5	5
2	Minor	CSA603	Research and Publication Ethics	2:0:0	2:0:0	2	2
3	Minor	CSA605	Applications of ICT Tools in Research	2:0:0	2:0:0	2	2
4	Major	CSA619	Indian Knowledge System (Computer Logic for Nyaya Shastra)	3:0:0	3:0:0	3	3
5	EC-1		Elective Courses-1	4:0:0	4:0:0	4	4
6	EC-2		Elective Courses-2	4:0:0	4:0:0	4	4

II. Practical Subjects

Sr. No.	Course Types	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major	CSA607	Dissertation-I (Research Objectives)	0:0:8	0:0:4	8	4
2	Major	CSA609	Professional Skills (Seminar)	0:0:4	0:0:2	4	2
3	IT	CSA520	Six Weeks Industrial/ Institutional Training	NA	NA	NA	2

Total Credits: 28
Total Contact Hours: 32

I.   Elective Courses-1 (4 Credits)

Sr. No.	Course Types	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	EC-1	CSA611	Computational Intelligence	4:0:0	4:0:0	4	4
2	EC-1	CSA613	System Analysis and Design	4:0:0	4:0:0	4	4

II.   Elective Courses-2 (4 Credits)

Sr. No.	Course Types	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	EC	CSA615	E-Commerce and Content Management System	4:0:0	4:0:0	4	4
2	EC	CSA617	Network and Web Security	4:0:0	4:0:0	4	4

Course Scheme MCA (4th Semester)

I.   Theory Subjects

Sr. No.	Course Types	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major	CSA602	Research Methodology -II (IPR)	4:1:0	4:1:0	5	5
2	Major	CSA604	Design & Analysis of Algorithms	4:0:0	4:0:0	4	4
3	Major	CSA606	Information Security & Cyber Law	4:0:0	4:0:0	4	4
4	Minor	CSA608	Professional Skills (Technical Writing)	2:0:0	2:0:0	2	2

I.   Practical Subjects

Sr. No.	Course Types	Course Code	Course Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Major	CSA610	Dissertation-II	0:0:12	0:0:6	12	6
2	Major	CSA612	Professional Skills (Seminar)	0:0:4	0:0:2	4	2

Total Credits: 23
Total Contact Hours: 31

*Dissertation must be completed by 30th May of Every Year.

Summary of Scheme

Semester	L	T	P	Contact Hours Per Week	Credits
1	18	0	4	25	21
2	18	0	4	26	22
3	19	1	6	32	28
4	14	1	8	31	23
Total	**69**	**2**	**22**	**114**	**94**

First Semester

Course Code	CSA501
Course Title	**Linux with Shell Programming**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	NA
Course Objective (CO)	The main objective of this course is to provide knowledge about fundamentals of the Bourne again shell (bash), shell programming, pipes, input and output redirection Control structures, arithmetic in shell interrupt processing, functions, debugging shell scripts.
Course Outcomes (CO)	The students will able to: 1. Understand the technical details of DOS, Windows and UNIX, LINUX operating system. 2. Ability to use various Linux commands that are used to manipulate system operations at admin level and a prerequisite to pursue job as a Network administrator. 3. Ability to develop IPC-API's that can be used to control various processes for synchronization. 4. Know and configure the various internet services

SYLLABUS

UNIT-I:
Introduction: Basic OS functions, resource abstraction, types of operating systems–multiprogramming systems, batch systems, time sharing systems; operating systems for personal computers & workstations, process control & real time systems. **Operating System Organization:** Processor and user modes, kernels, system calls and system programs. **Linux:** The Operating System: Linux Distributions, Difference Between Linux and Windows, Separation of the GUI and the Kernel, Understanding Linux Kernel, Installing Linux in a Server Configuration, Booting and Shutting Down Process, Concept of Root, Basic commands, working with vi Editor, Understanding files and File System.

UNIT-II:
Linux commands: PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text Processing utilities and backup utilities , tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio.

UNIT-III:
Introduction to Shells: Linux Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization. Filters: Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count Characters, Words or Lines, Comparing Files.

UNIT-IV:

DNS: Installing a DNS Server, Configuring a DNS Server, DNS Records Types, Setting Up BIND Database Files, The DNS Toolbox, Configuring DNS Clients. **Web Server:** Understanding the HTTP Protocol, Installing the Apache HTTP Server, Starting Up and Shutting Down Apache, Configuring Apache E-Mail Server: Understanding SMTP, Installing the Postfix Server, Configuring the Postfix Server, Running the Server, POP and IMAP Basics, Installing the UW-IMAP and POP3 Server. **Samba Server:** The Mechanics of SMB, Samba Administration, Using SWAT, Creating a Share, Mounting Remote Samba Shares, Creating Samba Users, Using Samba to Authenticate Against a Windows Server. Introduction to Sockets: Socket, socket connections, socket attributes, socket addresses, socket, connect, bind, listen, accept, socket communications.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Linux Administration: A Beginner's Guide	Wale Soyinka	McGrawHill
2.	UNIX and Linux system administration Handbook	Evi Nemeth, Garth Snyder, et. al	Pearson Education
3.	Linux All-In-One for Dummies,	Emmett Dulaney,	Wiley India

Course Code	CSA503
Course Title	**MATLAB Tools**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	NA
Course Objective(s)	The objective of this course includes learning the main concepts related to MATLAB.
Course Outcome (CO)	The students will be able to: 1. Understand the need for simulation/implementation for the verification of mathematical functions. 2. Understand the main features of the MATLAB/SCILAB program development environment to enable their usage in the higher learning. 3. Implement simple mathematical functions/equations in numerical computing environment such as MATLAB/SCILAB. 4. Interpret and visualize simple mathematical functions and operations thereon using plots/display.

SYLLABUS

UNIT-I: Introduction to Programming: Components of a computer, working with numbers, Machine code, and Software hierarchy. Programming Environment, MATLAB Windows. A First Program, Expressions, Constants, Variables and assignment statement, Arrays.

UNIT-II: Graph Plots: Basic plotting, Built in functions, Generating waveforms, Sound replay, load and save. Procedures and Functions Arguments and return values

UNIT-III: M-files: Formatted console input-output, String handling. (Control Statements) If, Else, Else-if, Repetition statements: While, for loop.

UNIT-IV: Manipulating: Text Writing to a text file, Reading from a text file, Randomizing and sorting a list, searching a list. GUI Interface Attaching buttons to actions, Getting Input, Setting Output

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	MATLAB for engineering	Holly Moore	Pearson
2.	Essential MATLAB for engineers and scientists	Brain Hahn, Danel T. Valentine	Elesvier Science
3.	A Guide to MATLAB: For beginners and experienced users	Brain R. Hunt, Ronald L. Lipsman	Cambridge university press

Course Code	CSA507
Course Title	**Mathematical Foundations of Computer Science**
Type of Course	Minor
L T P	3:0:0
Credits	3
Course Prerequisites	Basic understanding of mathematics
Course Objective (CO)	The students will be better learn the concepts of graph, matrix etc.
Course Outcomes (CO)	The students will able to: 1. Inculcate critical thinking to carry out scientific investigation objectively without being biased with preconceived notions. 2. Equip the student with skills to analyze problems, formulate a hypothesis, evaluate and validate results, and draw reasonable conclusions thereof. 3. Prepare students for pursuing research or careers in industry in mathematical sciences and allied fields. 4. Imbibe effective scientific and/or technical communication in both oral and writing.

SYLLABUS

UNIT I: A general introduction, simple and multi graphs, directed and undirected graphs, Eulerian and Hamiltonian Graphs, Shortest path algorithms, Chromatic number, Bipartite graph, graph coloring.

UNIT II: Sets and Relations: Definition of sets, subsets, complement of a set, universal set, intersection and union of sets, De-Morgan's laws, Cartesian products, Equivalent sets, Countable and uncountable sets, min-set, Partitions of sets, Relations: Basic definitions, graphs of relations, properties of relations

UNIT III: Algebra of logic, Propositions, Connectives, Tautologies and contradiction, Equivalence and implication, Principle of Mathematical induction, quantifiers.

UNIT IV: Introduction of a Matrix, its different kinds, matrix addition and scalar multiplication, multiplication of matrices, transpose etc. Square matrices, inverse and rank of a square matrix. Solving simultaneous equations using Gauss elimination, Gauss Jordan Methods, Matrix Inversion method.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Discrete Mathematical structures for Computer Sciences	Publications. Kolman and Busby	PHI
2.	Discrete Mathematical Structures for Computer Science	B Kolman& R.C	McGraw-Hill

Open Elective Course-1

Course Code	CSA513
Course Title	Cloud Computing Concepts
Type of Course	OE-1
L T P	4:0:0
Credits	4
Course Prerequisites	Computer Networks, Database Management System
Course Objective(s)	The objective of this course is to impart fundamental concepts in the area of cloud computing. To impart knowledge in applications of cloud computing
Course Outcome (CO)	The students will be able to: 1. Understand the concepts, characteristics, delivery models and benefits of cloud computing. 2. Understand the different characteristics of public, private and hybrid cloud deployment models. 3. Understand the key security and compliance challenges of cloud computing. 4. Understand the key technical and organizational challenges.

