॥ 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

Fax : (02462) 215572

Phone: (02462)215542

Academic-1 (BOS) Section

website: srtmun.ac.in

E-mail: bos@srtmun.ac.in

विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत राष्ट्रीय शैक्षणिक धोरण २०२० नुसार पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २७ मे २०२५ रोजी संपन्न झालेल्या मा. विद्यापरिषद बैठकीतील विषय क्रमांक १६/६१–२०२५ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण–२०२० नुसारचे पदवी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यास मा. विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी. एस्सी द्वितीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२५–२६ पासून लागू करण्यात येत आहेत.

01	B.Sc. Computer Management (Single Major)
02	B.Sc. Information Technology (Single Major)
03	B.Sc. Software Engineering (Single Major)
04	B.Sc. Computer Network Technology (Single Major)
05	B.Sc. Computer Science (Single Major)
06	B.Sc. Artificial Intelligence & Machine Learning (Single Major)
07	B.Sc. BCA (Single Major)
08	B.Sc. Computer Maintenance
09	B.Sc. Computer Science
10	B.Sc. Information Technology
11	B. Sc. Computer Application
12	B. Sc. Software Development
13	B. Sc. Data Science
14	B. Sc. 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.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.:शै–१/एनइपी/विवत्रंविपदवी/२०२५–२६/126
दिनांक १२.०६.२०२५

सहाय्यक कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत : माहितीस्तव तथा कार्यवाहीस्तव.

१) मा. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
२) मा. प्र. कुलगुरू महोदयांचे कार्यलय, प्रस्तुत विद्यापीठ.
३) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
४) मा. संचालक, परीक्षा व मुंल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
५) मा. प्राचार्य, सर्व संबधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. याना देवून कळविण्यात येते की, परिपत्रक अभ्यासक्रम संकेतस्थळावर प्रसिध्द करण्यात यावेत.

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED - 431 606 (MS)

(Credit Framework and Structure of Four Year UG Program with Multiple Entry and Exit Option as per NEP-2020)

UNDERGRADUATE PROGRAMME OF

SCIENCE & TECHNOLOGY

Major in **Computer Maintenance** and Minor in **DSM**

Under the Faculty of Science & Technology

B. Sc. S.Y.

Effective from the Academic year 2025 – 2026

(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 academic year 2014-2015. Further, following the suggestions by the UGC and looking at the better employ ability, 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 calibre 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 employ ability. Introduction of the mandatory On Job Training, Internship program for science background students is praise worthy and certainly help the students to imbibe firsthand 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

SRTMU, Nanded

From the Desk of Chairman, Board of Studies in Computer Science and Applications

Dear Students, Faculty, and Stakeholders,

It gives me immense pleasure to introduce the B.Sc. in Computer Maintenance as Major program, thoughtfully designed to equip students with essential technical knowledge and hands-on expertise in the dynamic field of computer systems and maintenance.

In today's digital era, computer maintenance forms the foundation of IT reliability, supporting areas such as Networking, Cybersecurity, System Support, Database Management, and Cloud Infrastructure. Our curriculum is structured to provide a strong theoretical base while emphasizing practical, industry-relevant skills that prepare students for workplace readiness.

Our B.Sc. Computer Maintenance (Major) program offers a comprehensive and application-oriented syllabus, covering essential domains such as: Core Programming (C, C++), Operating Systems and System Maintenance, Database Management (RDBMS, MySQL), Networking and Web Development Technology, and Emerging Areas (Cybersecurity, Cloud Computing). With a balanced mix of theory, hands-on labs, and real-world tasks, students will develop strong troubleshooting abilities, system knowledge, and technical problem-solving skills that are key traits for a successful career in IT support, system administration, and computer maintenance roles.

We have incorporated industry-demanded courses like Machine Learning, Data Science, and Cybersecurity in the curriculum of B. Sc. T.Y. to ensure graduates are job-ready. Additionally, Web Development using WordPress and Python programming opens doors to freelancing and entrepreneurship opportunities. Beyond Academics, we encourage students to engage in hackathons, internships, and research projects to gain hands-on experience.

As the Chairman of the Board of Studies, I assure you that our program is continuously updated to align with global standards.

We sincerely thank all of the experts who provided their insightful comments and recommendations in order to improve the contents, we have made every effort to take each of them into consideration.

Regards
Prof. Dr Sudhir Jagtap
Chairman, Board of Studies
Computer Science and Applications

Details of the Board of Studies Members in the subject Computer Science under the faculty of Science & Technology of S.R.T.M. University, Nanded

Sr. No.	Name of the Member	Designation	Address	Contact No.
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				

Credit Framework for B. Sc. S.Y.

