।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

Phone: (02462) 229542   Website: www.srtmun.ac.in   E-mail: bos.srtmun@gmail.com
Fax   : (02462) 229574

प्रस्तुत विद्यापीठाच्या संगणकशास्त्र संकुलामधील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील **M. Sc. Computer Application I Year** या विषयाच्या अभ्यासक्रम शैक्षणिक वर्ष २०२०—२१ पासून लागू करण्याबाबत.

परिपत्रक

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, प्रस्तुत विद्यापीठाच्या संगणकशास्त्र संकुलातील, **विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील M. Sc. Computer Application I Year या विषयाच्या C.B.C.S. (Choise Based Credit System) Pattern** नुसारच्या अभ्यासक्रमास शैक्षणिक वर्ष २०२०—२१ पासून लागू करण्याच्या दृष्टीने मा. कुलगुरू महोदयांनी मा. विद्यापरिषदेच्या मान्यतेच्या अधीन राहून मान्यता दिलेली असून त्यानुसार **M. Sc. Computer Application I Year** या विषयाचा अभ्यासक्रम लागू करण्यात येत आहे.

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

जा.क्र.:शैक्षणिक—१ / परिपत्रक / पदव्युत्तर—सीबीसीएस अभ्यासक्रम /

R-२०२०—२१ / २७७९

दिनांक : २२.०२.२०२१

स्वाक्षरित
उपकुलसचिव
शैक्षणिक (१—अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. अधिष्ठाता विज्ञान व तंत्रज्ञान, यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.
५) अधिक्षक, परिक्षा विभाग विज्ञान विद्याशाखा प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University, Nanded

(NAAC Re-accredited with 'A' Grade)

Syllabus of

M.Sc. (Computer Application) (Campus)

(2 years) (Revised CBCS pattern)

Introduced from Academic Year 2020-2021

Program code: SCS-S-MSCA-PG (13-2-1-01)

Introduced from Academic Year 2020-2021

M.Sc. Computer Application (Campus)

M.Sc. Computer Application (2years) program / degree is a specialized program in latest advances in computer application issues. It builds the student on higher studies and research awareness in overall computational application fields so as to become competent in the current race and development of new computational sciences. The duration of the study is of four semesters, which is normally completed in two years.

CBCS pattern : The M.Sc. Computer Application program as per CBCS (Choice based credit system) pattern, in which choices are given to the students under open electives and subject electives. The students can choose open electives from the wide range of options to them.

Eligibility and Fees

The eligibility of a candidate to take admission to **M.Sc. Computer Application program** is as per the eligibility criteria fixed by the University. More details on admission procedure and fee structure can be seen from the prospectus of the college / institution as well as on website of the University.

Credit Pattern

Every course has corresponding grades marked in the syllabus structure. There are 25 credits per semester. A total of 100 credits are essential to complete this program successfully. The Grading pattern to evaluate the performance of a student is as per the University rules. Every semester has a combination of Theory (core or elective) courses and Lab courses. Each theory course has 04 credits which are split as 02 external credits and 02 internal credits. The university shall conduct the end semester examination for 02 external credits. For theory internal credits, student has to appear for 02 class test (15 marks) and 01 assignment (20 marks). Every lab course has 02 credits which are split as 01 external credit and 01 internal credit. For lab internal credit, the student has to submit Laboratory Book (05 marks) and remaining 20 marks are for the Lab activities carried out by the student throughout the semester. For lab external credit, 20 marks are reserved for the examinational experiment and 05 marks are for the oral / viva examinations. There is a special skill based activity of 01 internal credits per semester which shall inculcate awareness regarding the domain of computers, IT, and ICT.

The open elective has 02 credits which are split as 01 external credit and 01 internal credit. Students are encouraged to opt for online courses / MOOCs /etc. The credit transfer shall be done as per the University policy. If students are opting for MOOCs as open elective, then, there must be a Faculty designed as MOOCs course coordinator who shall supervise learning through MOOCS. This is intentionally needed as the MOOCs course coordinator shall verify the MOOC details including its duration, staring date, ending date, syllabus contents, mode of conduction, infrastructure feasibility, and financial feasibility during start of each semester. This is precautionary as the offering of the MOOCs through online platforms are time specific and there must be proper synchronization of semester duration with the MOOCs duration. Students must opt for either institutional / departmental/school level open elective or a course from University recognized MOOCs platforms as open electives.

The number of hours needed for completion of theory and practical courses as well as the passing rules, grading patterns, question paper pattern, number of students in practical batches, etc shall be as per the recommendations, norms, guidelines and policies of the UGC, State Government and the SRTM University currently operational. The course structure is supplemented with split up in units and minimum numbers of hours needed for completion of the course, wherever possible. The new Question paper pattern as per the suggestion of Hon'ble Vice Chancellor sir which will be communicated later after due approval. Under the CBCS pattern, students would graduate **M.Sc. Computer Application** with a minimum number of required credits which includes compulsory credits from core courses, open electives and program specific elective course. All students have to undergo lab / practical activities leading to specific credits and project development activity as a part of professional PG program. The M.Sc. Computer Application Degree / program would be of 100 Credits and total credits per semester are 25. As per the guidelines, One Credit = 25 marks, Two Credits = 50 Marks, Four Credits = 100 Marks. Minimum four hours teaching per week is compulsory for 04 credit course and likewise for other variations in the credits. There must be minimum 60 lectures per semester for a theory course.