SYLLABUS

UNIT-I: Overview of Cloud Computing: Introduction, Definition of cloud, Definition of cloud, characteristics Of cloud, Why use clouds, How clouds are changing, Driving factors towards cloud, Comparing grid with cloud and other computing systems, workload pattern for the cloud, "BigData", ITasaservice.

UNIT-II: Cloud computing concepts: Concepts of cloud computing, Cloud computing leverages the Internet, Positioning cloud to a grid infrastructure, Elasticity and scalability, Virtualization, Characteristics of virtualization, Benefits of virtualization, Virtualization in cloud computing, Hypervisors, Multi-tenancy, Types of tenancy. Application programming interfaces (API). **Management:** Desktops in the Cloud , Security, Cloud service delivery: Cloud service, Cloud service model architectures, Infrastructure as a service(IaaS)architecture, Infrastructure as a service(IaaS) details, Platform as a service(PaaS)architecture, Platform As a service (PaaS) details, Platform as a service (PaaS) ,Examples of PaaS software.

UNIT-III: Cloud deployment scenarios: Cloud deployment models, Public clouds, Hybrid clouds, Community, Virtual private clouds, Vertical and special purpose, Migration paths for cloud, Selection criteria for Cloud deployment. **Security in Cloud computing**: Cloud security reference model, security integration, security risks.

UNIT–IV: Cloud Computing platforms: IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform, A comparison of Cloud Computing Platforms, Common building Blocks. Integration of cloud computing with mobile and adhoc network technologies.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Cloud Computing: Principles and paradigms	Raj Kumar Buyya, James Broberg,	Wiley
2.	Cloud Computing: A practical Approach	Anthony T. Velte, Toby J. Velte and Robert Elsenpeter	McGraw Hill
3.	Cloud Computing Bible	Barrie Sosinsky	Wiley

Course Code	CSA515
Course Title	**Big Data Analysis**
Type of Course	OE-1
L T P	4:0:0
Credits	4
Course Prerequisites	Basic knowledge of computer system
Course Objective(s)	This course will provide knowledge about contents of big data.
Course Outcome (CO)	The students will able to: 1. Identify the characteristics of datasets and compare the trivial data and big data for various applications. 2. Select and implement machine learning techniques and computing environment. 3. Solve problems associated with batch learning and online learning, and the big data characteristics. 4. Understand and apply scaling up machine learning techniques and associated computing techniques and technologies.

SYLLABUS

UNIT-I: Hours Grasping the Fundamentals of Big Data: The Evolution of Data Management - Understanding the Waves of Managing Data - Defining Big Data - Building a Successful Big Data Management Architecture - The Big Data Journey. **Examining Big Data Types:** Defining Structured Data, Defining Unstructured Data. Looking at Real-Time and Non-Real-Time Requirements. Putting Big Data Together.

UNIT-II: Digging into Big Data Technology Components: Exploring the Big Data Stack- Layer 0: Redundant Physical Infrastructure- Layer 1: Security Infrastructure- Interfaces and Feeds to and from Applications and the Internet- Layer 2: Operational Databases- Layer 3: Organizing Data Services and Tools -Layer 4: Analytical Data Warehouses -Big Data Analytics -Big Data Applications.

UNIT-III: Hours Virtualization and How It Supports Distributed Computing: Understanding the Basics of Virtualization- Managing Virtualization with the Hypervisor- Abstraction and Virtualization Implementing Virtualization to Work with Big Data.

UNIT–IV: Map Reduce Fundamentals: Tracing the Origins of Map Reduce -Understanding the map Function- Adding the reduce Function -Putting map and reduce Together -Optimizing Map Reduce Tasks. **Exploring the World of Hadoop:** Explaining Hadoop -Understanding the Hadoop Distributed File System (HDFS)-Hadoop Map Reduce.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Big Data for Dummies	Judith Hurwitz, Alan Nugent	John Wiley & sons
2.	Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams	Bill Franks	John Wiley & sons

Course Code	CSA517
Course Title	Ruby Programming
Type of Course	OE-1
L T P	4:0:0
Credits	4
Course Prerequisites	Basic Knowledge of Programming
Course Objective(s)	The objective of this course is to make students familiar with object Oriented Programming Language and Ruby for web Based Applications
Course Outcome (CO)	The students will able to: 1. Explore the Model-view-Controller architecture for server-side applications. 2. Understand the Rails Framework. 3. Harness the speed and ease of developing a Rails application. 4. Create and use XML in Rails applications

SYLLABUS

UNIT-I: Introduction: What is Ruby, Why ruby, General purpose of ruby, Brief History of Ruby, Where does ruby get its ideas, Ruby Installation with RVM, Installations of Software (RVM, Rails , GIT, Mysql, Ruby, Sublime Text Editor), Rvm Commands, Rvm Usage, Creating a basic script in ruby, Sample demo of ruby program.

UNIT-II: Working with Linux(Ubuntu Platform): Basic Linux Commands, file directory permissions , changing access rights, Text Editors used for ROR, Ruby Operators & Ruby Shell, Working with Ruby operators and expressions, Numeric Methods, Rand and Ranges, Strings, Escaping, Interpolation, String methods, Dates and Times, Ruby methods and modules, OOP in Ruby, Basic loops and iterators.

UNIT-III: Rails Installation and Ruby Gems: What is Rails, Full tack Framework, Rails Strength, COC(convention over configuration),Rails Installation, Ruby on Rails installation on linux, Ruby Gems, Working with Ruby Gems, Gem commands Framework Technology MVC Rails Components.

UNIT–IV: Models: What is model, Active record Basics, Destroy a model, Migrations, Modify, update a model, Dropping a database, Association, Validation and callbacks, Why Association, Without and with Association ,Types of Association, Active Record validations, Callbacks & types of callbacks Views, Embedded ruby, Working in HAML, Working with Ajax, Jquery in Rails framework, Testing, TDD & BDD.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Learn Ruby on Rails	Daniel Kehoe	RailsApps
2.	Ruby on rails tutorials	MichealHartl	Covers Rail
3.	Beginning Ruby	Peter Cooper	Apress

Course Code	CSA519
Course Title	**Data Warehousing and Data Mining**
Type of Course	**OE-1**
L T P	4:0:0
Credits	4
Course Prerequisites	Analysis of advanced aspect of data warehousing and data mining
Course Objective(s)	The main objective of this course is to provide information about the concepts of data warehouse and also provide knowledge about data mining techniques.
Course Outcome (CO)	The students will able to: 1. Understand about the need of data warehouse. 2. Understand the model and design of data warehouses. 3. Learn algorithms for data mining. 4. Apply the acquired knowledge for understanding data and select suitable methods for data analysis.

SYLLABUS

UNIT-I: Review of Data Warehouse: Need for data warehouse, Big data, Data Pre-Processing, Three tier architecture; MDDM and its schemas, Introduction to Spatial Data warehouse, Architecture of Spatial Systems, Spatial: Objects, data types, reference systems; Topological Relationships, Conceptual Models for Spatial Data, Implementation Models for Spatial Data, Spatial Levels, Hierarchies and Measures Spatial Fact Relationships.

UNIT-II: Introduction to temporal Data warehouse: General Concepts, Temporality Data Types, Synchronization and Relationships, Temporal Extension of the Multi Dimensional Model, Temporal Support for Levels, Temporal Hierarchies, Fact Relationships, Measures, Conceptual Models for Temporal Data Warehouses : Logical Representation and Temporal Granularity.

UNIT-III: Introduction to Data Mining functionalities, Mining different kind of data, Pattern/Context based Data Mining, Bayesian Classification: Bayes theorem, Bayesian belief networks Naive Bayesian classification, Introduction to classification by Back propagation and its algorithm, Other classification methods: k-Nearest Neighbor, case based reasoning, Genetic algorithms, rough set approach, Fuzzy set approach.

UNIT–IV: Introduction to prediction: linear and multiple regression, Clustering: types of data in cluster analysis: interval scaled variables, Binary variables, Nominal, ordinal, and Ratio-scaled variables; Major Clustering Methods: Partitioning Methods: K-Mean and K-Methods, Hierarchal methods: Agglomerative, Density based methods: DBSCAN.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Data Mining: Concepts and Techniques	J.Han and M. Kamber	Morgan Kaufmann Publishers
2.	Advanced Data warehouse Design	Elzbieta Malinowski	Pearson
3.	Modern DataWarehousing & Miningand Visualization	George M Marakas	Pearson

CSA509 Linux with Shell Programming(P)

L T P
0 0 4

Learning Objective: To become familiar with the operation of Linux and Acquire knowledge about the basic concept of writing commands in Linux.

