॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० नुसार पदवी प्रथम वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, मा. विद्यापरिषद बैठक दिनांक १५ मे २०२४ रोजीच्या बैठकीतील ऐनवेळचा विषय क्रमांक १०/५९–२०२४ व विषय क्रमांक १५/५९–२०२४ अन्वये विद्यापीठ संकुले, उपपरिसर लातूर परभणी येथे PM USHA योजने अंतर्गत पदवी, पदवीका आणि प्रमाणपत्र अभ्यासक्रम सुरू करण्यास व अभ्यासक्रमास मान्यता प्रदान केल्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरणानुसार तंत्रज्ञान संकुल उपपरिसर लातूर येथे खालील अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्यात येत आहे.

01	**B. Sc. I year Computer Science (With Data Science Specialization)**

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

डॉ. सरिता लोसरवार
सहय्यक.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी/विवत्रंविपदवी/२०२४–२५/288
दिनांक ०९.१०.२०२४

प्रत : १) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मुंल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
३) मा. संचालक, सर्व संबधित संकुले परिसर व उपपरिसर, प्रस्तुत विद्यापीठ
४) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, सदर परिपत्रक संकेतस्थळावर प्रसिध्द करण्यात यावे.

SWAMI RAMANAND TEERTH

MARATHWADA UNIVERSITY, NANDED - 431 606

(Structure and Syllabus of Four Years Degree Program with Multiple Entry and Exit Option)

FOUR YEAR BACHELOR OF SCIENCE

COMPUTER SCIENCE

(With Data Science Specialization)

School of Technology, Sub-Campus, Latur

Under the Faculty of
Science and Technology

Effective from Academic year **2024 – 2025**
(As per NEP-2020)

From the Desk of the Dean, Faculty of Science and Technology

Swami Ramanand Teerth Marathwada University, Nanded, enduring to its vision statement "***Enlightened Student: A Source of Immense Power",*** is trying hard consistently to enrich the quality of science education in its jurisdiction by implementing several quality initiatives. Revision and updating curriculum to meet the standard of the courses at national and international level, implementing innovative methods of teaching-learning, improvisation in the examination and evaluation processes are some of the important measures that enabled the University to achieve the **3Es, the *equity, the efficiency and the excellence*** in higher education of this region. To overcome the difficulty of comparing the performances of the graduating students and also to provide mobility to them to join other institutions the University has adopted the *cumulative grade point average* (CGPA) system in the year 2014-2015. Further, following the suggestions by the UGC and looking at the better employability, entrepreneurship possibilities and to enhance the latent skills of the stakeholders the University has adopted the *Choice Based Credit System* (CBCS) in the year 2018-2019 at graduate and post-graduate level. This provided flexibility to the students to choose courses of their own interests. To encourage the students to opt the world-class courses offered on the online platforms like, NPTEL, SWAYM, and other MOOCS platforms the University has implemented the credit transfer policy approved by its Academic Council and also has made a provision of reimbursing registration fees of the successful students completing such courses.

SRTM University has been producing a good number of high caliber graduates; however, it is necessary to ensure that our aspiring students are able to pursue the right education. Like the engineering students, the youngsters pursuing science education need to be equipped and trained as per the requirements of the R&D institutes and industries. This would become possible only when the students undergo studies with an updated and evolving curriculum to match global scenario.

Higher education is a dynamic process and in the present era the stakeholders need to be educated and trained in view of the self-employment and self-sustaining skills like start-ups. Revision of the curriculum alone is not the measure for bringing reforms in the higher education, but invite several other initiatives. Establishing industry-institute linkages and initiating internship, on job training for the graduates in reputed industries are some of the important steps that the University would like to take in the coming time. As a result, revision of the curriculum was the need of the hour and such an opportunity was provided by the New Education Policy 2020. National Education Policy 2020 (NEP 2020) aims at equipping students with knowledge, skills, values, leadership qualities and initiates them for lifelong learning. As a result the students will acquire expertise in specialized areas of interest, kindle their intellectual curiosity and scientific temper, and create imaginative individuals.

The curriculum given in this document has been developed following the guidelines of NEP-2020 and is crucial as well as challenging due to the reason that it is a transition from general science-based to the discipline-specific-based curriculum. All the recommendations of the ***Sukanu Samiti*** given in the **NEP Curriculum Framework-2023** have been followed, keeping the disciplinary approach with rigor and depth, appropriate to the comprehension level of learners. All the Board of Studies (BoS) under the Faculty of Science and Technology of this university have put in their tremendous efforts in making this curriculum of international standard. They have taken care of maintaining logical sequencing of the subject matter with proper placement of concepts with their linkages for better understanding of the students. We take this opportunity to congratulate the Chairman(s) and all the members of various Boards of Studies for their immense contributions in preparing the revised curriculum for the benefits of the stakeholders in line with the guidelines of the Government of Maharashtra regarding NEP-2020. We also acknowledge the suggestions and contributions of the academic and industry experts of various disciplines.

We are sure that the adoption of the revised curriculum will be advantageous for the students to enhance their skills and employability. Introduction of the mandatory ***On Job Training, Internship*** program for science background students is praise worthy and certainly help the students to imbibe first-hand work experience, team work management. These initiatives will also help the students to inculcate the workmanship spirit and explore the possibilities of setting up of their own enterprises.

Dr. M. K. Patil, ***Dean,*** *Faculty of Science and Technology*

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science & Technology

Structure for Four Year Multidisciplinary Degree Program with Multiple Entry and Exit

Subject: COMPUTER SCIENCE

Year & Level	Semester	Subject-1 Major (DSC/DSE) 8 Credits	Subject-2 Minor (DSM) (Basket 1) 4 Credits	Generic Elective (GE) (Basket 2) *(Select one each from Group A and B of Basket 2, different from DSC / DSM)* 2 Credits	Vocational & Skill Enhancement Course (V/SEC) *(Related to DSC)* 2 Credits	Ability Enhancement Course (AEC) (Basket 3 for L2) Value Education Courses (VEC) / Indian Knowledge System (IKS) *(Common across faculty)* 04 credits	Field Work / Project/ Internship/ OJT/ Apprenticeship / Case Study Or Co-curricular Courses (CC) (Basket 4 for CC) *(Common across faculty)* 2 Credits	Credits	Total Credits
1	2	3	4	5	6	7	8	9	10
1 (4.5)	I	SCSCCT 4101(2-Credits) SCSCCP 4102(2-Credits) SCSCCT 4103(2-Credits) SCSCCP 4104(2-Credits)	SCSCMT 4105 (2-Credits) SCSCMP 4106 (2-Credits)	SCSCGE 4107 (2-Credits)	SCSCVC 4108 (2-Credits)	SCSCAE 4109 (2-Credits) SCSCVE 4110 (2-Credits)	SCSCCC 4111 (2-Credits)	22	44
	II	SCSCCT 4151(2-Credits) SCSCCP 4152(2-Credits) SCSCCT 4153(2-Credits) SCSCCP 4154(2-Credits)	SCSCMT 4155 (2-Credits) SCSCMP 4156 (2-Credits)	SCSCGE 4157 (2-Credits)	SCSCVC 4158 (2-Credits)	SCSCAE 4159 (2-Credits) SCSCVE 4160 (2-Credits)	SCSCCC 4161 (2-Credits)	22	
***Exit option*: UG Certificate in Major DSC on completion of 44 credits** and additional **4 credits from NSQF / Internship**									