Year & Level	Semester	Optional-I	Optional-I1	Generic Elective (GE) (Basket 2)	Vocational & Skill Enhancement Course (VSEC)	Ability Enhancement Course (AEC) (Basket 3 for L2) Value Education Courses (VEC) / Indian Knowledge System (IKS)	Field Work / Project/ Internship/ OJT/ Apprenticeship / Case Study Or Co-curricular Courses (CC) (Basket 4 for CC)	Credits
II (5.0)	III	SCMCT1201 (2cr) Data Structure Using C SCMCT1202 (2cr) Operating Systems and System Maintenance SCMCP1203 (2cr) Lab Course 3 SCMCP1204 (2cr) Lab Course 4 8 Credits	SCMMT1201 Programming Logic Concepts (T-2cr) SCMMP1202 (P-2cr) Lab Course 4 Credits	GE-3 SCMGE1201 (2cr) Cyber Security 2 Credits	VSC 1 SCMVSC 1201 Web Programming 2 Credits	AECENG1201 (Compulsory English) 2 Credits ACEMIL1201 (Second Language) 2 Credits 4 Credits	CCC (2Cr) 2 Credits	**22**
	IV	SCMCT1251 (2cr) Object-Oriented Programming with C++ SCMCT1252 (2cr) RDBMS SCMCP1253 (2cr) Lab Course 5 SCMCP1254 (2cr) Lab Course 6 8 Credits	SCMMT1251 Web Technology (T-2cr) SCMMP1252 (P-2cr) Lab Course 4 Credits	GE-4 SCMGE1251 Data Analysis 2 Credits	VSC 2 SCMVSC 1251 Web Programming using WordPress 2 Credits	AECENG1201 (Compulsory English) 2 Credits ACEMIL1201 (Second Language) 2 Credits EVS 2 Credits 6 Credits	--	**22**

	Cum. Cr.	FY 08 + SY 16 = 24 Cr	FY 08 + SY 08 = 16 Cr	FY 04 + SY 04 = 08	FY 04 + SY 04 = 08	FY 12 + SY 10=22	02	FY 44 + SY 44=88
Exit Option: UG Diploma in Major Computer Maintenance and Minor DSM on completion of 88 credits and additional 4 credits NSQF/ Internship in DSC								

B. Sc. Second Year Semester III (Level 5.0)

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1 Major	**SCMCT1201**	Data Structure Using C	02		04	02	--
	SCMCP1203	Lab Course III (Practical)	-	02			04
	SCMCT1202	Operating Systems and System Maintenance	02		04	02	--
	SCMCP1204	Lab Course IV (Practical)	-	02			04
Optional 2 Minor	**SCMMT1201**	Programming Logic Concepts	02		04	02	--
	SCMMP1202	Lab Course PLC (Practical)	-	02			04
Generic Elective	SCMGE1201	Cyber Security	02		2	02	--
Skill Based Course	**SCSCVSC1201**	Web Development	--	02	2	--	04
Ability Enhancement Course	AECENG1201	Compulsory English	02		2	02	--
Ability Enhancement Course	ACEMIL1201		02		2	02	--
CCC	(NCC/NSS/SPTCLS/HWS/YEG/FIT)		02		2	02	--
Total Credits			**14**	**8**	**22**	**14**	**16**

Second Year Semester III (Level 5.0)

Examination Scheme

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

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)	Average of T1 & T2 (6)	Total (7)	CA (8)	ESA (9)	
Optional 1 Major	SCMCT1201	Data Structure Using C	10	10	10	40	--	--	50
	SCMCP1203	Lab Course III (Practical)					20	30	50
	SCMCT1202	Operating Systems and System Maintenance	10	10	10	40	--	--	50
	SCMCP1204	Lab Course IV (Practical)					20	30	50
Optional 2 Minor	SCMMT1201	Programming Logic Concepts	10	10	10	40	--	--	50
	SCMMP1202	Lab Course PLC (Practical)	--	--	--	--	20	30	50
Generic Elective	SCMGE1201	Cyber Security	10	10	10	40	--	--	50
Skill Based Course	SCMVSC1201	Web Development	--	-	--	--	20	30	50
Ability Enhancement Course	AECENG1201	Compulsory English	10	10	10	40	--	--	50
Ability Enhancement Course	ACEMIL1201		10	10	10	40	--	--	50
ccc	(NCC/NSS/SPTCLS/HWS/YEG/FIT)		10	10	10	40	--	--	50