1. Installation of Linux operating system.
   a. Partitioning drives
   b. Configuring boot loader (GRUB/LILO)
   c. Network configuration
   d. Setting time zones
   e. Creating password and user accounts
   f. Installing and removing packages
   g. Shutting down
2. Working with basic commands.
3. Linux system administration
   a. Becoming super user
   b. Temporarily changing user identity with su command
   c. Using graphical administrative tools
   d. Administrative commands
   e. Administrative configuration files
4. Configuring NICs with Network Device Configuration Utilities (ip and ifconfig).
5. Install and configuring a DNS Server with a domain name of your choice.
6. Install and configuring DHCP server and client.
7. Install and configuring Mail Server.
8. Write a shell script to create a file. Follow the instructions
   (i) Input a page profile to yourself, copy it into other existing file;
   (ii) Start printing file at certain line
   (iii) Print all the difference between two file, copy the two files.
   (iv) Print lines matching certain word pattern.
9. Write shell script for-
   (i) Showing the count of users logged in,
   (ii) Printing Column list of files in your home directory

    (iii) Listing your job with below normal priority

    (IV) Continue running your job after logging out.

10. Write a shell script to change data format. Show the time taken in execution of this script.

11. Write a shell script to print files names in a directory showing date of creation & serial number of the file.

12. Write a shell script to count lines, words and characters in its input (do not use wc).

13. Write a shell script to print end of a Glossary file in reverse order using Array. (Use awk tail)

14. Write a shell script to check whether Ram logged in, Continue checking further after every 30 seconds till success.

15. Write a shell script to compute GCD and LCM of two numbers. Use the basic function to find GCD & LCM of n numbers.

16. Write a shell script to find whether a given number is prime Take a large number such as 15 digits or higher and use a proper algorithm

CSA511 MATLAB Tools (P)

L T P
0 0 4

Learning Objectives: To become familiar with the operation of MATLAB.

- Basic Commands
- Working with Matrices

1. If x=[1 4; 8 3], find :

    a) the inverse matrix of x .

    b) the diagonal of x.

    c) the sum of each column and the sum of whole matrix x.

    d) the transpose of x.

2. If x= [2 8 5; 9 7 1], b=[2 4 5] find:

    a) find the maximum and minimum of x.

    b) find median value over each row of x.

    c) add the vector b as a third row to x.

3. If x=[2 6 12; 15 6 3; 10 11 1], then

    a) replace the first row elements of matrix x with its average value.

    b) reshape this matrix into row vector.

4. Generate a 4 x 4 Identity matrix.

5. Generate the following row vector b=[5, 10, 15, 20 . . . . 95, 100], then find the number of elements in this vector.

- Expressions
- Relational and Logical Operations

Second Semester

Course Code	CSA502
Course Title	Advanced Java
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Programming in Java
Course Objective(s)	This course introduces the fundamental programming concepts and techniques in Java Design and develops GUI applications using Abstract Windowing Toolkit (AWT), Swing and Event Handling.
Course Outcome (CO)	The students will be able to: 1. Learn the Internet Programming, using Java Applets. 2. Use the Java programming language for various programming technologies (understanding). 3. Develop software in the Java programming language, (application). 4. Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements (analysis).

SYLLABUS

UNIT-I: Java Basics: Review of Object oriented concepts, History of Java, Java buzzwords, JVM architecture, Data types, Variables, Scope and life time of variables, arrays, operators, control statements, type conversion and casting, simple java program, constructors, methods, Static block, Static Data, Static Method String and String Buffer Classes, Using Java API Document..

UNIT-II: Inheritance: Classes, Super classes & Subclasses, Object-The Universal Super class, Object Wrappers, vectors, Enumeration Classes. **Packages and Interfaces**: Defining, Creating and Accessing a Package, Understanding CLASS PATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT-III: Exception handling: Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. **Applets:** Applets basics, Applets HTML tags and attributes, Inter-applet communication.

UNIT–IV: Java Servlets: Servlet Interaction & Advanced Servlets Life cycle of Servlet, Java servlet development Kit, Javax. servlet package, Reading servlet Parameters, Reading Initialization Parameters, The Javax servlet, http package, handling HTTP. **Java Server Pages (JSP):** JSP Technologies, Understanding the Client-Server Model, Understanding Web server software, Configuring the JSP Server, Handling JSP Errors, JSP Translation Time Errors, JSP Request Time Errors, Creating a JSP Error Page. **Struts:** Introduction to the Apache Struts, MVC Architecture, Struts Architecture, How Struts Works?

Introduction to the Struts Controller, Introduction to the Struts Action Class, Using Struts ActionFrom Class, Using Struts HTML Tags, Introduction to Struts Validator Framework, Client Side Address Validation in Struts, Custom Validators Example, Developing Application with Struts Tiles.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Effective Java	Joshua Bloch	Pearson
2.	Spring in Action	Craig Walls	Manning Publications
3.	Core Java Volume II – Advanced Features	Cay S. Horstmann	Pearson

Course Code	CSA504
Course Title	**Advanced Computer Networks**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Computer Networks
Course objective(s)	The objective of this course is to provide a deep understanding of advanced computer networking principles including network architectures, protocols and performance optimization techniques.
Course Outcome (CO)	The students will be able to: 1. Analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies. 2. Have a basic knowledge of the use of cryptography and network security. 3. Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols. 4. Analyze, specify and design the topological and routing strategies for an IP based networking infrastructure.

SYLLABUS

UNIT-I: Introduction: Network Hardware & Software, OSI Reference Model, TCP/IP Model, Comparison of the OSI & TCP/IP model. **The Physical Link layer**: Guided Transmission Media, Physical Layer Standard. **The Data Link Layer**: Need for Data Link Control, Service provided by the Data Link Layer, Frame Design Consideration, Flow control Mechanism, Data Link Error control, Error Control in Stop-and-wait Mechanism & Sliding Window Mechanism, Sequence numbering, Piggybacking Acknowledgements, Data Link Management.

UNIT-II: Medium Access Sub layer: Channel Allocation, MAC protocols, ALOHA, CSMA protocols, Collision free protocols, Limited Contention Protocols, Wireless LAN protocols, IEEE 802.3, 802.4, 802.5 standards and their comparison. **Network Layer:** Design Issues, Routing Algorithms (Shortest Path, Flooding, Distance Vector, Hierarchical, Broadcast, Multicast). Congestion Control Algorithms: Leaky bucket, Token bucket and Load shedding. Internetworking. IP Protocol, ARP, RARP, IPv4 and IPv6.

UNIT-III: Devices: Bridges and Layer-2 Switches: LAN Bridge, Transparent Bridges, Spanning tree algorithm. Source routing bridge, route discovery in source routing, layer 2 Ethernet switches. **Transport Layer:** Addressing, Establishing and Releasing Connection, Flow Control, Buffering, Internet Transport Protocol (TCP and UDP).

UNIT-IV: Introduction to Internet Protocol: IPv4 Format, ICMP. Routing Algorithms. Static Routing, Dynamic Routing, Distance Vector Routing Algorithm, Routing Information, Protocol, Link State

Routing, OSPF Routing Protocol. Interior and Exterior Protocol, and Border Gateway Protocol. Introduction to the Cisco IOS: The Cisco Router User Interface, Command Line Interface (CLI), Router and Switch Administrative Functions, Router Interfaces, Viewing, Saving, and Erasing Configurations. Dynamic Routing Protocols: Routing Protocol Basics, Routing Information Protocol (RIP), Interior Gateway Routing Protocol (IGRP), Verifying Your Configurations.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Computer Networks	Andrew S. Tanenbaum	Pearson
2.	Data Communication and Networking	Behrouz A. Forouzan	McGraw Hill
3.	Internetworking with TCP/IP	Douglas E. Comer	Pearson

Course Code	CSA506
Course Title	Theory of Computation
Type of Course	Minor
L T P	3:0:0
Credits	3
Course Prerequisites	Student must have the basic knowledge of Discrete mathematics and System programming.
Course Objective(s)	This course provides the basic knowledge of concepts in automata theory and theory of computation. Allows the students to design grammars and recognizers for different formal languages.
Course Outcomes (CO)	The students will be able to: 1. Discuss key notions of computation, such as algorithm, computability, decidability, reducibility, and complexity, through problem solving. 2. Explain the models of computation, including formal languages, grammars and automata, and their connections. 3. State and explain the church-Turing thesis and its significance. 4. Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.

SYLLABUS

UNIT I: Introduction to theory of computation: Significance of theoretical computer science, Mathematical model of computer and programming languages, Automata, historical aspect of automata, application of Automata theory.

UNIT II: Finite Automata: Components of Automata, types of Automata, Deterministic Automata, Non- Deterministic Automata, Representation of Finite Automata, Deterministic Finite Automata (DFA), Representation of Deterministic Finite Automata using Transition Graphs, Transition diagraphs, Transition Tables, Languages generated by Deterministic Automata, Moore & Mealy Machines.

UNIT III: Basics of Languages: Informal & formal definitions. Alphabets, Strings, Languages, Grammar, automata and other related definitions, various operation on languages: - union, concatenation, negation, reverse, star closure, Positive closure properties, Regular Expressions, Grammar: Informal and formal definitions, Illustrations for generating grammar for various languages.