Basket 1: Minor Subject

* Students will have to choose one subject from Basket 1 as a Minor subject, from same faculty or other but other than DSC (in col. 3)

Semester	BOS proposing Minor	Details of Minor Subject	
		CODE	Title of the Corse
Semester I	Computer Science	SCSCMT 4105	Mathematical Foundation
		SCSCMP 4106	Lab II (Mathematical Foundation)
Semester II	Computer Science	SCSCMT 4155	Descriptive Statistics
		SCSCMP 4156	Lab VI (Desc. Stat)

Basket 2: Generic Elective course (GE)

Note*: Each BOS shall suggest Generic Elective Courses (at least one each for Group A and Group B) for semesters I and II*

* Students will choose one GE course each from Group A and B of Basket 2 (other than subjects DSC and DSM in col. 3 and 4).

Semester	BOS proposing GE	Group A	
		CODE	Title of the Corse
Semester I	Computer Science	SCSCGE 4107	Fundamental of Computer
Semester II	Computer Science	SCSCGE 4157	Advanced MS Excel

Vocational & Skill Enhancement Course (V/SEC)

Semester	BOS proposing GE	Group A	
		CODE	Title of the Corse
Semester I	Computer Science	SCSCVC 4108	Data Analysis using MS-Excel
Semester II	Computer Science	SCSCVC 4158	Data Security and Privacy

Basket 3: AEC/VEC/IKS

Semester	BOS proposing GE	Details of the Course	
		CODE	Title of the Corse
Semester I	Computer Science	SCSCAE 4109	Communication Skill
Semester I	Computer Science	SCSCVE 4110	Environmental Science
Semester II	Computer Science	SCSCAE 4159	Logical and Analytical Reasoning
Semester II	Computer Science	SCSCVE 4160	Communication Skill II

Basket 4: Field work / Project /Internship/ OJT/ Apprenticeship/ Case study Or Co-Curricular Courses (CC) (common across faculty)

Semester	Details of the Course	
	CODE	Title of the Corse (Paper)
Semester I	SCSCVE 4160	Communication Skill II
Semester II	SCSCCC 4161	Democracy , Election and Governance

B. Sc. CS First Year Semester I *(Level 4.5)*

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SCSCCT 4101	Problem Solving Using C	02	--	**02**	02	--
	SCSCCP 4102	Lab I (C Prog.)	--	02	**02**	--	04
	SCSCCT 4103	Database Management System	02	--	**02**	02	--
	SCSCCP 4104	Lab II (DBMS)	--	02	**02**	--	04
Minor	SCSCMT 4105	Mathematical Foundation	02	--	**02**	02	--
	SCSCMP 4106	Lab II (Mathematical Foundation)	-	02	**02**	--	04
Generic Elective	SCSCGE 4107	Fundamental of Computer	02	--	**02**	02	--
Vocational & Skill Enhancement Course	SCSCVC 4108	Data Analysis using MS-Excel	02	--	**02**	02	--
Ability Enhancement Course (AEC) Value Education Course (VEC)	SCSCAE 4109	Communication Skill	02	--	**02**	02	--
	SCSCVE 4110	Environmental Science	02	-	**02**	02	--
Community Engagement Services (CES)	SCSCCC 4111	Yoga Education	-	02	**02**	--	04
Total Credits			**14**	**08**	**22**	**14**	**16**

. B. Sc. CS First Year Semester II *(Level 4.5)*

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SCSCCT 4151	OOPs with C++	02	--	**02**	02	--
	SCSCCP 4152	Lab IV (C++ Prog.)	--	02	**02**	--	04
	SCSCCT 4153	Introduction to R Programming	02	--	**02**	02	--
	SCSCCP 4154	Lab V (R Prog.)	--	02	**02**	--	04
Minor	SCSCMT 4155	Descriptive Statistics	02	--	**02**	02	--
	SCSCMP 4156	Lab VI (Desc. Stat)	-	02	**02**	--	04
Generic Elective	SCSCGE 4157	Advanced MS Excel	02	--	**02**	02	--
Vocational & Skill Enhancement Course	SCSCVC 4158	Data Security and Privacy	02	--	**02**	02	--
Ability Enhancement Course	SCSCAE 4159	Logical and Analytical Reasoning	02	--	**02**	02	--
Value Education Course (VEC) /IKS	SCSCVE 4160	Communication Skill II	02	-	**02**	02	--
Community Engagement Services (CES)	SCSCCC 4161	Democracy , Election and Governance	-	02	**02**	--	04
Total Credits			**14**	**08**	**22**	**14**	**16**

B. Sc. CS First Year Semester I *(Level 4.5)*

B.Sc. Computer Science (Specialization with Data Science) Course Structure

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits assigned to individual paper)

Subject (1)	Course Code (2)	Course Name (3)	Theory				Practical		Total Col (6+7)/ Col (8+9) (10)
			Continuous Assessment(CA)			ESA			
			Test I (4)	Test II (5)	Avg of (T1+T2)/2 (6)	Total (7)	CA (8)	ESA (9)	
Major	SCSCCT 4101	Problem Solving Using C	10	10	10	40	--	--	50 (2 Credits)
	SCSCCP 4102	Lab I (C Prog.)	--	--	--	--	10	40	50 (2 Credits)
	SCSCCT 4103	Database Management System	10	10	10	40	--	--	50 (2 Credits)
	SCSCCP 4104	Lab II (DBMS)	--	--	--	--	10	40	50 (2 Credits)
Minor	SCSCMT 4105	Mathematical Foundation	10	10	10	40	--	--	50 (2 Credits)
	SCSCMP 4106	Lab II (Mathematical Foundation)	--	--	--	--	10	40	50 (2 Credits)
Generic Elective	SCSCGE 4107	Fundamental of Computer	10	10	10	40	--	--	50 (2 Credits)
Vocational & Skill Enhancement Course	SCSCVC 4108	Data Analysis using MS-Excel	10	10	10	40	--	--	50 (2 Credits)
Ability Enhancement Course	SCSCAE 4109	Communication Skill	10	10	10	40	--	--	50 (2 Credits)
Value Education Course	SCSCVE 4110	Environmental Science	10	10	10	40	--	--	50 (2 Credits)
Community Engagement Services (CC)	SCSCCC 4111	Yoga Education	--	--	--	--	10	40	50 (2 Credits)