Credit Distribution per Semester:

Sr. No.	Category of courses	Credits
1	Core Theory	12
2	Discipline Specific Electives Theory	04
3	Open Elective /MOOC/ RUSA Future Oriented	02
4	Core- Practicals / Projects	04
5	Elective Practicals / Projects	02
6	Skill Oriented	01
	Total Credits per Semester	25
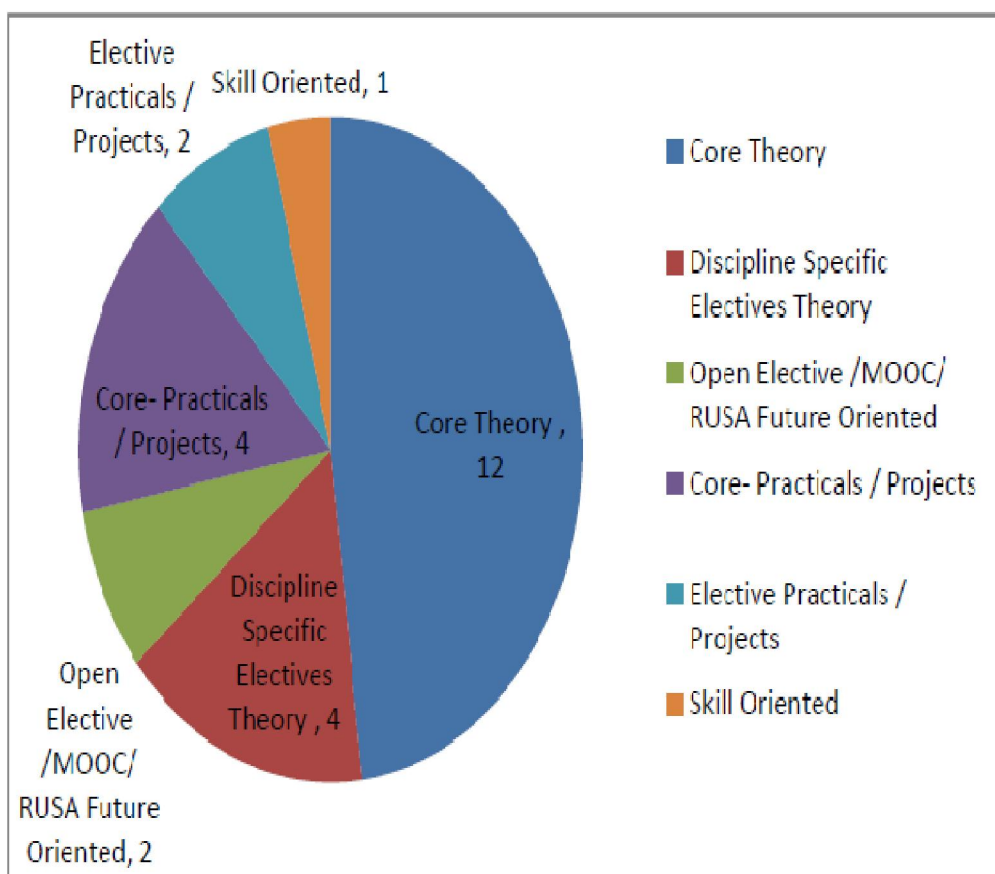
PEO, PO and CO Mappings

1. **Program Name** : M.Sc.(CA) Campus { SCS-S-MSCA-PG (13-2-1-01)}

2. **Program Educational Objectives**: After completion of this program, the graduates / students would

PEO I :Technical Expertise	Implement fundamental domain knowledge of core courses for developing effective computing solutions by incorporating creativity and logical reasoning.
PEO II : Successful Career	Deliver professional services with updated technologies in computational science based career.
PEO III :Hands on Technology and Professional experience	Develop leadership skills and incorporate ethics, team work with effective communication & time management in the profession.
PEO IV :Interdisciplinary and Life Long Learning	Undergo higher studies, certifications and research programs as per market needs.

1. **Program Outcome(s):** Students / graduates will be able to
   PO1: Apply knowledge of mathematics, science and algorithm in solving Computer problems.
   PO2: Generate solutions by understanding underlying computer application environment
   PO3: Design component, or processes to meet the needs within realistic constraints.
   PO4: Identify, formulate, and solve problems using computational temperaments.
   PO5: Comprehend professional and ethical responsibility in computing profession.
   PO6: Express effective communication skills.
   PO7: Recognize the need for interdisciplinary, and an ability to engage in life-long learning.
   PO8: Actual hands on technology to understand it's working.
   PO9: Knowledge of contemporary issues and emerging developments in computing profession.
   PO10: Utilize the techniques, skills and modern tools, for actual development process
   PO11: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings in actual development work
   PO12: Research insights and conduct research in computing environment.

2. **Course Outcome(s):** Every individual course under this program has course objectives and course outcomes (CO). The course objectives rationally match with program educational objectives. The mapping of PEO, PO and CO is as illustrated below

3. **Mapping of PEO& PO and CO**

Program Educational Objectives	Thrust Area	Program Outcome	Course Outcome
PEO I	Technical Expertise	PO1,PO2,PO3,PO6	All core courses
PEO II	Successful Career	PO4,PO5,PO11,	All discipline specific electives courses
PEO III	Hands on Technology and Professional experience	PO8,PO10	All Lab courses
PEO IV	Interdisciplinary and Life Long Learning	PO7,PO9,PO12	All open electives and discipline specific electives

The detailed syllabus is as below,

M.Sc.(CA) Campus { SCS-S-MSCA-PG (13-2-1-01)}
Revised in 2020-2021,
w.e.f Academic year 2020-2021