UNIT IV: Grammar: Types of grammars, Classification of Chomsky Hierarchy, Phase structured grammars, context free grammar, context sensitive grammar, regular grammar. Pushdown Automata: Definition and Representation of Pushdown automata, Non Deterministic Pushdown automata, operations on Pushdown automata, Turing machine: Basic Model, definition and representation of Turing Machine, Application of Turing Machine.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Introduction to Automata Theory, Languages and Computation	John E. Hopcroft	Pearson
2.	Elements of the Theory of Computation	H.R. Lewis and C.H. Papadimitriou	Pearson
3.	Introduction to languages and the theory of computation.	J.C. Martin	McGraw Hill

Open Elective Course-2

Course Code	CSA512
Course Title	**Mobile Computing and Wireless Networks**
Type of Course	OE-2
L T P	4:0:0
Credits	4
Course Prerequisites	Basic knowledge of Data Communication and Computer Networks
Course Objective(s)	To learn the basic concepts, aware of the GSM, SMS, GPRS Architecture, wireless protocols -WLN, Bluetooth, WAP, ZigBee issues and Network, Transport Functionalities of Mobile communication. To understand the concepts of Adhoc and wireless sensor networks.
Course Outcomes (CO)	The students will able to: 1. Explain the principles and theories of mobile computing technologies. 2. Describe infrastructures and technologies of mobile computing technologies. 3. List applications in different domains that mobile computing offers to the public, employees, and businesses. 4. Describe the possible future of mobile computing technologies and applications.

SYLLABUS

UNIT I: Wireless Communication Fundamentals, Architecture: Frequencies Spectrum-Multiplexing- Spread spectrum-GSM vs. CDMA - 2G Mobile Wireless Services-Comparison of 2G and 3 G - GSM Architecture-Entities-Call Routing-PLMN-Address and identifiers-Network Aspects-Mobility Management-Frequency Allocation-Authentication and Security-SMS Architecture-Value Added Service through SMS-GPRS-GPRS and Packet Data Network-Architecture-Network Operations-Data Service-Application.

UNIT II: Mobile Wireless Short Range Networks: GSM-Services and System Architecture, Radio Interfaces of GSM, Protocols of GSM Localization, Call Handling Handover, Security, New Data Services, General Packet Radio Service High-speed Circuit Switched Data, DECT, Modulation, Multiplexing, Controlling the Medium Access Spread Spectrum, Frequency Hopping Spread Spectrum (FHSS),Coding Methods, Code Division Multiple Access, IMT-2000 3G Wireless Communication Standards, WCDMA 3G Communications Standards ,CDMMA2000 3G Communication Standards, Imode, OFDM, High Speed Packet Access (HSPA) 3G Network Long-term Evolution, Wi-Max Rel 1.0 IEEE 802.16e, Broadband Wireless Access,4G Networks, Mobile Satellite Communication Network.

UNIT III: Mobile IP Network Layer, Transport Layer: IP and Mobile IP Network Layers, Packet Delivery and Handover Management Location Management, Registration, Tunneling and Encapsulation, Route Optimization Dynamic Host Configuration Protocol, VoIP, IPsec Conventional

TCP/IP Transport Layer Protocols, Indirect TCP, Snooping TCP Mobile TCP, Other Methods of Mobile TCP-layer Transmission ,TCP over 2.5G/3G Mobile Networks.

Data Organization, Database Transactional Models – ACID Rules, Query Processing Data Recovery Process, Database Hoarding Techniques , Data Caching, Client-Server Computing for Mobile Computing and Adaptation Software for Mobile Computing, Power-Aware Mobile Computing, Context-aware Mobile Computing.

UNIT IV: Mobile Ad hoc Network Routing Protocols: Communication Asymmetry, Classification of Data-delivery Mechanisms, Data Dissemination Broadcast Models, Selective Tuning and Indexing techniques, Digital Audio Broadcasting (DAB), Digital Video Broadcasting Synchronization, Synchronization Software for Mobile Devices, Synchronization Software for Mobile Devices SyncML-Synchronization Language for Mobile Computing,Sync4J (Funambol), Synchronized Multimedia Markup Language (SMIL).

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Mobile Computing, Technology Applications and Service Creation	Asoke K Talukder, Hasan Ahmed, Roopa Yavagal	McGraw Hill
2.	Mobile Computing, Second Edition	Raj Kamal	Oxford University Press
3.	Mobile Communications	Jochen Schiller	Pearson

Course Code	CSA514
Course Title	**Search Engine Optimization**
Type of Course	OE-2
L T P	4:0:0
Credits	4
Course Prerequisites	To learn the basic concepts of paid advertising, social media, and other online platforms can generate traffic to websites, the majority of online traffic is driven by search engines.
Course Objective(s)	The students will able to: 1. Define search engine marketing. 2. Describe the history of search engine marketing. 3. Identify the elements of search engine marketing plan. 4. Generate keywords that are highly relevant to Web site.

SYLLABUS

UNIT I: Internet & SEO Basics: Definition, Domain, Knowledge of World Wide Web, Difference between Portals and Search Engines, Types of SEO Techniques, Black Hat Technique & White Hat Technique, Working of Search Engine, Various SEO Tools, Website Design SEO guidelines.

UNIT II: SEO Research & Analysis: Market Research, Keyword Research & Analysis, Keyword Opportunity, Competitors Website Analysis, SWOT Analysis of Website, Tools available for keyword research, Ways to choose best keywords, Website analysis using various SEO Tools.

UNIT III: On Page SEO: On page optimization, SEO Page Title, Meta Description, Meta Keywords, Headings, Optimized Domain, Canonical Tag, Meta Tags, SEO Images, SEO internal link, Site Map, Hidden Text, Web Hosting, SEO 301 Redirect, SEO 404 error.

UNIT IV: Off Page SEO: Off Page Optimization, SEO Page Rank, Link Popularity, SEO Directory Submission, Social Bookmarks Submission, Blog Submission, Article Submission, Search Engine Submission, RSS Feed Submission.

RECOMMENDED BOOKS			
Sr. No.	Name	Author(s)	Publisher
1.	SEO Fitness Workbook, 2016 Edition: The Seven Steps to Search Engine Optimization Success on Google	Jason McDonald	CreateSpace Independent Publications
2.	Search Engine Optimization All-in-One For Dummies 3rd Edition	Bruce Clay	For Dummies
3.	Ultimate Guide to Link Building	Eric Ward & Garrett French	Entrepreneur Press

Course Code	CSA516
Course Title	**Natural Language Processing**
Type of Course	OE-2
L T P	4:0:0
Credits	4
Course Prerequisites	Basic understanding about Probability and statistics , Automata and languages
Course Objective(s) (CO)	The main purpose of this course is to provide the most fundamental knowledge to the students so that they can understand what the AI is. Due to limited time, we will try to eliminate theoretic proofs and formal notations as far as possible.
Course Outcomes (CO)	The students will able to: 1. Understand approaches to syntax and semantics in NLP. 2. Understand approaches to discourse, generation, dialogue and summarization within NLP. 3. Understand current methods for statistical approaches to machine translation. 4. Understand machine learning techniques used in NLP, including hidden Markov models and probabilistic

SYLLABUS

UNIT I: Introduction: Overview of NLP, Statistical machine translation, Language models and their role in speech processing, Course introduction and administration, *N*-gram Language Models and Information Theory, *n*-gram models, Entropy, relative entropy, cross entropy, mutual information, perplexity. **Statistical estimation and smoothing for language models:** Statistical Machine Translation (MT), Alignment Models Smoothing, Smoothing absolute discounting, proving you have a proper probability distribution.

UNIT II: Good-Turing implementation: Information theory examples and intuitions, Java implementation issues, Statistical Alignment Models and Expectation Maximization (EM), EM and its use in statistical MT alignment models, Putting together a complete statistical MT system, Decoding and A* Search.

UNIT III: Introduction to supervised machine, learning methods: Naïve Bayes (NB), classifiers for entity classification, Maximum Entropy Classifiers, Corpora and other resources. **Syntax and Parsing for Context-Free Grammars (CFGs)**: Parsing, tree banks, attachment ambiguities. Context free grammars. Top-down and bottom-up parsing, empty constituents, left recursion, and repeated work, Probabilistic CFGs.