	Total Credits 22

B. Sc. CS First Year SemesterII *(Level 4.5)*

[20% Continuous Assessment (***CA***) and 80% End Semester Assessment (***ESA***)]

(For illustration we have considered a paper of 02 credits, 50 marks, need to be modified depending on credits assigned to individual paper)

Subject (1)	**Course Code (2)**	**Course Name (3)**	**Theory**				**Practical**		**Total Col (6+7)/ Col (8+9) (10)**
			Continuous Assessment(CA)			**ESA**			
			Test I (4)	**Test II (5)**	**Avg of (T1+T2)/2 (6)**	**Total (7)**	**CA (8)**	**ESA (9)**	
Major	SCSCCT 4151	OOPs with C++	10	10	10	40	--	--	50 (2 Credits)
	SCSCCP 4152	Lab IV (C++ Prog.)	--	--	--	--	10	40	50 (2 Credits)
	SCSCCT 4153	Introduction to R Programming	10	10	10	40	--	--	50 (2 Credits)
	SCSCCP 4154	Lab V (R prog.)	--	--	--	--	10	40	50 (2 Credits)
Minor	SCSCMT 4155	Descriptive Statistics	10	10	10	40	--	--	50 (2 Credits)
	SCSCMP 4156	Lab VI (Desc. Stat)	--	--	--	--	10	40	50 (2 Credits)
Generic Elective	SCSCGE 4157	Advanced MS Excel	10	10	10	40	--	--	50 (2 Credits)
Vocational & Skill Enhancement Course	SCSCVC 4158	Data Security and Privacy	10	10	10	40	--	--	50 (2 Credits)
Ability Enhancement Course	SCSCAE 4159	Logical and Analytical Reasoning	10	10	10	40	--	--	50 (2 Credits)
Value Education Course	SCSCVE 4160	Communication Skill II	10	10	10	40	--	--	50 (2 Credits)
Community Engagement Services (CC)	SCSCCC 4161	Democracy , Election and Governance	--	--	--	--	10	40	50 (2 Credits)
							Total Credits		**22**

Guidelines for Course Assessment:

A. Continuous Assessment (CA) (20% of the Maximum Marks):

This will form 20% of the Maximum Marks and will be carried out throughout the semester. It may be done by conducting **Two Tests** (Test I on 40% curriculum) and **Test II** (remaining 40% syllabus). Average of the marks scored by a student in these two tests of the theory paper will make his **CA** score (col 6).

B. End Semester Assessment (80% of the Maximum Marks):

(For illustration we have considered a paper of 02 credits, 50 marks and need to be modified depending upon credits of an individual paper)

1. **ESA Question paper will consists of 6 questions, each of 10 marks.**
2. **Students are required to solve a total of 4 Questions.**
3. **Question No.1 will be compulsory and shall be based on entire syllabus.**
4. Students need to solve **ANY THREE** of the remaining Five Questions (Q.2 to Q.6) and shall be based on entire syllabus.

C. Assessment of Co-Curricular courses (CC):

a. Continuous Assessment (CA) of the CC course shall be done by the respective course coordinator depending on the regularity, performance of a student and his participation in the international, national, state, university, college level events or camps, wherever applicable.

b. End Semester Assessment (ESA) shall be done on the basis of the write-up and presentation by the student on the activities that he has carried out throughout the semester.

c. Students have freedom to take more than one CC courses, however, score of the best performing CES shall be considered for final assessment.

D. Syllabi, Teaching Scheme and Examination Scheme for the courses in Column 7 and Column 8 (AEC, VEC, IKS, CI, EVS, CCs, etc.) shall be common for all the students from different faculties.

Note: Number of lectures required to cover syllabus of a course depends on the number of credits assigned to a particular course. One credit of theory corresponds to 15 Hours lecturing and for practical course one credit corresponds to 30 Hours. For example, for a course of two credits 30 lectures of one hour duration are assigned, while that for a three credit course 45 lectures.

%%%%%

Semester First

Course Code:	SCSCCT 4101	**Problem Solving Using C**	**Credit : 02**
Course objectives	1. To be able to build own logic for a given problem and finally develop one's own program 2. To understand the syntax and the semantics of C programming language.		
Course outcomes	After completing this course satisfactorily, a student will be able to: 1. Written in C language 2. Write the C code for a given problem 3. Perform input and output operations using programs in C 4. Write programs that perform operations on arrays		

Unit No.	**Topic**	**Hrs.**
1	**Introduction**	6
1.1	Introduction: What is C, Getting Started with C, The Character Set, Constants, Variables and Keywords, Types of C Constants ,Rules for Constructing Integer Constants, Rules for Constructing Real Constants, Rules for Constructing Character Constants, Types of C Variables, Rules for Constructing Variable Names, C Keywords.	
1.2	The First C Program, Compilation and Execution, Receiving Input, C Instructions, Type Declaration Instruction, Arithmetic Instruction, Integer and Float Conversions.	
1.3	Type Conversion in Assignments, Hierarchy of Operations, Associatively of Operators, Control Instructions in C.	
2	**Control Structure**	8
2.1	The Decision Control Structure: Decisions, The if Statement, The Real Thing, Multiple, Statements within if , The if-else Statement, Nested if-else, Forms of if , Use of Logical Operators, The else if Clause, The ! Operator, Hierarchy of Operators Revisited, A Word of Caution, The Conditional Operators, Decisions Using switch, The Tips and Traps, switch Versus if-else Ladder, The goto Keyword	
2.2	The Loop Control Structure: Loops, The while Loop, Tips and Traps, More Operators, The for Loop, Nesting of Loops, Multiple Initializations in the for Loop, The Odd Loop, The break Statement, The continue Statement, The do-while Loop.	
3	**Functions and Pointers**	8
3.1	Functions: What is a Function, Why Use Functions, Passing Values between Functions, Scope Rule of Functions, Calling Convention, One Dicey Issue, Advanced Features of Functions, Function Declaration and Prototypes, Call by Value and Call by Reference.	
3.2	Pointers: An Introduction to Pointers, Pointer Notation, Back to	