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
First Semester						
1.	Core Subjects	CCA-101	Computer Organization and Architecture	2	2	4
2		CCA-102	Introduction to Data Structures and Algorithms	2	2	4
3		CCA-103	Introduction to Databases	2	2	4
Choose any one from below elective subjects						
4	Elective Subject	CCA-104 A	Programming Language Concepts	2	2	4
		CCA-104 B	Mathematical Foundations for Computer Science			
Practical /Lab						
5	Lab / Practical	CCA-105	Lab-1:COA + DSA	1	1	2
		CCA-106	Lab-2: Databases	1	1	2
		CCA-107	Lab-3 :Based on Elective	1	1	2
6	Open Elective	CCA-108A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR RUSA sponsored Future Oriented Courses	1	1	2
		CCA-108 B	Introduction to E-Commerce			
7	Skill based Activity	CCA-109	SK-01 : Assembly of Computers	1	0	1
	Total credits					25

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
			Second Semester			
1.	**Core**	CCA-201	Essentials of Operating Systems	2	2	4
2	**Subjects**	CCA-202	Computer Networks	2	2	4
3		CCA-203	Design and Analysis of Algorithms	2	2	4
			Choose any one from below elective subjects			
4	**Elective Subject**	CCA-204 A	Programming in Java	2	2	4
		CCA-204 B	Information Security and Cryptography			
			Practical /Lab			
5	**Lab / Practical**	CCA-205	Lab-4: OS+ CN	1	1	2
		CCA-206	Lab-5: DAA	1	1	2
		CCA-207	Lab-6 : Based on Elective	1	1	2
6	**Open Elective**	CCA-208A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR RUSA sponsored Future Oriented Courses	1	1	2
		CCA-208 B	Introduction to Linux			
7	**Skill based Activity**	CCA-209	SK-02 : Networking Essentials	1	0	1
	Total credits					25

Course Code:	CCA -101	Computer Organization and Architecture	Credits: 4

Course Objectives:
1. To aware Computer System architecture
2. To learn data processing
3. To understand digital circuits and its use

Course Outcome:
1. Students will be able to handle the digital circuits
2. Students will be able to perform micro operations

Unit-1:	**Digital Logic Circuits**
	Digital Computers, Logic Gates, Boolean Algebra, Map Simplification, Combinational Circuits, Flip-Flops, Sequential Circuits. Digital Components: Integrated Circuits, Decoders, Multiplexers, Registers, Shift Registers, Binary Counters, Memory Unit. Data Representation: Data Types, Complements, Fixed Point Representations, Floating Point Representation, Binary Codes, and Error Detection Codes.
Unit-2:	**Register Transfer and Micro operations**
	Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Micro operations, Logic Micro operations, and Shift Micro operations. Basic Computer Organization and Design: Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory Reference Instructions, Input-Output and Interrupt, Design of Accumulator Logic. Programming the Basic Computer: Machine Language, Assembly Language, The Assembler Program Loops, Programming Arithmetic and Logic Operations, Subroutines, Input-Output Programming.
Unit-3:	**Central Processing Unit**
	Introduction, General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced Instruction Set Computer (RISC). Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipelines, Instruction Pipelines
Unit-4:	**Input-Output Organization**
	Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, Direct Memory Access (DMA), Input-Output Processor, Serial Communication.
Unit-5:	**Memory Organization**
	Memory Hierarchy, Main Memory, RAM and ROM, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.
Prescribed Book	
1.	William Stallings, Computer Organization and Architecture
Text Books:	
1.	Andrew S. Tanenbaum, Structured Computer Organization
Reference Books	
1.	M. Morris Mano, Computer System Architecture(3e)

2.	Sajjan G. Shiva, Computer Organization, Design and Architecture

Course Code:	CCA -102	Introduction to Data Structures and Algorithms	Credits: 4

Course Objectives:

1. It will demonstrate familiarity with major algorithms and data structures.
2. Understand working of algorithms.
3. Choose the appropriate data structure and algorithm design method for a specified application.
4. Use various data structures effectively in application programs.
5. Demonstrate understanding of various sorting algorithms, including bubble sort, insertion sort, selection sort, merge sort, quick sort and heap sort.

Course Outcome:

1. Explain the organization and operations of selected data structures
2. Compare and contrast the functionalities and applications of different data structures
3. Demonstrate specific search and sort algorithms using data structures given specific user requirements.
4. Apply the operations of data structures in designing software procedures based on specific

Unit-1:	Introduction to Algorithm

Introduction to Algorithm, characteristics, writing algorithms, analysis of algorithms, Space and Time Complexities, Asymptotic notations

Unit-2:	Linear Data Structures

Introduction to Data, Variables (Local and Global), Data types.
Basic definition, representations, characteristics, types, applications, primitive data structure operations of linear data structures like arrays, stacks, queues, linked lists.

Unit-3:	Non Linear Data Structures

Basic definition, representations, characteristics, types, applications, primitive data structure operations of linear data structures like Trees and Graphs

Unit-4:	Sorting and Searching

Introduction to searching and sorting problems, Linear search , Binary search, Selection sort , Bubble sort , Insertion sort , Merge sort, Complexities of searching and sorting algorithms.

Unit-5:	Heaps and Multi-way Trees

Heap Structures and basic algorithms, M-way search trees, B- trees, insertion, deletion, traversing, searching, combining B- trees

Prescribed Book	
1	Data Structures, Lipschutz , Tata McGraw Hills.