UNIT IV: Lexicalized Probabilistic Context-Free Grammars (LPCFGs): Lexicalization and lexicalized parsing, The Charniak, Collins/Bikel, and Petrov & Klein parsers. **Modern Statistical Parsers Search methods in parsing:** Agenda-based chart, A*, and "best-first" parsing. Dependency parsing, Discriminative parsing Computational Semantics Semantic representations, lambda calculus, compositionality, syntax/semantics interfaces, logical reasoning, Lexical Semantics.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Natural Language Understanding	James A.	Pearson Education
2.	Natural Language Processing	Bharati A., Sangal R., Chaitanya V.	Paninian Perspective, PHI
3.	Natural Language Processing and Information Retrieval	Siddiqui T., Tiwary	OUP 2008

Course Code	CSA518
Course Title	**Computer and Information Security**
Type of Course	OE-2
L T P	4:0:0
Credits	4
Course Prerequisites	Basics of Computer Networks
Course Objective(s)	To understand the basic issues in information security, the concept of ciphers and cryptography, various ciphers, digital signatures and email security policies, malicious software and their remedies.
Course Outcomes (CO)	The students will able to: 1. Develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications. 2. Gain familiarity with prevalent network and distributed system attacks, defences against them, and forensics to investigate the aftermath. 3. Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today. 4. Develop an understanding of security policies as well as protocols to implement such policies in the form of message exchanges.

SYLLABUS

UNIT I:
Introduction of IT: Network security, Goals of Network Security, cryptography and its types, ciphers and their types, steganography, Data Encryption Standard, RSA algorithm, key distribution protocols.

UNIT II:
Software Security: Vulnerabilities, Attacks, and Countermeasures, Privileged programs (Set-UID programs) and vulnerabilities, Buffer Overflow vulnerability and attack, Return-to-libc attack, Race Condition vulnerability and attack, Format String vulnerability and attack, Input validation, Shellshock attack.

UNIT III:
Web Security: Vulnerabilities, Attacks, and Countermeasures, Same Origin Policy, Cross-Site Scripting Attack, Cross-Site Request Forgery Attack, SQL-Injection Attack, Click-Jacking Attack, Web Tracking, Web Proxy and Firewall

UNIT IV:
Smartphone Security, Access control in Android operating system, Rooting Android devices, Repackaging attacks, Attacks on apps, Whole-disk encryption, Hardware protection: TrustZone.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Computer Security: Hand on Approach	Wenliang Du	Pearson
2.	Computer and Information Security	John R. Vacca	Kindle Edition
3.	The Art of Deception	Kevin D. Mitnick	John Wiley & Sons

CSA508 Advanced JAVA (P)

L T P
0 0 4

Learning Objectives: To understand Basic Programming Constructs and the concepts of Object Oriented Programming and its Applications Practically.

Lab Work
Students should be made to practice the various concepts learned in classroom by implementing them in the form of programs. Various programs should be practiced in the lab based on each of the following –

1. Write a Java Program that reads a line of integers, and then displays each integer, and the sum of all the integers.
2. Write a Java program to illustrate the concept of class with method overloading.
3. Write a Java program to illustrate the concept of Single level and Multi level Inheritance.
4. Write a Java program to paint like paint brush in applet.
5. Write a Java program to display analog clock using Applet.
6. Write a Java program to create different shapes and fill colors using Applet.
7. Write a Java program to illustrate collection classes like Array List, Iterator, Hash map etc.
8. Write a Java program for handling mouse & key events.
9. Write a Java program that works as a simple calculator. Use a grid layout to arrange buttons for the digits and for the +, -, *, % operations. Add a text field to display the result.
10. Write a Java program to build a Calculator in Swings.
11. Write a Java program to display the digital watch in swing.
12. Write a Java program that to create a single ball bouncing inside a JPanel.
13. Write a JAVA program JTree as displaying a real tree upside down.
14. Script showing use of variables in JavaScript.
15. Script showing user defined functions.
16. Script showing how JavaScript places code in the browser window.
17. Script showing use of alert dialog box.
18. Script showing use of Confirm dialog box.
19. Program implementing the concept of cookies in JSP.
20. Program implementing the concept of session in JSP.
21. A servlet program to print hello world.
22. A servlet program to create a cookie.

CSA510 Advanced Computer Networks (P)

L T P
0 0 4

Learning Objectives: To understand Basic Programming Constructs and the concepts of Object Oriented Programming and its Applications Practically.

1. Configuration and logging to a CISCO Router and introduction to the basic user Interfaces. Introduction to the basic router configuration and basic commands.

2. Configuration of IP addressing for a given scenario for a given set of topologies.

3. Configure a DHCP Server to serve contiguous IP addresses to a pool of four IP devices with a default gateway and a default DNS address. Integrate the DHCP server with a BOOTP demon to automatically serve Windows and Linux OS Binaries based on client MAC address.

4. Configure, implement and debug the following: Use open source tools for debugging and diagnostics.

a. ARP/RARP protocols

b. RIP routing protocols.

c. BGP routing

d. OSPF routing protocols.

e. Static routes (check using netstat)

5. Configure DNS: Make a caching DNS client, and a DNS Proxy; implement reverse DNS and forward DNS, using TCP dump/Wireshark characterize traffic when the DNS server is up and when it is down.

6. Configure FTP Server on a Linux/Windows machine using a FTP client/SFTP clientcharacterize filetransfer rate for a cluster of small files 100k each and a video file of 700mb.Use a TFTP client and repeat the experiment.

7. Configure a mail server for IMAP/POP protocols and write a simple SMTP client in C/C++/Java client to send and receive mails.

8. Implement Open NMS+ SNMPD for checking Device status of devices in community MIB of a Linux PC. Using yellow pages and NIS/NFS protocols implement Network Attached Storage Controller (NAS).

Third Semester

Course Code	CSA601
Course Title	**Research Methodology-I (General)**
Type of Course	Major
L T P	4:1:0
Credits	4
Course Prerequisites	N.A.
Course Objective(s)	The objective of this course is to understand Research and Research Process
Course Outcomes (CO)	The students will able to: 1. Prepare a preliminary research design for projects in their subject matter areas. 2. Accurately collect, analyze and report data. 3. Present complex data or situations clearly. 4. Review and analyze research findings Get the knowledge of objectives and types of research.

SYLLABUS

UNIT I: Foundations of Research: Meaning, Objectives, Motivation, and Utility. Concept of theory. Empiricism, deductive and inductive theory. Characteristics of scientific method: Understanding the language of research – Concept, Construct, Definition, Variable. Research Process

Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance

UNIT II: Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables. **Qualitative and Quantitative Research:** Qualitative research – Quantitative research – Concept of measurement, causality, generalization, and replication. Merging the two approaches.

UNIT III: Measurement: Concept of measurement. Problems in measurement in research. Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio. **Sampling:** Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample– Practical considerations in sampling and sample size.

UNIT IV: Data Analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association. Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Business Research Methods	Donald Cooper & Pamela Schindle	TMGH- 9th Edition
2.	Research Methodology	C.R.Kothari	Kalyani Publications

Course Code	CSA603
Course Title	**Research and Publication Ethics**
Type of Course	Minor
L T P	2:0:0
Credits	2
Course Prerequisites	NA
Course Objective(s)	The objective of this course is to acquire an overview of important issues in research ethics, like responsibility for research, ethical vetting, and scientific misconduct.
Course Outcomes (CO)	The students will able to: 1. Understand the importance of being ethical in carrying out research and publication activities. 2. Differentiate the quality publication practices and how to be cognizant about dubious publishing practices/publishers. 3. Get acquainted with the ethics and conduct necessary for carrying out research work. 4. Understand citation, indexing and impact factors.

SYLLABUS

UNIT I: Philosophy and Ethics: Introduction to philosophy: definition, nature and scope, concept, branches, Ethics: definition, moral philosophy, nature of moral judgments and reactions.

UNIT II: Scientific Conduct: Ethics with respect to science and research, Intellectual honesty and research integrity. **Scientific misconducts:** Falsification, Fabrication, and Plagiarism (FFP).

UNIT III: Publication Ethics: Definition, introduction and importance. Best practices / standards setting initiatives and guidelines: COPE, WAME, etc., Conflicts of interest. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types.

UNIT IV: Databases and Research Metrics: Indexing databases, Citation databases: Web of Science, Scopus etc. Impact Factor of journal as per Journal Citation Report, SNIP, SIR, IPP, Cite Score. Metrics: h-index, g index, i10 index.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Research an d Publication Ethics	Wakil Kumar Yadav	Notion Press
2.	Handbook of Research Ethics and Scientific Integrity	Ron Iphofen	Springer

Course Code	CSA605
Course Title	**Applications of ICT Tools in Research**
Type of Course	Minor
L T P	2:0:0
Credits	2
Course Prerequisites	Basic understanding of Journals and Research Papers.
Course Objective(s)	The objective of this course is to become proficient in finding research papers and references through ICT research tools.
Course Outcomes (CO)	The students will able to: 1. Understand ICT Research Tools 2. Gain knowledge of research websites 3. Understand reference software 4. Understand academic ICT Tools.

SYLLABUS

UNIT I:
ICT for Learning and Research: Introduction of MOOC and Open Source LMS, LMS Activities and Resources. MOOC (NPTEL, Spoken Tutorials, e-PG Pathshala, Coursera, eDX, Udemy, Unacademy).

UNIT II:
Awareness of Academic Social Networking Sites (Academia.edu, Research Gate, Linkedin, Google Scholar, ORCID)

UNIT III:
Reference Management Software (Zotero, Mendeley, EndNote), Scholarly writing using Ms-Word.