	Function Calls, Conclusions, Recursion, Recursion and Stack, Adding Functions to the Library.	
4	**Arrays**	8
4.1	Arrays: What are Arrays, Array Initialization, Bounds Checking, and Passing Array Elements to a Function, Pointers and Arrays, Passing an Entire Array to a Function?	
	Two Dimensional Arrays, Initializing a 2-Dimensional Array, Memory Map of a 2-Dimensional Array, Pointers and 2-Dimensional Arrays, Pointer to an Array Passing 2-D array to a Function, Array of Pointers, Three Dimensional Array.	
Reference books	1. FUNDAMENTALS OF COMPUTERS BY V. RAJARAMAN. 2. COMPUTERS AND COMMONSENSE BY R. HUNT AND SHELL Y. 3. FUNDAMENTALS OF COMPUTER Systems. Low Price Edition	

Course Code:	**SCSCCP 4102**	**LAB 1 (C Prog)**	**Credit : 02**
Course Objective	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:	SCSCCT 4103	**Database Management System**	**Credit : 02**
Course objectives	1. To understand the features of DBMS. 2. To understand the data models and schemas in DBMS. 3. To understand the functional dependencies and design of the databases using normalization 4. To learn SQL- the standard language of relational databases for database operations.		
Course outcomes	After completing this course satisfactorily, a student will be able to: 1. 1. Create their own database and modelling their applications 2. 2. Learn and practice data modeling using the entity-relationship and developing database designs. 3. 3. Understand the use of Structured Query Language (SQL) and learn SQL syntax for writing the queries. 4. Apply normalization techniques to normalize the databases.		
Unit No.	Topics		
1	**Introduction to Databases**		**6**
1.1	What is Database and DBMS?, Problems in traditional file oriented approach, Advantages and Disadvantages of DBMS, Applications of DBMS, Three level architecture of DBMS(1-tier, 2-tier, 3-tier), General Architecture/structure of DBMS, Roles and duties of DBA		
1.2	Data models (Relational data model, E-R data model, and hierarchical data model), advantages and disadvantages of each data model, E-R diagrams with examples		
2	**Relational Algebra and its operations**		**8**
2.1	Basics of Relational Algebra, Selection, Projection, Division, Cross Product, Set Operators (Union, Intersection etc.), Join and its types, writing Relational Algebra notations for user queries.		
2.2	Join and its types, Lossless join, writing Relational Algebra notations for user queries.		
3	**Normalization**		**8**
3.1	Introduction to attributes, types of Keys, Relationships and their types, Anomalies in databases, understanding Functional Dependencies (Determinant, partial, full, transitive, multi valued, etc)		
3.2	Normalization process, First Normal form, Second Normal Form, Third Normal Form, and Boyce-Codd Normal Form		
4	**SQL Essentials**		**8**
4.1	Introduction to SQL, Table, building blocks of SQL including data types, operators.		
4.2	DDL Queries, DML Queries, DCL Queries with examples Some SQL Functions, Aggregate functions		
References Books	1.“Database System Concepts”, Silber Schatz Korth, Tata McGraw Hill.		

	2.“Database Management Systems”, Raghu Ramakrishnan, Johannes, Gehrke, Tata McGraw Hill. 3.“Fundamental of Database System”, Sham Kanth B. Navathe, Pearson Education. 4.“Introduction to Database management System”, Bipin Desai, Galgotia Publications. 5.“SQL, PL/SQL the Programming Language of Oracle”, By Ivan Bayross, Third revised or Fourth edition, BPB publication,	

Course Code:	**SCSCCP 4104**	**Lab II (DBMS)**	**Credit : 02**
Course Objective	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:	SCSCCT 4105	Mathematical Foundations	Credit : 02
Course objectives	1. The objective of this course is to teach students how to think logically and mathematically. 2. The course focuses on mathematical reasoning and describes different ways in which mathematical problems could be solved. **3.** This course serves as an introductory course in mathematics for B. Sc. students.		
Course outcomes	1. The student will gain knowledge of the topics such as mathematical matrices, sets, Relations function, Mathematical logic, and graphs. 2. The student will be able to understand and solve problem related to logic, proofs, set theory and graph theory		
Unit No.	**Topic**		**No. of Hours**
1	**SETS, RELATIONS AND FUNCTIONS**		6
	1. Introduction to Sets 2. finite and Infinite sets 3. Relations 4. Properties of Binary relations 5. Equivalence Relation, 6. Functions		
2	**MATHEMATICAL LOGIC**		8
	1. Proposition 2. Logical Connectives 3. Propositional Forms 4. Truth Table 5. Tautology, Contradiction, Contingency 6. Converse, Inverse and Contrapositive of conditional statement		
3	**Matrices**		8
	1. Matrices and Determinants Definition of a matrix; 2. Operations on matrices; Square Matrix and its inverse; 3. determinants; properties of determinants; 4. solution of equations using matrices and determinants;		
4	**INTRODUCTION TO GRAPHS**		8
	1. Introductions to Graph Theory 2. Basic Terminology, Types of graphs 3. Multigraphs and weighted graphs 4. Graph Representation 5. Graph Isomorphism 6. Connectivity		
References	1. Lidl and pitz., Applied Abstract Algebra, Springer -		

Books	Verlag, New York, 1984. 2. K.H. Rosen, Discrete Mathematics and its Applications, Mc-Graw Hill Book Company, 1999 3. The elements of Real Analysis, R.G.Bartle. 4. A textbook of Matrices, Shanti Narayan and P.K.Mittal 5. Ordinary and Partial differential equations, M.D.Raisinghania, S.Chand pub. 6. Linear Algebra by A.R.Vasistha and J.N.Sharma (Author), KrishnaPub. 7. Linear Algebra by K.P.Gupta(Author), A PragatiEdition. Dr. B. S. Grewal , Higher Engineering Mathematics , KhannaPublishers.	