Text Books:	
1.	Fundamentals of Computer Algorithms- Ellis Horowitz, Satraj Sahani,

Reference Books	
1.	How to solve it by Computers- R.G. Dromey , 8th Edition , Pearson Education
2.	Elementary Data Structures, Andrew S. Tanenbaum

Course Code:	CCA -103	Introduction to Databases	Credits: 4

Course Objectives:

1. To understand the features of Relational database.
2. To describe data models and schemas in DBMS.
3. To use SQL- the standard language of relational databases for database operations.
4. To understand the functional dependencies and design of the databases.

Course Outcome:

1. To study the basic concepts of relational databases
2. Learn and practice data modelling using the entity-relationship and developing database designs.
3. Understand the use of Structured Query Language (SQL) and learn SQL syntax for writing queries.
4. Apply normalization techniques to normalize the databases.

Unit-1:	Introduction

Problems in Traditional file oriented approach, Three level architecture of DBMS, basic database components like schema, views, instances, General Architecture of DBMS, Roles of DBA, Data Dictionary, Advantages and Disadvantages of DBMS.

Unit-2:	Data Models

Concepts of Abstraction and Data Model, Discussions on data modeling using Entity Relationship model, Discussions on data modeling using Relational Model, E-R to Relational Conversion.

Unit-3:	Relational Algebra

Basics of Relational Algebra, selection, projection, division, cross product Operators Set Operators, Join and its types, writing Relational Algebra notations for user queries.

Unit-4:	Normalization

Introduction to attributes, Keys, relationships and their types, Anomalies in databases, understanding Functional Dependencies(Determinant, partial, full, transitive, multi valued, etc), normalization process, First Normal form, Second Normal Form, Third Normal Form etc. , Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form.

Unit-5:	SQL

Introduction to data retrieval languages like QBE, QUEL, SQL Discussions on SQL, Table , View Definitions ,DDL Statements, DML Statements, DCL Statements , TCL statements , SQL Functions ,Introduction to PL/SQL , Cursors.

Prescribed Books

1	Database System Concepts- Silber Schatz Korth, Tata McGraw Hill.

Text Books:

1.	Database Management Systems- Raghu Ramakrishnan, Johannes, Gehrke, Tata McGraw Hill.

Reference Books

1.	Fundamental of Database System- Sham Kanth B. Navathe, Pearson Education.
2.	Introduction to Database management System- Bipin Desai, Galgotia Publications.
3.	Oracle Development Language Oracle PL/SQL Programming, Steven Feuerstein , O'Reilly
4.	ORACLE documentations on ORACLE PRESS / Internet.

Course Code:	CCA -104 A Elective	Programming Language Concepts	Credits: 4

Course Objectives:

1. To help the students understand the fundamental concepts of programming Languages.
2. To prepare students about the need and use of data structures
3. To prepare students to identify and apply data structures for problem solving

Course Outcome:

1. Understanding the concepts of evolution of programming languages.
2. Understanding the concepts of object oriented languages, functional and logical programming languages
3. Analyzing the methods and tools to define syntax and semantics of a languages
4. Analyzing the design issues involved in various constructs of programming languages
5. Apply the concepts and identify the issues involved in other advanced features of programming languages

Unit-1: The role of Programming Languages

Introduction to Languages, Basic types of languages (Machine, Assembly, High level Languages), Toward Higher-Level Languages, Programming Paradigms, Language Implementation: Bridge the Gap.

Unit-2: Language Description: Syntactic Structure

Expression Notations, Abstract Syntax Trees, Lexical Syntax: Tokens and Spellings, Context-Free Grammars, Grammars for Expressions, Handling Associativity and Precedence.

Unit-3: Statements: Structured Programming

Need for Structured Programming, Syntax-directed Control Flow (conditional, Looping Construct, for, Selection Case) Design considerations: Syntax, Programming with Invariants.

Unit-4: Types: Data Representation

The role of types, Basic types, Arrays: Sequence of elements, Records: Name Fields, Union and Variant Records, Sets, Pointers.

Unit-5: Procedure Activations and Logic Programming

Introduction to Procedures, Parameter-Passing Methods, Scope Rules for Names, Nested Scopes in the Source Text, Activation Records, Lexical Scope., Computing with relations, Introduction to Prolog, Data Structure in Prolog, Programming Techniques, Control in Prolog, cuts.

Prescribed Books

1.	Programming Languages Concepts and constructs- Ravi Sethi, Pearson Education.

Text Books:

2.	Concepts of Programming Languages- Robert .W. Sebesta, Pearson Education.
3.	Programming Language Design Concepts- D. A. Watt, Wiley Dream Tech.

Reference Books

1.	Programming Languages- A. B. Tucker, R. E. Noonan, 2nd Edition, TMH.
2.	Programming Languages- K. C. Louden, 2nd Edition, Thomson Press.

Course Code:	CCA -104 B Elective	Mathematical Foundations for Computer Science	Credits: 4

Course Objectives:

1. Cultivate clear thinking and creative problem solving.
2. Thoroughly train in the construction and understanding of mathematical proofs.
3. Exercise common mathematical arguments and proof strategies.

Course Outcome:

1. At the end of the course student will be able to understand the notion of mathematical thinking, mathematical proofs and to apply them in problem solving.
2. Ability to understand use of functions, graphs and their use in programming applications.
3. Apply discrete structures into computing problems, formal specification, artificial intelligence, cryptography, data analysis.

Unit-1:	Introduction

Sets, Venn diagrams, Operations on Sets, Laws of set theory, Power set and Products, Partitions of sets, The Principle of Inclusion and Exclusion.

Unit-2:	Propositions and Logical Operations

Propositions and logical operations, Truth tables , Equivalence, Implications ,Laws of logic, Normal Forms, Predicates and Quantifiers, Mathematical Induction.