UNIT IV:
ICT Tools for Academics: Google Slides, Google Meet, Google forms and Certify'em, Google Sites. Concept of OER and FOSS for education. Plagiarism Tools, Understanding Creative commons - Handling copyright for online resources / Courses.

RECOMMENDED BOOKS			
Sr. No.	Name	Author(s)	Publisher
1.	Research Tools in ICT in Teaching	Dr. S. Rajasekar	Neelkamal Publishers

Course Code	CSA619
Course Title	**Indian Knowledge System (Computer Logic for Nyaya Shastra)**
Type of Course	Major
L T P	3:0:0
Credits	3
Course Prerequisites	Basic understanding of logic, computer science fundamentals, or Indian philosophy (preferred but not mandatory).
Course Objective(s)	To introduce students to the principles of Nyāya Shāstra and its logical frameworks, explore the application of Nyāya's epistemological and logical tools in modern computer science, AI, and knowledge systems and to develop skills in applying Nyāya reasoning to computational problems and designing logic-based systems inspired by Indian thought.
Course Outcomes (CO)	The students will able to: 1. Understand the foundational concepts of Nyāya Shāstra, including its epistemology and logical structures. 2. Analyze the parallels between Nyāya logic and modern computational logic. 3. Apply Nyāya's methods of reasoning (e.g., pramāṇa, tarka) to computational problems like knowledge representation and inference. 4. Critically evaluate the relevance of Nyāya Shāstra in advancing AI and computer logic systems.

SYLLABUS

UNIT I: Introduction to Indian Knowledge Systems and Nyāya Shāstra: Overview of Indian Knowledge Systems (IKS): Scope, relevance, and integration with modern disciplines. **Introduction to Nyāya Shāstra:** Historical context, key texts (Nyāya Sūtras by Akṣapāda Gautama). **Core concepts:** Pramāṇa (means of valid knowledge), prameya (objects of knowledge), and tarka (reasoning).

UNIT II: Nyāya's Epistemology and Pramāṇa Framework: Pramāṇa: Four means of valid knowledge in Nyāya: Pratyakṣa (perception): Nirvikalpa (indeterminate) and savikalpa (determinate).
Application: Mapping pramāṇa to computational knowledge representation (e.g., ontologies, semantic networks).

UNIT III: Nyāya Logic and Computational Reasoning: Nyāya's logical tools: Tarka (hypothetical reasoning), vāda (debate), and śāstrārtha (open inquiry). Advanced logical formalism, technical terms (e.g., avacchedaka, viśeṣaṇa), and their potential in formal systems. Computational parallels:
Inference rules in Nyāya vs. rule-based systems in AI. Nyāya's relational logic and its application to database systems or knowledge graphs.

UNIT IV: Challenges and Future Directions: Impedance mismatch: Challenges in integrating Nyāya Shāstra with modern computer science (e.g., terminology, context). Opportunities: Broadening AI scope with Nyāya's concepts of consciousness (ātman) and relational reasoning. Future trends: Potential for Nyāya-inspired AI systems, ethical frameworks, and human-AI interaction models.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Indian Logic: A reader	Jonardon Ganeri	Routledge
2.	Logic, Language and Reality: Indian Philosophy and Contemporary Issues	Bimal Krishna Matilal	Motilal Banarsidass

Elective Courses

Course Code	CSA611
Course Title	**Computational Intelligence**
Type of Course	EC
L T P	4:0:0
Credits	4
Course Prerequisites	Basic knowledge of Soft computing
Course Objective(s)	The main objective of this course is to provide conceptual as-well-as practical knowledge about Neural Networks, Fuzzy Logic and soft computing.
Course Outcomes (CO)	The students will able to: 1. Describe human intelligence and AI Explain how intelligent system works. 2. Apply basics of Fuzzy logic and neural networks. 3. Discuss the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience 4. Develop some familiarity with current research problems and research methods in Soft Computing Techniques.

SYLLABUS

UNIT I:
Introduction: Neural Networks, Application Scope of Neural Network, Fuzzy Logic, Genetic Algorithm, Hybrid Systems and Soft computing. Artificial Neural Network: Fundamental Concept, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Important Terminologies of ANNs, McCulloch-Pitts Neuron, and Hebb Network.

UNIT II:
Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets: Introduction to Fuzzy logic, Classical Sets (Crisp Sets), Operations of Classical Sets, Fuzzy Sets Operations. **Classical Relations and Fuzzy Relations:** Cartesian Product of Relation, Classical Relation, Fuzzy Relations, Tolerance and Equivalence Relations, No interactive Fuzzy Sets. **Membership Functions:** Features of Membership Functions, Fuzzification and Defuzzification.

UNIT III:
Fuzzy Rule Base and Approximate Reasoning: Introduction, Truth Values and Table in Fuzzy Logic, Fuzzy Propositions, Fuzzy Reasoning, Fuzzy Inference System. **Fuzzy Decision Making:** Individual Decision Making, Multi-person Decision Making, Multi-objective Decision Making, Multi-attribute Decision Making, Fuzzy Bayesian Decision Making. **Fuzzy Logic Control Systems:** Control System Design, Architecture and Operation of FLC system, FLC System Models, Application of FLC Systems.

UNIT IV:
Hybrid Soft Computing Techniques: euro-Fuzzy Hybrid Systems, Generic Neuro-Hybrid Systems, Genetic Fuzzy Hybrid and Fuzzy Genetic Hybrid Systems, Simplified Fuzzy ARTMAP. **Applications of Soft Computing:** A Fusion Approach of Multispectral Images with SAR (Synthetic Aperture Rader), Optimization of Traveling Salesmen Problem using Genetic Algorithm Approach, Genetic Algorithm-Based Internet Search Technique, Soft computing Based Hybrid Fuzzy Controllers.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Computational Intelligence: Methods and Techniques	Leszek Rutkowski	Springer
2.	Computational Intelligence in Machine Learning	Amit Kumar, Jacek M. Zurada	Springer
3.	Computational Intelligence and Its Applications: Evolutionary Computation, Fuzzy Logic, Neural Network and Support Vector Machine Techniques	H.K. Lam, S.H. Ling, H.T. Nguyen	World Scientific

Course Code	CSA613
Course Title	**System Analysis and Design**
Type of Course	EC
L T P	4:0:0
Credits	4
Course Prerequisites	Knowledge of Software
Course Objective(s)	The main objective of this course is to provide students with an overall foundation of systems analysis and design to effectively and efficiently design and implement system.
Course Outcomes (CO)	The students will able to: 1. Explain what systems are and how they are developed. 2. Identify and describe the phases of the systems development life cycle. 3. Follow the analysis portion of the Systems Development Life Cycle in a disciplined manner. 4. Develop and evaluate system requirements.

SYLLABUS

UNIT I:
Introduction to system, data, information, knowledge, types of system, and requirements of information at different levels of management. System/Software Development Life Cycle: Requirements determination, requirements, specifications, feasibility analysis, final specifications, hardware and software study, system design, system implementation, system testing, system maintenance.

UNIT II:
Role of the system analyst. Attributes of a systems analyst, tools used in system analysis
Information gathering, system requirements specification, Feasibility analysis, examining alternative solutions, cost benefit analysis, quantifications of costs and benefits, tools for prototype creation

UNIT III:
Tools for systems analysts: data flow diagrams, logical and physical DFDs, software tools to create DFDs. Structured systems analysis and design, procedure specifications in structured English, examples and cases, decision tables for complex logical specifications, Data oriented systems design, entity relationship model, E-R diagrams

UNIT IV:
Control – audit and security of information systems, objectives of control, techniques used in control, auditing information systems, testing information systems, types of tests, security of information systems, disaster recovery, Complete system analysis and design case study of Library management system.

RECOMMENDED BOOKS			
Sr. No.	Name	Author(s)	Publisher
1.	Introduction of System Analysis and Design	I.T. Haryszkiewycz	Pearson Education
2.	Analysis and Design of Information System	V. Rajaraman	Pearson Education
3.	System Analysis and Design Methods	J.K.Whiten., L.D.Bentley,	Galgotia Publications

Course Code	CSA615
Course Title	**E-Commerce and Content Management System**
Type of Course	EC
L T P	4:0:0
Credits	4
Course Prerequisites	Basic knowledge of web development (HTML, CSS, JavaScript), databases, and internet technologies.
Course Objective(s)	The objective of this course is to understand the principles, models, and technologies of e-commerce and to explore the architecture, tools, and frameworks of content management.
Course Outcomes (CO)	The students will able to: 1. Explain the concepts, business models, and technologies underpinning e-commerce systems. 2. Design and implement a functional e-commerce website using CMS platforms. 3. Evaluate and select appropriate CMS tools for specific e-commerce requirements. 4. Apply security protocols, payment gateways, and SEO strategies in e-commerce and CMS environments..