Course Code:	**SCSCCP 4106**	**Lab II (Mathematical Foundations)**	**Credit : 02**
Course Objective	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:	SCSCCP 4107	Fundamentals of Computer	Credit : 02
Course objectives	1. The objective of this course is to study the fundamentals of Computer System and to learn how computer systems work and Underlying principles		
Course outcomes	After completing this course satisfactorily, a student will be able to: 1. Operate desktop computers to carry out computational tasks 2. Understand working of hardware and software and the importance of operating systems 3. Understand programming languages, number systems, peripheral devices, networking, 4. Multimedia and internet concepts Read, understand and trace the execution of programs		
Unit No.	**Topic**		**Hrs. Required**
1	**Introduction**		**8**
1.1	Introduction: Definition of Computer, Characteristics of Computer, Computer Generation, Classification of Computers: Notebook, PCs, Workstation, Mainframe, Super, Clint and Server, Hand held computers (Tablet, PDA, Smartphone).		
1.2	Basic Computer Organization: Block Diagram, Input Unit, Output Unit, Storage Unit, Arithmetic Unit, Control Unit, Central Processing Unit.		
1.3	Number Systems: Non-Positional Number Systems, Positional Number Systems: Binary, Octal, Decimal, Hexadecimal. Conversion from one number system to another number system.		
2	**Computer Codes and Memory**		**8**
2.1	Computer Codes: BCD, EBCDIC, ASCII, UNICODE.		
2.2	Main Memory: Storage Evolution criteria, Main Memory Organization, Main Memory Capacity, Types of Memory Chips, Cache Memory.		
2.3	Secondary Memory: Sequential and Direct Access Devices, Magnetic Taps, Magnetic Chips, Optical Disks, Memory Storage Devices (Pen Drives, SD/MMC)		
3	**Input and Output Devices**		**8**
3.1	Input Devices: Keyboard, Point-and-draw devices, Data scanning devices, Digitizer, Electronic Card Reader, Speech Recognition Devices, and Vision input devices.		
3.2	Output Devices: Monitor, Printers, Plotter, Screen image projectors, Voice response systems.		
4	**Introduction to Software and Operating system**		**8**
4.1	Computer Software: Software, Relationship between		

	Hardware and Software, Types of Software.	
4.2	Concept of operating system, Functions of OS, Types of OS- Batch Processing, Single User, Multi User, Multiprogramming, Multi-Tasking, Introduction of Windows and DOS, booting process, file & directory structure.	
Reference Books	1. FUNDAMENTALS OF COMPUTERS BY V. RAJARAMAN. 2. COMPUTERS AND COMMONSENSE BY R. HUNT AND SHELL Y. 3. FUNDAMENTALS OF COMPUTER Systems. Low Price Edition. 4. Microprocessor B.Ram.	

Course Code:	**SCSCVC 4108**	**Data Analysis using MS-Excel**	**Credit : 02**
Course objectives	1. Making students habitual of using computers for data storing and data analysis		
Course outcomes	Learn how to use spreadsheets built- in data analysis features, create charts and visualizations, and discover multiple ways to tell the stories hidden in the numbers		
Unit No.	Topic		Hrs.
1	**Introduction to MS Excel**		6
	An overview of the screen, navigation and basic spreadsheet concepts, Various selection techniques, Shortcut Keys , Customizing the Ribbon, Using and Customizing AutoCorrect, Filtering on Text, Numbers & Colors, Advanced Sorting, Working with Tables		
2	**Using Ranges and Formulas**		8
	Using Functions – Sum, Average, Max, Min, Count, Counta · Absolute, Mathematical Functions SumIf, SumIfs, CountIf, CountIfs, AverageIf, AverageIfs, Nested IF Statement, AND, OR, NOT		
3	**Text and Basic stat functions**		8
	Text Functions: Upper, Lower, Proper · Left, Mid, Right · Trim, Len, Exact · Concatenate · Find, Substitute, **Statistical Functions:** Using The SUMIF / COUNTIF Functions · Using The AVERAGE / COUNT / LARGER / SMALLER Functions		
4	**Data Analysis and Charts**		8
	Creating Charts, Different types of chart, Formatting Chart Objects, Changing the Chart Type, Showing and Hiding the Legend, Showing and Hiding the Data Table, Sorting, Filter, Text to Column, Data Validation		

Reading References	1. Excel Data Analysis For Dummies, 5th Edition, Paul McFedries 2. Excel: Quick Start Guide from Beginner to Expert, by William Fischer 3. Excel 2016 from Scratch, by Peter Kalmström 4. Excel 2016 Bible, by John Walkenbach	

Course Code:	**SCSCAE 4109**	**Communication Skill**	**Credit : 02**
Course objectives	1. To familiarize students with English sounds and phonemic symbols. 2 To enhance their ability in listening and speaking.		
Course outcomes	1. Listen to lectures, public announcements and news on TV and radio 2. Engage in telephonic conversation 3. Communicate effectively and accurately in English. **4.** Use spoken language for various purposes.		
Unit No.	Topic		No. of Hours
Unit I	**Language and communication:** Definition of Language, nature of language, Characteristics of Human Language, Varieties of English Language: British, American, Indian, Australian etc., English for specific and special purposes.		6
Unit II	***Communication:*** Importance of communication; Animal and human communication; Methods of communication (Verbal & Non-Verbal);Barriers of communication		8
Unit III	**Oral Communication** Basic skills of communication, Listening to and Understanding a) Extended natural speech in business situations, Both face to face and on the telephone. b) Understanding standard American, British and Indian accents., Speaking with correct Pronunciation a) English Consonants b) English Vowels c)Speaking with right accent		8
Unit IV	**Presentation Skills :** 1) Planning and preparing to speak 2) Strategies for making powerful openings in presentations. 3) Body Language 4) Voice Modulations Other communications a) Meetings b) Group discussions c) Seminars d)		8

	Conference e) Interviews	
Suggested Readings	1) DEVELOPING COMMUNICATION SKILLS Krishna Mohan and Meera Bajaj 2) THE STERILING BOOK OF COMMON ERRORS IN ENGLISH Gratian Vass 3) SPOKEN ENGLISH FOR YOU.R.Radha Krishna Pillai and K Rajeevan 4) INDIAN AND BRITISH ENGLISH- A HAND BOOK OF USAGE AND PRONUNCIATION. ParooNihlani, Ray Tongue and Priya Hosali 5) A COURSE IN PHONETICS AND SPOKEN ENGLISH Sethi and Dhamija. 6) ENGLISH PRONUNCING DICTIONARY. Daniel Jones. 7) MACMILLAN'S FOUNDATION ENGLISH.R. K. Dwivedi and A. Kumar	

Course Code:	SCSCVE 4110	Environmental Science	Credit : 02
Course objectives	1. 1. To familiarize and to understand English language. 2. To enhance the LSRW skills in English language of the students 3. To acquaint and familiarize the students with advanced writing skills in different contexts 4. To minimize the gap between the existing communicative skills of the students and the skills they require at professional level		
Course outcomes	1. Students will develop competency to understand English language and develop communication skills. 2. Students will be able to enhance vocabulary and grammar skills. 3. Students will be able to interpret English language. 4. Students will be able to develop conversation skills. **5.** Students will be able to develop writing skills.		