Unit-3:	Relations, Paths and Digraphs

Relations, Paths and Digraphs, Properties and types of binary relations , Operations on relations, Closures, Warshalls algorithm, Equivalence and partial ordered relations, Poset, Hasse diagram and Lattice ,Functions: Types of functions - Injective, Surjective and Bijective Composition of functions , Identity and Inverse function, Pigeon-hole principle.

Unit-4:	Permutations and Combinations

Permutations, Combinations, Elements of Probability, Discrete Probability and Conditional Probability, Generating Functions and Recurrence Relations, Recursive Functions, Introduction to Functional Programming, Graphs Definitions, Paths and circuits: Eulerian and Hamiltonian, Types of graphs, Sub Graphs Isomorphism of graphs.

Unit-5:	Algebraic structures

Algebraic structures with one binary operation: semigroup, monoid and group, Abelian group Isomorphism, Homomorphism and Automorphism, Cyclic groups, Normal subgroups, Codes and group codes.

Prescribed Book	
1	Discrete Mathematical Structures- C. L. Liu, Second Edition, McGraw-Hill Book

Text Books:	
1.	Discrete Mathematical Structures- Bernad Kolman, Robert Busby, Pearson Education.
2	Discrete Mathematics and applications- K. H. Rosen, Tata McGraw Hill publishing

Reference Books	
1.	Discrete Mathematical Structures- Y N Singh, Wiley-India Press.
2.	Discrete Mathematics for Computer Scientists and Mathematicians- J. L. Mott, A.Kandel, Prentice Hall of India.
3.	Discrete Mathematical Structures with Applications to Computer Science- Discrete Mathematics for Computer Scientists and Mathematicians, Tata Mcgraw-Hill.

Course Code:	CCA -105	Course Name: Lab-1 : COA+DSA	Credits: 02
Course Objectives: As per the Lab Manual circulated to students by the concerned Teacher			
Course Outcome: As per the Lab Manual circulated to students by the concerned Teacher			
Experiments As per the Lab Manual circulated to students by the concerned Teacher			

Course Code:	CCA -106	Course Name: Lab-2 : Databases	Credits: 02
Course Objectives: As per the Lab Manual circulated to students by the concerned Teacher			
Course Outcome: As per the Lab Manual circulated to students by the concerned Teacher			
Experiments As per the Lab Manual circulated to students by the concerned Teacher			

Course Code:	CCA -107	Course Name: Lab 3 : Based on Elective	Credits: 02
Course Objectives: As per the Lab Manual circulated to students by the concerned Teacher			
Course Outcome: As per the Lab Manual circulated to students by the concerned Teacher			
Experiments As per the Lab Manual circulated to students by the concerned Teacher			

Course Code:	CCA - 108 A	Open Elective	Credits: 02
Open Elective : University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses OR RUSA sponsored Future Oriented Courses			

OR

Course Code:	CCA -108 B	Introduction to E-Commerce	Credits: 2
Course Objectives:			
1. To gain an understanding of the theories, concepts and business models of E-Commerce.			
2. To make students familiar with required mechanisms for conducting business transactions through electronic means.			
3. To understand the methodology for online business dealing and payments using E-Commerce infrastructure.			
4. To develop an understanding of students relating to the legal and regulatory environment and security issues of E-Commerce			
Course Outcome:			

1. At the end of learning this course the students will be able to;
2. Understand basic electronic commerce functions, client/server infrastructure that supports the E-Commerce.
3. Perform and handle business transactions through different online and electronic means.
4. Perform online business dealing and payments using E-Commerce infrastructure.
5. Understand the legal and ethical, security issues related to the E-Commerce.

Unit-1:	Introduction to E-commerce

Evolution of E-Commerce, Definition of E-Commerce, Functions and Scope of E-Commerce, Difference between E-Commerce and E-Business Models, Types of E-Commerce and its characteristics, E-Commerce business models, Limitations and Advantages of E-Commerce, Internet, Intranet, Extranet and Browsers.

Unit-2:	EDI and UN/EDIFACT standard

EDI and electronic messaging, Benefits of EDI, EDI Architecture, EDI Components, EDI softwares, communication of EDI messages, EDI implementation issues, introduction of UN/EDIFACT and its message, interchange structure, UN/EDIFACT message directories, commerce over internet and extranet, storage area network.

Unit-3:	Legal and Regulatory environment and Security issues of E-commerce

Legal issues, Risks (Paper document Vs electronic documents), authenticating electronic documents, laws for E-Commerce, EDI agreement, legal issues for internet commerce, Introduction to cyber crimes, cyber attacks, hacking, cyber Laws in India, firewalls, intrusion detection system, SSL, cryptography based solutions, digital signatures, Public key cryptography (Encryption and concepts of public and private key infrastructure), protocols for secure messaging, key management, VPN, developing security policies, CERT

Unit-4:	Electronic Payment Systems and Internet Banking

Introduction to Electronic Payment System (EPS), components of EPS, payment gateways, Types of e-payment System, Internet Banking, PayPal, SET protocol, financial payments (Large-scale or wholesale payments, Small-scale or retail payments, Home banking), Retailing payments(Credit Cards, Private label credit/debit cards, Charge Cards), On-line electronic commerce payments(Token-based payment systems (Electronic cash, Electronic checks, Smart cards or debit cards), Credit card-based payments systems, Digital token-based electronic payments systems), E-cash and currency servers, E-cheques, credit cards, smart cards, electronic purses and debit cards.