B. Sc. Second Year Semester IV (Level 5.0)

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs./ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1 Major	**SCMCT1251**	Object-Oriented Programming with C++	02		04	02	--
	SCMCP1253	Lab Course V	-	02			04
	SCMCT1252	RDBMS	02		04	02	--
	SCMCP1254	Lab Course VI	-	02			04
Optional 2 Minor	**SCMMT1251**	Web Technology			04	02	--
	SCMMP1252	Lab Course WT (practical)		02			04
Generic Elective	**SCMGE1251**	Data Analysis			2	02	--
Skill Based Course	**SCMVSC1251**	Web Programming using WordPress		02	2	--	04
Ability Enhancement Course	AECENG1201	(Compulsory English)			2	02	--
Ability Enhancement Course	ACEMIL1201				2	02	--
CCC	EVS				2	02	--
Total Credits			**14**	**8**	**22**	**14**	**16**

Second Year Semester III (Level 5.0)

Examination Scheme

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

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)	Average of T1 & T2 (6)	Total (7)	CA (8)	ESA (9)	
Optional 1 Major	**SCMCT1251**	Object-Oriented Programming with C++	10	10	10	40	--	--	50
	SCMCP1253	Lab Course V					20	30	50
	SCMCT1252	RDBMS	10	10	10	40	--	--	50
	SCMCP1254	Lab Course VI					20	30	50
Optional 2 Minor	**SCMMT1251**	Web Technology	10	10	10	40	--	--	50
	SCMMP1252	Lab Course WT (practical)	--	--	--	--	20	30	50
Generic Elective	**SCMGE1251**	Data Analysis	10	10	10	40	--	--	50
Skill Based Course	**SCMVSC1251**	Web Programming using WordPress	--	-	--	--	20	30	50
Ability Enhancement Course	AECENG1201	(Compulsory English)	10	10	10	40	--	--	50
Ability Enhancement Course	ACEMIL1201		10	10	10	40	--	--	50
ccc	EVS		10	10	10	40	--	--	50

Semester III

Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology
Subject: Computer Maintenance

Course Type: DSC (Major)

Course Title: Data Structure Using C

Course Code: SCMCT1201

Credits: 02 **Max. Marks: 50** **Lectures: 30 Hrs.**

Course Objectives:

1. To provide students with a solid foundation in the fundamental concepts of programming through the study of data structures and algorithms.
2. To develop an understanding of basic computational principles and elementary data structures such as arrays, linked lists, stacks, and queues.
3. To enable students to convert well-structured problem-solving strategies into functional programs using appropriate data structures.
4. To introduce students to algorithmic thinking for solving simple problems involving text and numerical data.

Course Outcomes:

After completion of the course, the student will be able to-

1. Implement arrays and linked lists for efficient data representation and manipulation.
2. Understand the working principles of basic data structures such as stacks, queues, trees, and apply fundamental sorting algorithms.
3. Design new algorithms or adapt existing ones to address specific application-based problems.
4. Analyze and compare algorithms based on their space and time complexity to evaluate efficiency.

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Data Structure and Arrays**	**10**
	Definition: Data, Data Types, Data Structures, Importance of Data Structures. **Classification of Data Structures:** Primitive and Non-Primitive Structures. **Operations on Data Structures:** Traversing, Insertion, Deletion, Searching, Sorting. **Introduction to Arrays:** Representation of Arrays in Computer Memory (1D and 2D). **Array Operations:** Traversing, Insertion, Deletion, Searching (Linear Search, Binary Search - Basic Idea), Sorting (Bubble Sort - Basic Idea).	
II	**Linked Lists**	**08**
	Definition: Linked List and comparison with Arrays. **Components of Linked List:** Node (Data + Pointer). **Representation of Linked List in Computer Memory.** **Advantages and Disadvantages of Linked List.**	

Unit No.	Title of Unit & Contents	Hrs.
	Operations on Linked List: Traversing, Insertion (at beginning, middle, end), Deletion (specific node, first node, last node), Searching, Sorting (basic introduction).	
III	**Stacks and Queues**	**05**
	Stack: Definition and Introduction, Array Representation of Stack, Operations: PUSH and POP. **Queue:** Definition and Introduction, Array Representation of Queue, Operations: Insertion (Enqueue) and Deletion (Dequeue).	
IV	**Tree and Graph**	**07**
	Trees: Definition: Tree, Binary Tree, Complete Binary Tree, Binary Search Tree. Traversal of Binary Trees: Preorder Traversal, Inorder Traversal, Postorder Traversal. **Graphs –** Terminology, Representation of Graph.	