Unit No.	Topic	No. of Hours
1	**Introduction to environmental studies**	04
	Multidisciplinary nature of environmental studies; Scope and importance, Concept of sustainability and sustainable development	
2	**Ecosystem**	08
2.1	What is an ecosystem? Structure and function of ecosystem Energy flow in an ecosystem: food chains, food webs and ecological succession.	
2.2	Case studies of the Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	
3	**Natural Resources : Renewable and Non-renewable Resources**	10
3.1	Land resources and land use change; Land degradation, soil erosion and desertification, Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.	
3.2	Water: Use and over-exploitation of surface and ground water, floods, droughts conflicts overwater (international & inter-state), Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs, case studies.	
4	**Biodiversity and Conservation**	8
4.1	Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots , Threats to biodiversity;	

4.2	Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services:	
Ref. Books	1. Carson, R. 2002. Silent Spring. Houghton Mifflin Harcourt. 2. Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of California Press. 3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London, Routledge. 4. Glick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ.Press. 5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. Principles of Conservation Biology. Sunderland: Sinauer Associates, 2006.	

Course Code:	**SCSCCC 4111**	**Yoga Education**	**Credit : 02**
Course objectives	Record a brief history and development of Yoga through the ages. • Discuss how Yoga and Yoga practices are important for healthy living. • Explain some important principles of Yoga. • State the different types of Yoga.		
Course outcomes	**Student will be able to understand the yoga practices practically and theoretically.**		
Unit No.	**Topic**		**No. of Hours**
1	**Introduction to Yoga**		6
	1.1 Introduction 1.2 Learning objectives 1.3 Yoga: meaning and initiation 1.4 Origin and history of development of 1.5 The streams of Yoga		
2	**Yogic Practices**		8
	2.1 The schools of Yoga: Rāja Yoga and Haṭha Yoga 2.2 Yogic practices for healthy living		
3	**Yogic Texts**		8
	Historicity of Yoga as a discipline Classification of Yoga and yogic texts Understanding Aṣṭāṅga Yoga of Patañjali		
4	**Yoga and Health**		8
	Need of Yoga for positive health		

	4.1 Role of mind in positive health as per ancient yogic literature 4.2 Concept of health, healing and disease: yogic perspectives 4.3 Potential cause of ill health 4.4 Yogic principles of healthy living 4.5 Integrated approach of Yoga for management of health 4.6 Stress management through Yoga and yogic dietary considerations	
Reference Books	YOGA EDUCATION (BACHELOR OF EDUCATION – B.ED.) [ISBN: 978-81-931534-1-3], National Council for Teacher Education (NCTE)	

Second Semester

Course Code:	SCSCCT 4151	OOPs with C++	Credit : 02
Course objectives	1. This course is designed to introduce programming concepts using C++ to students. 2. The course aims to develop structured as well as object-oriented programming skills using C++ programming language. 3. The course also aims to achieve competence amongst its students to develop correct and efficient C++ programs to solve problems spanning multiple domains		
Course outcomes	1. Write simple programs using built-in data types of C++. 2. Implement arrays and user defined functions in C++. 3. Write programs using dynamic memory allocation, handling external files, interrupts and exceptions. 4. Solve problems spanning multiple domains using suitable programming constructs in C++. 5. Solve problems spanning multiple domains using the concepts of object oriented programming in C++		
Unit No.	**Topic**		**No. of Hours**
Unit I:	**Introduction to OOPs and C ++**		**6**
1.1	Basic concepts of OOPS, Features and Benefits of OOPs.		
1.2	Tokens, Keywords, Identifiers, Constant, Data types, variables, Scope resolution Operator, I/O statements, Structure of C++ program, Control statements, Looping statements, Type casting, Arrays		
Unit II:	**Class & Object and Function in C++**		**8**
2.1	Function in C++: Call by reference, Return by reference**,** Function overloading and default arguments, Inline function, Static class members, Friend functions.		
2.2	Class & Object: Define Class, Members, Object, Visibility Modes, Static members, Defining Data Members and Member Functions, Nested Classes, Local Classes, Pointer to members & Pointer to Objects, Constructors & Destructors		
Unit III	**Function and Operator overloading**		**8**

3.1	**Function Overloading** Function overloading, Function Overriding, examples on it	
3.2	**Operator overloading** Overloading Unary Operators, Overloading Binary Operators, Overloading, Rules for Overloading.	
Unit IV	**Inheritance & Polymorphism**	**8**
4.1	Types of Inheritance with Examples, Virtual Base Classes and Abstract Base Classes, Polymorphism, Constructor and Destructor in Derived Class, Virtual Functions and Pure Virtual Function	
Reference Books	1. Robert Lafore "Object Oriented Programming with C++" 2. E. Balagurusamy "Object Oriented Programming with C++" 3. Herbert Shildth "The Complete Reference C++" 5. Yashwant Kanitkar "Let us C++"	

Course Code:	**SCSCCP 4152**	**Lab IV (C++ Prog.)**	**Credit : 02**
Course Objective	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:	SCSCCT 4153	Introduction to R Programming	Credit : 02
Course objectives	1. This course will introduce students to the collection and Preparation of data in systematic way 2. It enables the student for analysis and modeling of data in systematic way 3. It also enables the student to visualization of data, covering both conceptual and practical issues. **4.** Enable the student to handle example and case studies from diverse fields and hands-on use of statistical and data manipulation software's		
Course outcomes	1. Recognize various disciplines that contribute to a successful data science effort. 2. Understand the processes of data science - identifying the problem to be solved, data collection, preparation, modeling, evaluation and visualization. 3. Be aware of the challenges that arise in data sciences. 4. Develop and appreciate various techniques for data modeling and mining. 5. Be cognizant of ethical issues in many data science tasks.		
Unit No.	**Topic**		**No. of Hours**
Unit I	**Introduction to R Programming**		**6**
1.1	**Basics of R** Basics of R-Programming, Evolution of R, Features of R, Local Environment support, R Command prompt, R Script File, Comments		
1.2	**Data Types** R-Data types, R-Variables, R-Operators, R-function, Assignment - Modes -Operators - special numbers - Logical values Understanding data: Introduction – Types of Data: Numeric – Categorical – Graphical – High Dimensional Data, Basics of R-		
1.3	**Classification of digital Data** Structured, Semi-Structured and Unstructured - Example Applications. Different Sources of Data.		
Unit II	**Decision making and looping**		**8**
2.1	**Decision Making statements of R**: R-If statement, R-If….else statement, R- if….else if…else statement-Switch Statement		
2.2	**R-Looping statements:** Repeat loop, While loop, for loop, Control statement:- Break, Next.– Basic Functions - R help functions - R Data Structures - Control Structures.		
2.3	**Vectors:** Definition- Declaration - Generating - Indexing -Naming - Adding & Removing elements - Operations on Vectors		