Unit-5:	M-Commerce

Introduction to Mobile Commerce, Mobile Marketing, M-commerce Applications, M-commerce Strategy and Security, Social and Ethical Issues in M-commerce.

Prescribed Book	
1	E-Commerce: The cutting edge of Business By Kamlesh K. Bajajand Debjani Nag, Second edition, Tata McGraw Hill company publishing.

Text Books:	
1.	E-Commerce: Business, Technology, Society, By Kenneth C. Laudon, Carol Guercio Travor, 10th edition Published by Pearson education.

Reference Books	
1.	E-Commerce: By Sarika Gupta and Gaurav Gupta, Khanna Publishers, 2nd Revised edition.
2.	E-Commerce: A simplified approach, By Munesh Chandra Trivedi, Jaico Publishing House, First edition.

Course Code:	CCA -109	Skill based Activity SK- 01: PC Assembly and Maintenance	Credits: 01

Scope : Practically understand the PC and surrounding peripherals. The student will assemble / setup and upgrade personal computer systems; install OS and other application software, diagnose and isolate faulty components; optimize system performance and install / connect peripherals.

Second Semester

Course Code:	CCA -201	Essentials of Operating Systems	Credits: 4

Course Objectives:

1. To learn the fundamentals of Operating Systems.
2. To learn the mechanisms of OS to handle processes and threads and their communication
3. To learn the mechanisms involved in memory management in contemporary OS
4. To gain knowledge on distributed operating system concepts that includes architecture, Mutual exclusion algorithms, deadlock detection algorithms and agreement protocols
5. To know the components and management aspects of concurrency management
6. To learn programmatically to implement simple OS mechanisms

Course Outcome:

1. Analyse the structure of OS and basic architectural components involved in OS design
2. Analyse and design the applications to run in parallel either using process or thread models of different OS
3. Analyse the various device and resource management techniques for timesharing and distributed systems

Unit-1:	Overview of Operating System

Operating system objectives and functions, Evolution of OS, Characteristics of modern OS, Basic concepts: Processes, Files, System calls, Shell, Kernel architectures: Monolithic, Micro-kernel, Layered, Kernel mode of operations.

Unit-2:	Process Management

Process description: Process, Process States, Process Control Block (PCB), Threads, Thread management. Process Scheduling: Types, Comparison of different scheduling policies.

Unit-3:	Process Co-ordination

Principles of Concurrency, Race condition and critical section, Mutual Exclusion, Semaphores, Message Passing, Deadlock: Principles of Deadlock, Deadlock Detection, Deadlock Avoidance, Deadlock Prevention.

Unit-4:	Memory Management and Input Output Management

Memory Management Requirements, Memory Partitioning, Virtual memory: Paging; Segmentation; Page replacement policies, I/O Devices, Organization of the I/O Function, Operating System Design Issues, I/O Buffering, Disk Scheduling and disk scheduling algorithms.

Unit-5:	File System

File concept, Access methods, Directory and disk structure, File system mounting, File sharing, Protection.

Prescribed Book

1	Operating Systems Concepts- Silberschatz A., Galvin P., Gagne G, Wiley Publication

Text Books:	
1.	Modern Operating Systems, Andrew S. Tanenbaum, III rd Edition, PHI Publication.
Reference Books	
1.	Operating System-Internal and Design Principles, William Stallings, Pearson Education.
2.	Principles of Operating Systems-Naresh Chauhan, First Edition, Oxford University press.
3.	Operating Systems in Depth- Thomas W. Doeppner, Wiley Publications..

Course Code:	CCA -202	Computer Network	Credits: 4
Course Objectives:			

1. To understand the basic concepts of computer network and firm foundation for understanding how data communication occurring using computer network.
2. Knowledge of the OSI Reference Model which deals with the major issues and related protocol studies in the various layers (Physical, Data Link, Network, Transport, Session, Presentation and Application) of the model.

Course Outcome:

1. Ability to analyze the requirements for a given organizational structure and select the most appropriate networking architecture and technologies
2. Specify and identify deficiencies in existing protocols, and then go onto formulate new and better protocols;
3. Analyze, specify and design the topological and routing strategies for an IP based networking infrastructure
4. Have a working knowledge of datagram and internet socket programming

Unit-1:	Introduction to computer networks and Internet

Understanding of network and Internet, The network edge, The network core, Understanding of Delay, Loss and Throughput in the packet-switching network, protocols layers and their service model, History of the computer network

Unit-2:	Application Layer

Principles of computer applications, Web and HTTP, E-mail, DNS, Socket programming with TCP and UDP

Unit-3:	Transport Layer

Introduction and transport layer services, Multiplexing and Demultiplexing, Connection less transport (UDP), Principles of reliable data transfer, Connection oriented transport (TCP), Congestion control.

Unit-4:	Network Layer

Introduction, Virtual and Datagram networks, study of router, IP protocol and addressing in the Internet, Routing algorithms, Broadcast and Multicast routing

Unit-5:	The Link layer and Local area networks

Introduction and link layer services, error-detection and correction techniques, Multiple access protocols, addressing, Ethernet, switches.

Unit-6:	Introduction to LAN

Devices, Topologies, Tools, Cables, Configuration

Prescribed Book.	