Reference Books**:**

1. Data Structure Using C, Yashwant Kanetkar, BPB Publication
2. Data Structures Using C, Tenenbaum
3. Data Structure, Seymour Lipschutz Outline Series
4. Data Structures and Algorithms using C , R. S. Salaria Khanna Book Publications
5. Data Structures and Algorithms Made Easy, Narasimha Karumanchi, Career Monk

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Subject: Computer Maintenance

Course Type: DSC Major

Course Title: Lab Course 3

Course Code: SCMCP1203

Credits: 02 **Max. Marks: 50** **Lectures: 60Hrs.**

This is suggestive practical list for code laboratory.

1. Program for traversing an array.
2. Program for searching an element in an array.
3. Program for sorting array elements.
4. Program for inserting & deleting elements from an array
5. Program for merging operation.
6. Program for stack implementation.
7. Program for queue implementation.
8. Program for implementation of Linked List.
9. Program for searching from Linked List.
10. Program for sorting Linked List.

Note: Implement above programs in C language.

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Subject: Computer Maintenance

Course Type: DSC Major

Course Title: Operating Systems and System Maintenance

Course Code: SCMCT1202

Credits: 02 **Max. Marks: 50** **Lectures: 30Hrs.**

Course Objectives:

1. To understand the types, architecture, and functions of modern operating systems.
2. To learn key concepts of process management, scheduling, and inter-process communication.
3. To study memory management techniques, file systems, and storage structures.
4. To explore system maintenance tools and operating system security mechanisms.

Course Outcomes:

After completion of the course, the student will be able to-

1. Describe the structure and types of operating systems along with their key functions.
2. Explain process states, scheduling algorithms, and inter-process communication methods.
3. Understand memory allocation strategies and the organization of file systems.
4. Apply knowledge of system tools to perform OS maintenance and manage security threats.

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Operating Systems and Computer System Architecture**	07
	Operating System Overview: Definition, types, and functions of an operating system, Batch, time-sharing, real-time, and distributed operating systems. **Computer System Architecture**: Components of a computer system: CPU, memory, I/O devices, OS structure and its operations: Process management, memory management, storage management. **Basic OS Concepts**: OS services and user interface, System calls and basic OS generation.	
II	**Process Management and Inter-process Communication**	08
	Process Concept and Management: What is a process? Process states: New, Ready, Running, Waiting, Terminated, Process control block (PCB) and process scheduling, Process scheduling algorithms: FCFS, Round Robin, Priority Scheduling. **Inter-process Communication (IPC):** Communication methods: Shared memory, message passing, Examples of IPC in client-server systems, Introduction to **threads** and **multithreading** models.	

Unit No.	Title of Unit & Contents	Hrs.
III	**Memory Management and File Systems**	**08**
	Memory Management Techniques: Contiguous memory allocation, paging, and segmentation, Virtual memory and its implementation, Page replacement algorithms: FIFO, LRU, Optimal. **File Systems:** Definition, types of files, and file operations, Directory structures and file allocation methods, File system mounting and file system structure.	
IV	**Operating System Maintenance and Security**	**08**
	OS Maintenance: Routine OS maintenance tasks: Disk cleanup, software updates, patch management, Importance of antivirus software and system protection, Managing startup programs and system services. **System Security:** Authentication, access control, and user account management, Security threats: Malware, viruses, and worms, Security updates and patches.	

Reference Books:

1. A SILBERSCHATZ, et.al. “Operating System Concepts”, John Wiley & Sons.
2. A Tanenbaum “Modern Operating Systems”, PHI Publication
3. William Stallings “Operating Systems”, Prentice Hall

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Subject: Computer Maintenance

Course Type: DSC Major

Course Title: Lab Course 4

Course Code: SCMCP1204

Credits: 02 **Max. Marks: 50** **Lectures: 60 Hrs.**

This is suggestive practical list for code laboratory.

1. Identify and compare types of operating systems (Batch, Real-Time, Time-Sharing, etc.).
2. Use systeminfo, ver, and echo to check operating system details.
3. Use dir, cd, mkdir, copy, and del to manage files and folders.
4. Use tasklist to view all running processes.
5. Use taskkill to stop a specific running process.
6. Use msconfig or taskmgr to manage startup programs and process states.
7. Use chkdsk and diskpart to check disk health and partition information.
8. Use cleanmgr to perform disk cleanup and system maintenance.
9. Use netstat and ipconfig to view network connections and configuration.
10. Use net user or control userpasswords2 to manage user accounts and permissions.

Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology
Subject: Computer Maintenance

Course Type: Minor

Course Title: Programming Logic Concepts

Course Code: SCMMT1201

Credits: 02 **Max. Marks: 50** **Lectures: 30Hrs.**

Course Objectives:

1. To understand fundamental problem-solving techniques, including top-down design and algorithmic thinking.
2. To analyze the efficiency of algorithms using basic complexity analysis.
3. To implement algorithms using flowcharts and pseudocode before translating them into C programs.
4. To apply core programming concepts in C, including variables, data types, operators, control structures, loops, arrays, and functions.

Course Outcomes:

After completion of the course, the student will be able to-

1. Design structured solutions to problems using top-down decomposition and algorithmic approaches.
2. Write syntactically correct and logically efficient C programs for given computational tasks.
3. Compare different algorithms (e.g., sorting, searching) based on time and space complexity.
4. Construct flowcharts to represent program logic before implementation.

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction Problem Solving Aspects**	**7**
	Introduction to problem solving aspects, Top-down design Introduction to Algorithms, Implementation of algorithms, Efficiency of algorithms, Analysis of algorithms, Flowchart and it's symbols.	
II	**Fundamentals of Algorithms**	**10**
	Exchanging the value of two variables, Counting, Summation of set of numbers, Factorial computation, Generation of the Fibonacci sequence, Reverses the Digits of an Integer	
III	**Factoring Methods**	**5**
	The Smallest divisors of an integer, Generating prime numbers, Definition and Memory Representation of Array, Array order reversal, Array Counting, Finding the Maximum number in a set.	
IV	**Searching and Sorting Methods**	**8**
	Linear search, Binary Search, Bubble Sort, Selection Sort, Insertion Sort	

Reference Books**:**

1. How to Solve by it Computer, R.G.Dromey, Pearson.
2. Programming in C, E. Balagurusamy, Mc.Graw Hill Education
3. Data Structure by Seymour Lipschtz, TMH Publication

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Subject: Computer Maintenance

Course Type: Minor

Course Title: Lab Course Minor 1

Course Code: SCMMP1202

Credits: 02 **Max. Marks: 50** **Lectures: 60Hrs.**

Suggestive practical list

1. Implement an algorithm to swap two numbers.
2. Implement an algorithm to find the sum of the first *n* natural numbers.
3. Implement an algorithm to generate the Fibonacci sequence.
4. Implement an algorithm to find the smallest divisor of a number (greater than 1).
5. Implement an algorithm to generate prime numbers up to a given limit.
6. Implement an algorithm to check if a number is an Armstrong number.
7. Implement an algorithm to reverse the elements of an array.
8. Implement an algorithm to find the maximum element in an array.
9. Implement an algorithm to sort an array using bubble sort (exchange sort).
10. Implement binary search on a sorted array.

Note: All algorithms are to be implemented using the C programming language.

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Subject: Computer Maintenance

Course Type: Generic Elective

Course Title: Cyber Security

Course Code: SCMGE120

Credits: 02 **Max. Marks: 50** **Lectures: 30Hrs.**

Course Objectives:

1. Learn the foundations of Cyber security and threat landscape.
2. To equip students with the technical knowledge and skills needed to protect and defend against cyber threats.
3. To develop skills in students that can help them plan, implement, and monitor cyber security mechanisms to ensure the protection of information technology assets.
4. To expose students to governance, regulatory, legal, economic, environmental, social and ethical contexts of cyber security.
5. To expose students to responsible use of online social media networks.

Course Outcomes:

After completion of the course, the student will be able to-

1. Understand the cyber security threat landscape.
2. Develop a deeper understanding and familiarity with various types of cyberattacks, cybercrimes, vulnerabilities and remedies thereto.
3. Analyse and evaluate existing legal framework and laws on cyber security.
4. Analyse and evaluate the digital payment system security and remedial measures against digital payment frauds.
5. Analyse and evaluate the importance of personal data its privacy and security

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Cyber security**	**7**
	Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web, Advent of internet, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security	
II	**Cybercrime and Cyber law**	**8**
	Classification of cybercrimes, Common cybercrimes- cybercrime targeting computers and mobiles, cybercrime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks, Cybercriminals modus, reporting of cybercrimes, Organisations dealing with Cybercrime and Cyber security in India, Case studies.	