SYLLABUS

UNIT I: Introduction to E-Commerce: Overview of E-Commerce: Definition, scope, and evolution of e-commerce; types (B2C, B2B, C2C, B2G, m-commerce).E-Commerce Business Models: Retail, marketplace, subscription, dropshipping, and hybrid models. E-Commerce Technologies: Client-server architecture, web servers, APIs, and cloud computing. E-Commerce Ecosystem: Stakeholders (merchants, customers, payment gateways, logistics providers). Case Studies: Analysis of successful e-commerce platforms (e.g., Amazon, Flipkart, Shopify). Ethical and Legal Issues: Privacy, data protection, and e-commerce regulations (e.g., IT Act, 2000, India).

UNIT II: Content Management Systems (CMS) Fundamental: Introduction to CMS: Definition, purpose, and types (open-source, proprietary, headless CMS). Popular CMS Platforms: WordPress, Drupal, Joomla, Magento, Shopify (features, use cases, comparison). CMS Architecture: Core components (content repository, templates, plugins, user management). Content Creation and Management: Content types (text, images, videos), workflows, and versioning.
CMS in E-Commerce: Role of CMS in product catalog management, customer engagement, and personalization. Case Study: WordPress with WooCommerce vs. Magento for e-commerce solutions.

UNIT III: E-Commerce Technologies and Development: Frontend Technologies: HTML5, CSS3, JavaScript frameworks (e.g., React, Angular) for e-commerce UI. Backend Technologies: Server-side programming (PHP, Python, Node.js), databases (MySQL, MongoDB). Payment Gateways: Integration of PayPal, Stripe, Razorpay, and UPI; security considerations (PCI-DSS compliance). E-Commerce Security: SSL/TLS, encryption, secure authentication, and fraud prevention. APIs and Microservices: RESTful APIs for e-commerce integration (e.g., product APIs, payment APIs).

UNIT IV: CMS Implementation and Customization: CMS Installation and Configuration: Setting up WordPress, Drupal, or Magento on a web server. Themes and Plugins: Customizing CMS with themes (e.g., Astra, Divi) and plugins (e.g., Yoast SEO, WooCommerce). Content Modeling: Designing content structures for e-commerce (products, categories, reviews). Headless CMS: Concepts and applications (e.g., Contentful, Strapi) for decoupled e-commerce architectures. SEO and Analytics: Optimizing CMS for search engines (meta tags, sitemaps) and integrating Google Analytics.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	E-Commerce: Strategy, Technology and Applications	David Whiteley	McGraw Hill
2.	Content Management Systems in Libraries: Case Studies	Bradford Lee Eden	Scarecrow Press

Course Code	CSA617
Course Title	**Network and Web Security**
Type of Course	EC
L T P	4:0:0
Credits	4
Course Prerequisites	To understanding the basics of Network and Web Security
Course Objective(s)	The main objective of this course is to provide conceptual as-well-as practical knowledge about various issues in network and web security.
Course Outcomes (CO)	The students will able to: 1. Understand Foot-printing and hacking 2. Understand types of attacks. 3. Analyze spoofing, hijacking and threats. 4. Understand Hacking and Intrusion Detection.

SYLLABUS

UNIT I:

Foot Printing : Information gathering methodology, Hacking Tools, Scanning- Definition, Types of Scanning, Objectives of Scanning, Scanning Methodology, Counter measures; Enumeration- NetBios Null Sessions, hacking tools – Enumerating User Accounts, Active Directory Enumeration and Countermeasures; System Hacking- Administrator password guessing, Password Cracking Algorithm, Automated Password Cracking, Types of Password Attacks, Hacking tools.

UNIT II:

Trojans and Backdoors: Overt and Covert Channels, Indications of a Trojan Attack, Reverse Engineering Trojans, Backdoor Countermeasures; Sniffers- Working of Sniffer, Passive Sniffing, Active Sniffing, Hacking tools, Sniffing Countermeasures; Denial of Service- Goal of DoS, Impact and Modes of Attack, DoS Attack Classification, Countermeasures for Reflected DoS, Tools for Detecting DDoS Attacks.

UNIT III:

Session Hijacking: Spoofing vs. Hijacking, Steps in Session Hijacking, Types of Session Hijacking, Hacking Tools, Protection against Session Hijacking, IP Security; Hacking Web Servers- Popular Web Servers and Common Security Threats, Apache Vulnerability, Attack against IIS Console, Hacking Tools, Countermeasures, Increasing Web Server Security; Web Application Vulnerabilities- Web Application Hacking, Anatomy of an Attack, Web Application Threats, Carnivore, Google Hacking, Counter measures.

UNIT IV:
Linux Hacking : Linux Vulnerabilities, Scanning Tools, Scanning Tools, Linux Security Tools, Advanced Intrusion Detection System, Linux Security Auditing Tool; Evading Firewalls. **Intrusion Detection Systems**: Intrusion Detection Tools, Penetration Testing, Penetration Test vs. Vulnerability

Test, Reliance on Checklists and Templates, Phases of Penetration Testing, Risk Analysis, Active Reconnaissance.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Hackers Beware: The Ultimate Guide to Network Security	Eric Cole	Sams
2.	The Secret of Hacking, 3rd Edition	Manish Kumar	Createspace Independent Publications

CSA607 Dissertation-I (Research Objectives)

L T P
0 0 8

Learning Objectives: To initiate the research project and prepare the objectives. Apart from it, gear up students for preparation of Dissertation-II in Semester-4th.

Students will select topics from the field of computer applications and based on a thorough review of literature on that topic, they will identify the problems and decide on plans of research for dissertation and prepare for Synopsis. Under the supervision of faculty members, they will execute their plans involving theoretical and/or experimental work. Students will have to prepare proper documentation consisting of SRS, Modeling Techniques, Development Strategies and Implementation and Testing Strategies. Student may use any Design Methodologies. This is done during phase 1. Regular reviews will be conducted.

CSA609 Professional Skills (Seminar)

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A student shall be expected to carry out intensive literature survey for a period of about two months in the field of interest and to select a topic for his/her dissertation in consultation with the faculty adviser assigned. The student shall then submit a report and deliver a seminar on the problem chosen by him/her to the panel of three departmental PG recognized faculty members. It shall be expected that a student justifies the gravity and also the relevance of the problem through his/her seminar. This shall be for the approval of synopsis.

CSA609 Professional Skills (Seminar)

CSA520 Six Weeks Industrial/ Institutional Training

L T P
N.A.

Six weeks of industrial training is a crucial part of the Master of Computer Applications (MCA) curriculum. It bridges academic learning with real-world industry experience.

Objectives:

1. Gain practical exposure to software development, IT infrastructure, or system analysis.
2. Apply theoretical knowledge in real-time projects.
3. Understand work ethics and corporate culture.
4. Enhance technical and communication skills.

Company/Organization Selection:

1. It can be IT companies, startups, MNCs, or government organizations and should offer relevant work in: Software development, Web/mobile app development, Data analytics or AI/ML, Cyber Security, Networking.
2. Must be approved by the Training & Placement Cell.

Work Expectations:

1. Work on real-time or dummy projects.
2. Participate in team meetings, development, testing, or documentation.
3. Follow company guidelines, ethics, and timelines.
4. Maintain a daily training diary.

Final Presentation:

1. Present to a panel of faculty members or internal/external examiners.
2. Include a demo of the project, challenges faced, and technologies learned.

Tools:

1. Word or LaTeX for documentation.
2. Proper formatting with page numbers, headers, and footers

Documentation & Reports:

Students must submit a Training Report at the end of the internship. It should include:

1. Title Page

2. Certificate (from company)

3. Acknowledgment

4. Company Profile

5. Project Title & Description

6. Technology Stack Used

7. Modules & Screenshots

8. Work done (with code snippets, diagrams, etc.)

9. Learning Outcomes

10. Challenges Faced

11. Conclusion & Future Scope

12. References

Fourth

Semester

Course Code	CSA602
Course Title	**Research Methodology-II (IPR)**
Type of Course	Major
L T P	4:1:0
Credits	5
Course Prerequisites	Basic understanding of research principles and methods.
Course Objective(s)	The main objective of this course is to equip students with the skills to conduct research effectively and to understand the importance of protecting intellectual creations.
Course Outcomes (CO)	The students will able to: 1. Understand research fundamentals. 2. Learn about data collection and analysis. 3. Understand Intellectual Property Rights and its models. 4. Patents and its registration process.

SYLLABUS

UNIT I:

Research Design: Overview of research process and design, Use of Secondary and exploratory data to answer the research question, Qualitative research, Observation studies, Experiments and Surveys.

UNIT II:

Data Collection and Sources: Measurements, Measurement Scales, Questionnaires and Instruments, Sampling and methods. Data Preparing, Exploring, examining and displaying. **Data Analysis and Reporting:** Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting insights and findings using written reports and oral presentation.

UNIT III:

Intellectual Property Rights: Intellectual Property – The concept of IPR, Evolution and development of concept of IPR, IPR development process, Trade secrets, utility Models, IPR & Bio diversity, Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.