	1. Computer Networks (4th edition), Andrew Tanenbaum, Prentice Hall
Text Books:	
1.	Computer Networking-A Top-Down approach, 5thedition, Kurose and Ross, Pearson
Reference Books	
1.	Computer Networking and the Internet (5thedition),Fred Halsall, Addison Wesley
2.	Data Communications and Networking (4th edition), Behrouz Forouzan, McGraw Hill

Code:	CCA -203	Design and Analysis of Algorithms	Credits: 04

Course Objectives:

1. Reinforce basic design concepts (e.g., pseudo code, specifications, top-down design)
2. Knowledge of algorithm design strategies
3. Familiarity with an assortment of important algorithms
4. Ability to analyze time and space complexity

Course Outcome:

1. Ability to analyse algorithm
2. Ability to propose efficient algorithms
3. Ability to think on complexity issues

Unit-1:	Introduction

Review of Algorithms , complexity notations, elementary data structures , Graphs and Trees Algorithms on graphs including searching algorithms like DFS and BFS , Shortest path Algorithms like , the Bellman-ford algorithm, the Dijkstra algorithm ,the Floyd-Warshall algorithm, Johnson"s algorithm.

Unit-2:	Divide and Conquer

Divide and conquer mechanism ,General method, binary search, merger sort, quick sort, Strassen" s matrix multiplication.

Unit-3:	Greedy Methods

The Greedy method ,The general method, container loading knapsack problem, job sequence with deadlines. Introduction to Spanning trees , Minimum Spanning Trees ,Growing a minimum spanning tree, the algorithms of Kruskal and Prim.

Unit-4:	String Matching Algorithms

Introduction to String matching: Robin – Karp algorithm, Knuth – Morris Pratt algorithm, Algorithm for parallel computers, parallelism, the PRAM models and simple PRAM algorithms. Amortized Analysis method , Aggregate Analysis, The Accounting Method Dynamic Programming mechanism : General method and one example.

Unit-5:	

Introduction to NP completeness , Polynomial Time , Polynomial Time Verification , NP Completeness and reducibility, NP completeness proofs , NP completeness problems

Prescribed Book

1	Introduction to Algorithms, Corman , Leiserson and others , 2nd edition , PHI

Text Books:

1.	Fundamentals of Computer Algorithms, Ellis Horowitz, Satraj Sahani, Universities Press Inc
2.	Design and Analysis of Algorithms , Dave and Dave , Pearson Education Inc

Reference Books

1.	Data Structures, Lipschutz , Tata McGraw Hills
2.	Design Methods and Analysis of Algorithms , S.K.Basu , PHI.
3.	The Art of Computer Programming, Vol 1,2,3 , Dr.Kunth , Addison Wesley
4.	The Design and Analysis of Computer Algorithms, Aho , Hopcroft and Ullman, Addison Wesley.

Course Code:	CCA -204 A Elective	Programming in Java	Credits: 4

Course Objectives:

1. The objective of this course is to create Java programs that leverage the object-oriented features of the Java language, such as encapsulation, inheritance and polymorphism, use data types, arrays and other data collections, implement error-handling techniques using exception handling, create and event-driven GUI using Applet.

Course Outcome:

1. To design, write, compile, test and execute straightforward programs using a high level language.
2. To implement, compile, test and run Java programs comprising more than one class, to address a particular software problem
3. To demonstrate the ability to use simple data structures like arrays in a Java program.

Unit-1:	Introduction to Java

History, Features, How java differ from C and C++?, Java program structure, Java tokens, Java Statements, Java virtual machine, Command line arguments, Constants, Variable, Data types, Type casting.

Unit-2:	Operators and Expression

Decision making and branching, Decision making and looping, Class, Methods, Objects, Constructors, Method overloading, Static members, nesting of methods.

Unit-3:	Inheritance

Overriding methods, Final variables, Final methods, Final Classes, Finalizer method, Abstract methods, Abstract Classes, Visibility Control, Interface, Arrays, Strings, Vectors, Wrapper Classes.

Unit-4:	System Packages

Naming conventions, Creating and accessing packages, Introduction to multithreaded programming, Creating and extending threads, Life cycle of thread, Thread exception, Thread priority, Synchronization, Implementing Runnable interface, Types of errors, Exceptions, Exception handling code, Multiple catch statements, finally statement, Throwing our own exceptions, Exception for debugging.

Unit-5:	Introduction to Applet and the Graphic Class

How applet differ from application?, Applet code, Applet life cycle, Creating an executable applet, designing a web page, Applet tag, Passing parameter to applet. Lines, Rectangles, Circles, Ellipses, Arcs, Polygons, Line graphs, Bar charts, Control loops in applet

Prescribed Book	
1	Programming with Java A Primer – E.Balaguruswamy, McGraw Hill.

Text Books:	
1	Java 7 Programming Black Book -Kogent Learning Solutions Inc,DreamTech press.

Reference Books	
1.	Java Fundamentals A comprehensive introduction- Herbert Schildt, Dale Skrien, McGraw Hill Education.
2.	The Complete Reference, Java 2 -, Herbert Schild, (Fourth Edition) - TMH.
3.	Core Java Volume-I Fundamentals- Horstmannand Cornell, - Pearson Education.

Code:	CCA -204 B Elective	Information Security and Cryptography	Credits: 04

Course Objectives:

1. To understand the basic categories of threats to computer and network.
2. To understand intrusion and intrusion detection.
3. To defend the need for protection, security, and the role of ethical consideration in computer use.
4. To describe efficient basic number algorithms.
5. To discuss the fundamental ideas and algorithms of secret key, cryptography and public key cryptography.

Course Outcome:

1. To explore a comprehensive study of the principles and practices of computer system security
2. To continually strengthen and improve the overall capabilities of the information security management system
3. To increase professional skills in terms of information security management and technology
4. To establish quantified information security goals annually through management and review meetings

Unit-1:	Introduction to Cryptography

Active vs. passive attacks, Layers and cryptography, Authorization, Viruses, Worms, Trojan horses, The multi level model of security, Legal issues, What is cryptography? Breaking an encryption scheme, Types of cryptographic functions, Secret key cryptography, Public key cryptography, Hash algorithms.