Unit No.	Title of Unit & Contents	Hrs.
III	**Introduction to Social networks**	**7**
	Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding posting of inappropriate content, Best practices for the use of Social media, Case studies.	
IV	**Digital Devices Security, Tools and Technologies for Cyber Security**	**8**
	End Point device and Mobile phone security, Password policy, Data backup, Downloading and management of third party software, Device security policy, Cyber Security best practices, Significance of host firewall and Ant-virus, Management of host firewall and Anti-virus, Wi-Fi security, Configuration of basic security policy and permissions	

Reference Books**:**

1. Cyber Crime Impact in the New Millennium, by R. C Mishra , Auther Press. Edition 2010.
2. Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Sumit Belapure and Nina Godbole, Wiley India Pvt. Ltd. (First Edition, 2011)
3. Security in the Digital Age: Social Media Security Threats and Vulnerabilities by Henry A. Oliver, Create Space Independent Publishing Platform. (Pearson , 13th November, 2001)
4. Electronic Commerce by Elias M. Awad, Prentice Hall of India Pvt Ltd. 5. Cyber Laws: Intellectual Property & E-Commerce Security by Kumar K, Dominant Publishers.

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Subject: Computer Science

Course Type: SEC/VSC

Course Title: Web Programming

Course Code: SCMVSC1201

Credits: 02 **Max. Marks: 50** **Lectures: 60Hrs.**

Course Objectives:

1. To describe the architecture of the World Wide Web, including the roles of browsers, websites, and web pages.
2. To construct well-structured HTML documents using basic tags.
3. To design interactive web pages with hyperlinks, tables, and forms.
4. To apply CSS for styling web pages.
5. To implement advanced CSS features.

Course Outcomes:

After completion of the course, the student will be able to –

1. Write syntactically correct HTML code to structure web content (tables, forms, lists).
2. Create user-friendly forms with validation-friendly input types and multimedia integration.
3. Style web pages using CSS properties and layout techniques.
4. Build a complete website combining HTML semantics and CSS styling

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Web & HTML5**	**12**
	World Wide Web, Web browser, Website & Web Page, Structure of HTML documents Basic Tags: HTML, HEAD, TITLE, BODY, Use of Formatting tags, List & Types of Lists, Creating Hyper Links	
II	**Working with Tables & Forms**	**12**
	Creating tables with all table formatting & attribute, rowspan & colspan, cell spacing & padding, <img> tag, creating user forms, creating basic forms using check boxes and radio buttons, creating lists, additional input types in HTML incorporating sound and video, Audio and video in HTML, HTML multimedia basics, embedding video clips, incorporating audio on web page, Image Mapping.	
III	**Web Designing with CSS**	**12**
	Introduction to CSS and Syntax, Types of CSS, Identification and grouping of elements, Components of CSS: selectors, colors, background, fonts, text, links, lists, tables. CSS Box model: Margin, Padding, Border, height and width, floating elements, CSS display: positioning of elements, align, dropdowns, navigation bar, counters, Image gallery.	
IV	**Practical**	**24**
	Development of small website with the use of above contents.	

Reference Books:

1. The Complete Reference HTML & CSS, Thomas A Powell, TataMc- Graw Hill Publishing Co. Ltd.- New Delhi
2. HTML5 Black Book, DT Editorial Services
3. Responsive Web Design with HTML5 and CSS: Develop future-proof responsive websites using the latest HTML5 and CSS techniques, Ben Frain

Semester IV

B. Sc. Second Year Semester IV (Level 5.0)

Teaching Scheme

	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Optional 1 Major	**SCMCT1251**	Object-Oriented Programming with C++	02		04	02	--
	SCMCP1253	Lab Course V	-	02			04
	SCMCT1252	RDBMS	02		04	02	--
	SCMCP1254	Lab Course VI	-	02			04
Optional 2 Minor	**SCMMT1251**	Web Technology			04	02	--
	SCMMP1252	Lab Course WT (practical)		02			04
Generic Elective	**SCMGE1251**	Data Analysis			2	02	--
Skill Based Course	**SCMVSC1251**	Web Programming using WordPress		02	2	--	04
Ability Enhancement Course	AECENG1201	(Compulsory English)			2	02	--
Ability Enhancement Course	ACEMIL1201				2	02	--
CCC	EVS				2	02	--
Total Credits			**14**	**8**	**22**	**14**	**16**

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Subject: Computer Maintenance

Course Type: DSC Major

Course Title: Object-Oriented Programming with C++

Course Code: SCMCT1251

Credits: 02 **Max. Marks: 50** **Lectures: 30 Hrs.**

Course Objectives:

1. To learn OOPs concepts
2. To understand how C++ improves C
3. To learn how to design C++ classes for code reuse.
4. To apply programming skills to develop software.