Unit III	Data input output in R	8
3.1	Reading and Writing datasets in various formats, Functions - Creating User defined functions, Functions on Function Object - Scope of Variables - Accessing Global	
Unit IV	**Exploratory Data Analysis and Visualization :**	8
4.1	Data Preprocessing Descriptive Statistics - Central Tendency - Variability - Mean - Median - Range - Variance - Summary - Handling Missing values and Outliers.	
4.2	Data Visualization in R : Types of visualizations - packages for visualizations - Basic Visualizations, Advanced Visualizations and Creating plots.	
Reference Books	1. Nina Zumel, John Mount, "Practical Data Science with R", Manning Publications, 2014. 2. Jure Leskovec, Anand Rajaraman, Jeffrey D.Ullman,"Mining of Massive Datasets", Cambridge University Press, 2014. 3. Mark Gardener, "Beginning R - The Statistical Programming Language", John Wiley & Sons, Inc., 2012. 4. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013. 5. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta,"Practical Data Science Cookbook", Packt Publishing Ltd., 2014. 6. Nathan Yau, "Visualize This: The FlowingData Guide to Design, Visualization, and Statistics", Wiley, 2011. 7. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, "Professional Hadoop Solutions", Wiley, ISBN: 9788126551071, 2015.	

Course Code:	SCSCCP 4154	Lab V (R Prog.)	**Credit : 02**
Course Objective	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:	SCSCMT 4155	Descriptive Statistics	Credit : 02
Course objectives	1. To learn elementary statistical methods for tabulating information given in descriptive form and use graphical techniques and interpret it. 2. To learn various measures of central tendency, dispersion, skewness and kurtosis, correlation coefficient for bivariate data and interpret it. 3. To learn statistical methods for summarizing and analyzing and interpreting the data 4. To learn to apply statistics in the various fields for preparing, analyzing and interpreting the given data or information.		
Course outcomes	1. To tabulate statistical information given in descriptive form and use graphical techniques and interpret. 2. To compute various measures of central tendency, dispersion, skewness and kurtosis, correlation coefficient for bivariate data and interpret it. 3. To summarize and analyze data pertaining to attributes and to interpret the results. 4. To apply statistics in the various fields.		
Unit No.	**Topic**		**No. of Hours**
Unit I	**Introduction to Statistics**		**6**
1.1	**Introduction to Statistics** Meaning of Statistics as a Science, Importance of Statistics, Scope of Statistics in different fields, Statistical organizations in India and their functions: CSO, ISI, NSS, IIPS, Bureau of Economics and statistics.		
1.2	**Population and Sample:** Types of characteristics, Attributes: Nominal scale, ordinal scale, Variables: Interval scale, ratio scale, discrete and continuous variables, difference between linear scale and circular scale.		
1.3	**Types of data**: Primary data, Secondary data, Cross-sectional data, time series data, failure data, industrial data, directional data.		
1.4	**Notion of a statistical population**: Finite population, infinite population, homogeneous population and heterogeneous population. Notion of sample, random sample and non-random sample.		
Unit II	**Presentation of Data**		**8**
2.1	Classification: Raw data and its classification, Discrete frequency distribution, continuous frequency distribution, inclusive and exclusive methods of classification,		
2.2	**Graphical Presentation of Data**: Histogram, frequency curve, other standard charts		
Unit III	**Measures of Dispersion**		**8**
3.1	**Measures of Dispersion** Concept of dispersion, characteristics of good measure of dispersion, Range : Definition, merits and demerits, Semi-		

	interquartile range (Quartile deviation)	
3.2	**Mean deviation**: Definition, merits and demerits, minimality property (without proof).	
Unit IV	**Moments, Skewness and Kurtosis**	**8**
4.1	**Moments:** Raw moments for grouped and ungrouped data, Moments about an arbitrary constant for grouped and ungrouped data	
4.2	**Skewness and Kurtosis** Concept of skewness of frequency distribution, positive skewness, negative skewness, symmetric frequency distribution, Concepts of kurtosis its importance	
Reference Books	1. Goon Gupta and Das Gupta : Fundamentals of Statistics, Vol. 1, The World Press Pvt. Ltd., Kolkata. 2. Gupta and Kapoor : Fundamentals of Mathematical Statistics, Sultan Chand and Sons, New Delhi. 3. Mukhopadhyay, P. : Mathematical Statistics (1996), New Central Book Agency, Calcutta, Introduction to Mathematical Statistics, Ed. 4 (1989), MacMillan Publishing Co. New York. 4. Snedecor and Cochran : Statistical Methods, Oxford and IBH Publishers. 5. Amir D. Aczel and Jayael Soundarpandiyan, Complete Business Statistic : McGraw Hill Education (6th Edition).	

Course Code:	SCSCCP 4154	Lab V (R prog.)	**Credit : 02**
Course Objective	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:	**SCSCGE 4157**	**Advanced MS Excel**	**Credit : 02**
Course objectives	1. To learn basics of MS-Excel for preparing tabular data in systematic way 2. To perform different operation on data using excel all category functions. 3. To represent data into different charts and graphs and interpret them		

	4. To analyze the data and draw interpretations from it	
Course outcomes	1. Prepare data and information in tabular format in systematic way 2. Perform different mathematical, statistical and other operation on the given data 3. Represent the given data into different charts and graphs and interpret them 4. Analyze the data and draw interpretations from it	
Unit No.	**Topic**	**No. of Hours**
1	**Unit I : Introduction**	**6**
	Inserting pictures, equations, Symbols , workbook views Splitting the Screen, Freezing Panes, Copying and Pasting Data between Spreadsheets, Hiding , Protecting worksheets	
	Importing data from various external Sources.	
2	**Unit II : Advanced Formulas Formulae**	**8**
	Date and Time, Mathematical, Lookup and References Statistical Functions, Information Formulas	
	Engineering and compatibility formulas	
3	**Unit III : Spreadsheet Charts and Data Analysis**	**8**
	Creating PivotTables, Manipulating a PivotTable, Using the PivotTable Toolbar, Changing Data Field, Properties, Displaying a PivotChart, Setting PivotTable Options, Adding Subtotals to PivotTables, Win loss analysis, power Reports etc	
4	**Unit IV : Advanced operations for data analysis**	**8**
	Splitting the Screen, Freezing Panes, Copying and Pasting Data between Spreadsheets,	
	Hiding, Protecting worksheets, Recording Macros, Running Macros, Deleting Macros	
Reference Books	1. Excel Data Analysis For Dummies, 5th Edition, Paul McFedries 2. Excel: Quick Start Guide from Beginner to Expert, by William Fischer 3. Excel 2016 from Scratch, by Peter Kalmström 4. Excel 2016 Bible, by John Walkenbach	