UNIT IV:

Patents: Patents – objectives and benefits of patent, Concept, features of patent, Inventive step, Specification, Types of patent application, process E-filling, Examination of patent, Grant of patent, Revocation, Equitable Assignments, Licenses, Licensing of related patents, patent agents, Registration of patent agents.

RECOMMENDED BOOKS			
Sr. No.	**Name**	**Author(s)**	**Publisher**
1.	Research Methodology	C. R. Kothari	New Age International
2.	Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets	Catherine J. Holland	Entrepreneur Press

Course Code	CSA604
Course Title	**Design and Analysis of Algorithms**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Data Structures and Programming Skills
Course Objective(s)	The main objective of this course is to provide conceptual as well as practical knowledge of various Algorithm Designing techniques and their impact on programming.
Course Outcomes (CO)	The students will able to: 1. Analyze the asymptotic performance of algorithms. 2. Write rigorous correctness proofs for algorithms. 3. Demonstrate a familiarity with major algorithms and data structures. 4. Apply important algorithmic design paradigms and methods of analysis.

SYLLABUS

UNIT I: Introduction: Fundamentals of Algorithmic Problem solving, important problem types, Fundamentals of the Analysis of algorithm efficiency, asymptotic notation, general sorting algorithms, Mathematical Analysis of recursive and non-recursive algorithms, Master's Theorem.

UNIT II: Divide and Conquer: General method, binary search, ternary search algorithm, merge sort, quick sort, selection, Strassen's matrix multiplication, analysis of algorithms for these problems.
Greedy Method: General method, knapsack problem, job sequencing with deadlines, minimum spanning trees, single source paths, optimal storage on tapes, optimal merge patterns and analysis of these problems.

UNIT III: Dynamic Programming: General method, single source shortest path, all pair shortest path, optimal binary search trees, 0/1 knapsack, the traveling salesman problem, All pairs shortest path problem-Warshal's and Floyd's algorithms, Longest Common sequence (LCS). **Back Tracking:** General method, 8 queens' problem, graph coloring, sum of subsets, Hamiltonian cycles, and analysis of these problems.

UNIT IV: Branch and Bound: General Method, 0/1 knapsack and traveling salesman problem.**NP-Hard and NP-Completeness:** P, NP, NP-Hard, NP-Complete. **String Matching Algorithms:** KMP Algorithm, Rabin-Karp Algorithm.**Approximation Algorithms:** Travelling-salesman Problem.

RECOMMENDED BOOKS			
Sr. No.	Name	Author(s)	Publisher
1.	Algorithms Unlocked	Thomas H. Cormen	MIT Press
2.	Fundamentals of Computer Algorithms	Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran	University Press(India) Ltd.

Course Code	CSA606
Course Title	**Information Security & Cyber Law**
Type of Course	Major
L T P	4:0:0
Credits	4
Course Prerequisites	Basic knowledge of computer concepts, operating systems and networking.
Course Objective(s)	To equip learners with the knowledge and skills to understand, analyze, and address the challenges posed by cyber threats and cybercrimes, while also familiarizing them with the relevant legal and regulatory frameworks.
Course Outcomes (CO)	The students will able to:

The students will able to:
1. Learn latest authentication mechanisms.
2. Knowledge about various cyber attacks.
3. Get knowledge about cyber security and cyber forensics techniques.
4. Know about cyber laws.

SYLLABUS

UNIT I: Information Security: Need of Information Security, Attributes of Information Security, Authentication, Confidentiality, Integrity, Availability, and Non-Repudiation. Access Control, Threats and Vulnerabilities, Security Attacks, Unauthorized Access, Impersonation, Denial of Service, Malicious Software, Viruses, Worms, Trojan Horses. Definitions, Types of authentication, Password Authentication, Password Vulnerabilities &Attacks: Brute Force & Dictionary Attacks. Password Policy & Discipline, Single Sign-on – Kerberos, Alternate Approaches, Biometrics: Types of Biometric Techniques: False Rejection, False Acceptance, Cross over Error Rates.

UNIT II: Definition: Plain text, encryption, decryption, cipher text, key, ciphers, Symmetric and asymmetric cryptography, Public key , private key ,Crypt analysis, Cyber forensics. Substitution cipher (Caesar), Transposition cipher. Risk analysis, process, key principles of conventional computer security, security policies, data protection, access control, internal vs. external threat, security assurance, passwords, access control, computer forensics and incident response.

UNIT III: Cyber Attacks (definitions and examples): Denial-of-service attacks, Man-in-the middle attack, Phishing, spoofing and spam attacks, Drive by attack, Password attack, SQL injection attack, Cross-site scripting attack, Eavesdropping attack, Birthday attack, Malware attacks, Social Engineering attacks. Brief introduction of handling the attacks. Firewalls, logging and intrusion detection systems, e-mail security, security issues in operating systems, ethics of hacking and cracking.

UNIT IV: Definitions: Digital Signature and Electronic Signature, Digital Certificate, Penalty and compensation for damage to computer etc., Tampering with computer source documents, Punishment for sending offensive messages through, Punishment for dishonestly receiving stolen computer resource or communication device, Punishment for identity theft, Punishment for cheating by impersonation by using computer resource, Punishment for violation of privacy, Punishment for cyber terrorism, Punishment for publishing or transmitting obscene material in electronic form.

RECOMMENDED BOOKS

Sr. No.	Name	Author(s)	Publisher
1.	Computer Security: Concepts, Issues and Implementation	Basta, A., & Halton, W.	Cengage Learning India.
2.	Cyber Crimes and Laws	Sushila Madan	MKM Publishers Pvt. Ltd

Course Code	CSA608
Course Title	**Professional Skills (Technical Writing)**
Type of Course	Minor
L T P	2:0:0
Credits	2
Course Prerequisites	Basic writing skills; knowledge of sentence structure, grammar, and organization. Basic knowledge of a scientific or technical field.
Course Objective(s)	The primary objective of technical writing is to convey complex information to readers in a way that they can understand and apply, even if they have no prior knowledge of the subject.
Course Outcomes (CO)	The students will able to: 1. Demonstrate rhetorical knowledge to create effective technical writing documents for end users. 2. Apply and adapt flexible writing process strategies to produce clear, high-quality deliverables in a multitude of technical writing genres. 3. Use professional technical writing conventions of clean and clear design, style, and layout of written materials. 4. Write clearly, correctly, and concisely

SYLLABUS

1. Course Overview; Introduction; Getting Started

2. Reading and Reviewing

3. Korean Thanksgiving (no class)

4. Hypotheses, Questions, and Evidence

5. Writing a Paper; Good Style

6. Style Specifics, Punctuation

7. Mathematics; Algorithms

8. Graphs, Figures, and Tables

9. Other Professional Writing; Editing

10. Experimentation

11. Presentations; Ethics

12. Oral Presentations

RECOMMENDED BOOKS			
Sr. No.	Name	Author(s)	Publisher
1.	Technical Writing: Principles, Strategies, and Readings	Diana C. Reep	Pearson
2.	Reporting Technical Information	Ken W. Houp et al.	Oxford University Press

CSA610 Dissertation-II

L T P
0 0 6

Dissertation-II refers to the second part of the mandatory research. It builds upon the work completed in Dissertation-I, focusing on in-depth research, analysis, and the culmination of the student's scholarly work. The dissertation is a substantial piece of academic writing that demonstrates the student's ability to conduct independent research, analyze findings, and contribute to the field of study.

Key aspects of Dissertation-II:

1. **Continuation of Research:** Dissertation-II builds upon the research problem, methodology, and initial findings established in Dissertation-I.

2. **In-depth Analysis:** It involves a more detailed investigation, analysis, and interpretation of the research data and results.

3. **Original Contribution:** The dissertation should demonstrate the student's ability to make an original contribution to the field, whether through the development of a new method, the discovery of new insights, or the validation of existing theories.

4. **Scholarly Communication:** The dissertation should be written in a clear, concise, and scholarly manner, adhering to the specific formatting and citation guidelines of the institution.

5. **Publication:** MCA students are to publish their research findings in reputable journals or conference proceedings.

6. **Grading:** The dissertation is usually graded based on the quality of research, the originality of contribution, the clarity of writing, and the effectiveness of the defense.

7. **Examples of Content:**
   - Introduction, including a clear statement of the research problem and objectives.
   - Literature review, providing a comprehensive overview of the existing research in the field.
   - Methodology, describing the research methods and techniques used.
   - Results and Discussion, presenting the findings of the research and discussing their implications.
   - Conclusion, summarizing the main findings and suggesting directions for future research.
   - References, listing all the sources cited in the dissertation.

CSA612 Professional Skills (Seminar)

L T P
0 0 2

The Professional Skills (Seminar) covers foundational concepts, the research process, types of research, and data analysis methods. It also includes presenting Power-point presentation on research ethics, report writing, and potentially specific techniques relevant to the field of study. Submit a report including the following topics:

1. Introduction to Research

2. Research Design and Planning

3. Data Collection Methods

4. Data Analysis:

5. Research Report Writing