Course Outcomes:

After completion of the course, the student will be able to-

1. Understand and apply OOPs concepts.
2. Write and execute C++ Programs.
3. Understand concept of Functions and inheritance in C++.
4. Apply programming skills to develop software.

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to OOP and C++**	**07**
	Basic Concepts of OOP: Introduction to Object-Oriented Programming (OOP), Fundamental principles: Encapsulation, Abstraction, Inheritance, Polymorphism, Object-Oriented Languages and their applications. **Structure of a C++ Program**: Basic structure and components: header files, main function, etc. **Difference between Top-down and Bottom-up Approaches**: Understanding the programming paradigms and their usage.	
II	**Introduction to C++**	**08**
	Tokens, Keywords, Identifiers & Constants: Understanding tokens, keywords, identifiers, and constants in C++. **Basic Data Types, Variables, and Operators**: Different data types in C++, declaring variables, and using operators. **Decision Control**: Using if, if-else, nested if, else-if ladder, and switch statements., Introduction to the goto statement and its usage with break. **Loop Control Structures**: Using while, do-while, and for loops for repetition.	
III	**Functions in C++**	**07**

Unit No.	Title of Unit & Contents	Hrs.
	Introduction to Functions: Definition of a function, function prototypes, and function calls. **Call by Value and Call by Reference**: Difference between call by value and call by reference. **Inline Functions and Default Arguments:** What is an inline function? How and when to use it, Default arguments in functions and their importance. **Operator Overloading**: Concept of operator overloading in C++ and its usage. **Function Overloading**: Definition and examples of function overloading. **Library Functions:** Introduction to standard library functions in C++.	
IV	**Classes and Objects**	**08**
	Introduction to Structures and Classes: Understanding the difference between structures and classes in C++. **Defining a Class and Member Functions:** How to define a class, and how to specify and define member functions. **Static Data Members and Static Member Functions:** How static data members and functions are used in C++. **Friend Functions:** Understanding the concept and purpose of friend functions in C++. **Introduction to Constructors and Destructors:** Constructors: Default, parameterized, and copy constructors, Destructors: Purpose and syntax. **Introduction to Inheritance and Types of Inheritance:** Basic concept of inheritance and different types: Single, Multiple, and Multilevel.	

Reference Books**:**

1. Object-Oriented Programming with C++ -E-Balgurusamy
2. The C++ Complete Reference -TMH Publication
3. Object Oriented Programming in C++ by Robert Lafore

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Subject: Computer Maintenance

Course Type: DSC Major

Course Title: Lab Course V

Course Code: SCMCP1253

Credits: 02 **Max. Marks: 50** **Lectures: 60 Hrs.**

This is suggestive practical list for code laboratory.

1. Write programs using: Input / Output statements,
2. Write programs using: Control statements and Loops
3. Design and Implementation of class
4. Design and Implementation of constructor
5. Design and Implementation of destructor
6. Design and Implementation of Friend Function
7. Design and Implementation of Function Overloading
8. Design and Implementation Operator Overloading
9. Design and Implementation of Inheritance
10. At least 15 Programs on C++

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Subject: Computer Maintenance

Course Type: DSC Major

Course Title: Relational Data Base Management System (RDBMS)

Course Code: SCMCT1252

Credits: 02 **Max. Marks: 50** **Lectures: 30Hrs.**

Course Objectives:

1. To explain the architecture of DBMS, its users, and languages (DDL, DML, DCL).
2. To model database cases using E-R diagrams and Relational Models
3. To normalize databases to 1NF, 2NF, 3NF
4. To use SQL for database creation

Course Outcomes:

After completion of the course, the student will be able to-

1. Demonstrate the role of DBMS in modern data management and its superiority over file systems.
2. Translate real-world scenarios into E-R diagrams and Relational schemas.
3. Normalize databases to reduce redundancy and improve efficiency.
4. Write SQL queries to create, modify, and retrieve data from tables.