Course Code:	SCSCVC 4158	Data Security and Privacy	Credit : 02
Course objectives	To become familiar with the fundamental concepts of data security and privacy mechanisms along with an understanding of hiding data in text and images.		
Course outcomes	**1.** To learn the basic concepts related to data security and understand the different types of symmetric key ciphers **2.** To understand and apply the concepts of encryption standards **3.** To understand hash functions and to learn the basic concepts of hiding data in text and images **4.** To understand the concepts of privacy, authentication, web and email security.		
Unit No.	**Topic**		**No. of Hours**
1	Introduction to Security		
	Introduction: Security goals, Cryptographic Attacks, Services and Mechanism, Techniques		**6**
2	Introduction to ciphers		
	Traditional Symmetric Key Ciphers: Introduction, Substitution Ciphers, Transposition Ciphers, Stream and Block Ciphers. Introduction to Modern Symmetric-Key Ciphers: Modern Block Ciphers, Modern Stream Ciphers		**8**
3	Encryption Algorithms		
	Data Encryption Standard (DES): Introduction, DES Structure, DES Analysis, Multiple DES, Security of DES. Advanced Encryption Standard (AES) Cryptography: Introduction, RSA Cryptosystem		**8**
4	Hash Functions, Digital Signature and Data Hiding		**8**
	Cryptographic Hash Functions Digital Signature: Comparison, Process, Services, Attacks on Digital Signature, Digital Signature Standard. Data Hiding in Text: Basic Features, Applications of Data Hiding, Watermarking, Intuitive Methods		
Reference Books	1. Cryptography and Network Security by Behrouz A. Forouzan, Dedeep Mukhopadhyay, TMH, 2nd edition, 2013. (Modules I, II, III) 2. Data Privacy and Security by Salomon, David, Springer, 2003. (Module III) 3. Security in Computing by Charles Pfleeger, Shari Lawrence Pfleeger, 5th Edition, PHI,2015. (Module IV)		

Course Code:	SCSCAE 4159	Logical and Analytical Reasoning	Credit : 02
Course objectives	1. To build and improve mental aptitude, critical thinking and logical skills of the students for problem solving 2. To dissect and study a problem in a logical manner to determine a practical solution to the problems 3. To improve ability of students to study information and apply logic to find patterns and make inferences. 4. To understand statements and making sense of them using logic and establishing theory.		
Course outcomes	1. Find solutions to common problems and make informed decisions about which action to take next. 2. Understand problems and analysing the situation for viable solutions. 3. Make important decisions, determine the truth, solve problems, come up with new ideas and set achievable goals 4. Apply logical thinking to a situation to derive the correct problem solving strategy		
Unit No.	**Topic**		**No. of Hours**
1	**Introduction of Mathematical Reasoning**		**6**
	Basics of mathematical reasoning, Problems on Number series, Letter series, Letters -Numbers mixed series, Elementary statistics, Progressions, Averages and mixtures		
2	**Arithmetic Based Problems on Quantitative Aptitude**		**8**
	Problems and solution methods on Percentage, Profit and Loss, Proportion, Interest and Discounting, Time Speed and Distance, Time and Work, Ratio and proportion		
3	**Logical Reasoning**		**8**
	Important concepts in logical reasoning (Logic and Language), Understanding structure of arguments, Statements and assumptions, Statements and arguments, Statements and course of actions, Decision making		
4	**Analytical Reasoning**		**8**
	Important concepts in analytical reasoning, Analytical reasoning problems on Seating arrangement, Complex arrangements, Ranking and time sequence test, Directions, Calendars, Clocks, Blood Relationship, Number Series, CodingDecoding, Assumption.		
Reference Books	1. How to prepare for Logical Reasoning By Arun Sharma 2nd edition Mcgraw Hill education 2. Analytical & Logical Reasoning , By PeeyushBhardwaj 3. Best Book on Analytical Reasoning, By Dr.Vandana Gupta, Writersgram Publications 4. Analytical Reasoning, By M.K.Pandey, Bsc Publisher 5. How prepare for Quantitative Aptitude By Arun Sharma 6nd edition Mcgraw Hill education		

Course Code:	SCSCVE 4160	Communication Skill II	Credit : 02
Course objectives	**1.** To enhance learner's communication skills by giving adequate exposure (use of language lab) in listening and speaking skills and the related sub-skills. **2.** To create learner's confidence in oral and interpersonal communication by reinforcing the basics of pronunciation. **3.** To help learners to recognize and make use of sentence structures in English		
Course outcomes	1. Students will be aware of listening and speaking skills and the related sub-skills. **2.** They can focus a lot on listening style to be the better speaker of English language		
Unit No.	**Topic**		**No. of Hours**
Unit I	**Reading:** Reading and understanding business letters, Reports and memos. Reading and understanding scientific texts. Reading a dictionary, thesaurus, and encyclopedia. Reading passages and poems.		**8**
Unit II	**Writing :** Letters- Formal and Informal, Note taking and note making, Reports, Curriculum Vitae, Making advertisements for newspapers, Rearranging the jumbled sentences.		**8**
Unit III	**Use of Grammar and usage reference sources:** Morphology: Word formation processes, Word classes, Phrase, Clause and Sentence, Punctuation and Capitalization. Common errors in the use of English.		**8**
Unit IV	**Aspects of Communication** a) Communication through body language: i) Eye contact. ii) Gesture. iii) Posture. b) Communication through Technology: Email and PPT **Written Communication** a) Comprehension c) Composition c) Précis Writing		**6**
Reference Books	1. Balasubramanium, T. 1981.A Textbook of Phonetics for Indian Students. New Delhi: Macmillan. 2. Sethi, J. & P. V. Dhamija, 1997.A Course in Phonetics and Spoken English. New Delhi, Prentice-Hall. 3. Crystal, David. 1985. Rediscover Grammar with David Crystal Longman. 4. Bakshi, R. N.A Course in English Grammar Orient Longman.		

Course Code:	SCSCCC 4161	Democracy , Election and Governance	Credit : 02
Course objectives	1. To make aware student about the Indian constitution 2. To make aware student about the democracy in India 3. To make aware student about the Indian governance		
Course outcomes	After completion of this course student will be able understand the democracy, Election and Governance in India		
Unit No.	**Topic**		**No. of Hours**
1	**Democracy in India**		**10**
	– Dimensions of Democracy: Social, Economic and Political – Decentralisation: Grassroots Level Democracy – Challenges before Democracy: women and marginalised sections of the society		
2	**Election to Local Self Government Bodies**		**10**
	– 73rd and 74th Constitutional Amendment Acts: Institutions at the local level and Role of State Election commission – Local Body Elections: Urban & Rural – Duties of an Individual towards electoral process		
3	**Good Governance**		**10**
	– Meaning and concept – Government and Governance – Good Governance initiatives in India		
Reference Books	Study material Kolhapur University 2017-18		