Unit-2:	Secret Key Cryptography

Generic block encryption, Data encryption standards, International data encryption algorithm, Advanced encryption standard.

Unit-3:	Modes of Operation, Hashes and Message Digests

Encrypting a large message, Generating MACs, Multiple encryptions DES, MD2, MD4, MD5, SHA-1, HMAC.

Unit-4:	Public Key Algorithms

Modular arithmetic, RSA, Diffie-Hellman, Digital signature standard, Elliptic curve cryptography.

Unit-5:	Number Theory, Authentication and Cryptographic Standards

Password based and Cryptographic based authentication protocol, Kerberos, PKI, IPSec.

Prescribed Book	
1.	William Stalling, Network Security Essentials: Applications and Standards, 2nd edition, Prentice Hall publication,2002.

Text Books:	
1.	Kaufman Charlie, Perlman Radia, Speciner Mike, Network Security: Private Communication in public World, PHI publication, 2001.

Reference Books	
1.	Vyless, Internet Security Protocol, Pearson publication.
2.	Comer D.E., Internetworking with TCP/IP, 5th edition, Pearson publication, 2006
3.	Morrison, Information Security-An Overview, PHI publication, 1995

Course Code:	CCA -205	Course Name: Lab-4 : OS+CN	Credits: 02
Course Objectives: As per the Lab Manual circulated to students by the concerned Teacher			
Course Outcome: As per the Lab Manual circulated to students by the concerned Teacher			
Experiments As per the Lab Manual circulated to students by the concerned Teacher			

Course Code:	CCA -206	Course Name: Lab-5 : DAA	Credits: 02
Course Objectives: As per the Lab Manual circulated to students by the concerned Teacher			
Course Outcome: As per the Lab Manual circulated to students by the concerned Teacher			
Experiments As per the Lab Manual circulated to students by the concerned Teacher			

Course Code:	CCA -207	Course Name: Lab 6 : Based on Elective	Credits: 02
Course Objectives: As per the Lab Manual circulated to students by the concerned Teacher			
Course Outcome: As per the Lab Manual circulated to students by the concerned Teacher			
Experiments As per the Lab Manual circulated to students by the concerned Teacher			

Course Code:	CCA - 208 A	Open Elective	Credits: 02
Open Elective : University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental courses OR RUSA sponsored Future Oriented Courses			

OR

Course Code:	CCA -208 B	Introduction to Linux	Credits: 02
Course Objectives:			
1. To enable the students practice the concepts of Operating systems and develop solutions for real world problems.			
Course Outcome:			
1: Have a good orientation towards concept-based approach and practical-based approach 2: Students will be able to describe the components of a modern operating system 3: Apply operating system concepts practically 4: Apply the concepts of operating systems design to practical problems			
Unit-1:	**Synaptic Package Manager**		
Synaptic Package Manager, How to install packages, Basic Commands, Commands with example, Command interpreter, Shell, Using man, Apropos.			
Unit-2:	**General Purpose Utilities in Linux**		

Echo, uname, who, passwd, date, cal, Brief overview on Files and directories, pwd, ls, cat, File System, File, Directory, File Inode, Types of Files,Home directory and Current directory, Change Directory(cd), mkdir,rmdir, cat, rm, cp, mv, cmp, wc, File Attributes.

Unit-3:	Redirection Pipes

Input, output and error stream, Redirection : > and >>, Working with Linux Process, Process, Shell process, Process spawning - parent and child process, Process attributes - pid, ppid, Init Process, User process and System process, ps with options.

Unit-4:	The Linux Environment

Environment variable vs Local variables, set command, env command, SHELL, HOME, PATH, LOGNAME, PS1, PS2, history, ! and ~, alias, Basics of System Administration, Root login-su, User management - UID, GID, useradd, usermod, userdel, Discs – Du, df, Simple filters, Head, tail, sort, cut, paste.

Unit-5:	The grep command

To see the content of a file, To list the entries of a particular stream, To ignore cases, Lines that do not match the pattern, To list the line numbers, To store the result in another file, To know the count, To match more than one pattern, Character class, To match a pattern at the end of the file, The sed command, Line Addressing, Context Addressing, Basics of awk, Awk Preliminaries, Selection criteria, action, Fields, Regular expressions, NR - number of records, Variables.

Prescribed Book	
1	Linux For Dummies- Dee-Ann LeBlanc, R. K. Blum, Wiley Publishing

Text Books:	
1.	Fedora 10 and Red Hat Enterprise Linux Bible- Christopher Negus, Wiley Publishing

Reference Books	
1.	Ubuntu for Non-Geeks, 2nd Edition: A Pain-Free, Project-Based, Guide book- Rickford Grant, Phil Bull, William Pollock Press.

Course Code	CCA -209	Skill based Activity SK-02: Networking Essentials	Credits: 01

Scope : Networking Essentials deals with knowing what is a network, how to install, configure, and troubleshoot a computer network It includes knowledge of the fundamental building blocks that form a modern network, such as various cables, switches, routers, connectors, LAN-NIC cards and network operating systems. It then provides in-depth coverage of the most important concepts in contemporary networking like connecting computers/ peripherals, servers and clients, Wi-Fi connectivity, etc. Students are expected to have the skills to build a network / LAN from scratch and maintain, upgrade, and troubleshoot an existing network.

==0000==== First Year Ends====0000==