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Database and Elements of DBMS**	**8**
	Definition of DBMS, Components of DBMS, Advantages and disadvantages of DBMS Architecture of DBMS and Users Responsibilities of DBA	
II	**Data Models**	**7**
	Introduction to Database Modelling, E-R model components and E-R diagram Introduction Relational model, Schemes, Instance and Domain Degree and Cardinality of Relations, Mapping 1:1, 1:M, M:1, M:M Converting ER Diagrams to Relational Model Keys in the Database: Super Key, Candidate Key, Primary Key, Foreign Key	
III	**Relational Database Design and Normalization**	**7**
	Understand the process of Database Designing, Normalization: Needs, Anomalies, Functional Dependency, Illustration for 1NF, 2NF, 3NF, processes	
IV	**Competency in SQL**	**8**
	Understand Database Language like SQL, data types, various operators and expressions. DDL, DML, DCL commands and their syntax, examples, Data retrieving using SELECT commands with emphasis on Between, In, Not In, Like, Null, AND, OR, NOT operators, Basic SQL functions	

Reference Books:

1. Database System Concepts by Abraham Silberschatz, Henry Korth, and S. Sudarshan
2. Database Management Systems by Raghu Ramakrishnan
3. Oracle SQL by Ivan Bayross

Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology
Subject: Computer Maintenance

Course Type: DSC Major

Course Title: Lab Course VI

Course Code: SCMCP1254

Credits: 02 **Max. Marks: 50** **Lectures: 60 Hrs.**

Study and perform following practical based on course contents of RDBMS.

1. Create following tables, Accounts, Inserting Records in the Tables
2. Use of ALTER TABLE Command
3. Study and Perform to use of DML commands
4. Study and Perform to use Arithmetic & logical Operators
5. Study and Perform for logical & Comparison operators
6. Study and Perform for Single Row Function
7. Study and Perform for Multiple Row Function
8. Study and Perform for Joining Tables (Equi-Join, Non-Equi Join, Outer Join)
9. Study and Perform Subqueries
10. Study and Perform PL/SQL Blocks
11. Study and Perform PL/SQL Blocks with control looping statements

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Subject: Computer Maintenance

Course Type: Minor

Course Title: Web Technology

Course Code: SCMMT1251

Credits: 02 **Max. Marks: 50** **Lectures: 30Hrs.**

Course Objectives:

1. To explain the evolution of the World Wide Web (WWW), client-server architecture, and the roles of browsers/servers.
2. To construct well-structured HTML5 documents using semantic elements, multimedia tags, and forms with modern input types.
3. To style web pages using CSS3 properties and implement responsive designs with media queries.
4. To create interactive web pages with JavaScript, including event handling, and form validation.

Course Outcomes:

After completion of the course, the student will be able to –

1. Demonstrate understanding of web architecture.
2. Design static web pages using HTML5 with proper document structure and semantic markup.
3. Apply CSS3 to create visually appealing, responsive layouts and animations.
4. Develop dynamic user interfaces with JavaScript.

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to Web Technologies**	**6**
	Evolution of the World Wide Web (WWW) Web browsers, servers, and HTTP/HTTPS protocols Client-server architecture Web hosting and domain management basics	
II	HTML Fundamentals	**8**
	Structure of HTML documents (<!DOCTYPE>, <html>, <head>, <body>) Text formatting tags, lists, hyperlinks, and images HTML5 semantic elements (<header>, <section>, <article>, <footer>) Tables, forms, and input types (email, date, range) Multimedia embedding (<audio>, <video>, <canvas>)	
III	**CSS3 and Styling**	**8**
	CSS syntax, selectors, and the box model, Colors, backgrounds, fonts, and text effects Responsive design, Transitions, animations, and transformations	
IV	**JavaScript Programming**	**8**
	Introduction to JavaScript, variables, and data types, Control structures (loops, conditionals) and functions.	

Reference Books:

1. Web Publishing by Monica D'Souza
2. HTML 5 in simple steps, Kogent Learning Solutions Inc., Dreamtech Press.
3. HTML & CSS: The Complete Reference, Fifth Edition, by Thomas Powell
4. HTML and JavaScript – Ivan Bayross
5. Mastering HTML, CSS & Javascript Web Publishing

Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology
Subject: Computer Maintenance

Course Type: Minor

Course Title: Lab Course WT

Course Code: SCMMP1252

Credits: 02 **Max. Marks: 50** **Lectures: 60 Hrs.**

Suggestive Practical List:

1. Study and Perform to Use Chrome/Firefox DevTools
2. Study and Perform to use free hosting
3. Study and Perform to use <header>, <section>, <footer>, and <article>
4. Study and Perform Interactive Form
5. Study and Perform Multimedia Gallery
6. Study and Perform Box Model
7. Study and Perform Responsive Layout
8. Study and Perform DOM Manipulation
9. Study and Perform Form Validation
10. Study and Perform Personal Portfolio Website

Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology
Subject: Computer Maintenance

Course Type: Generic Elective
Course Title: Data Analysis
Course Code: SCMGE1251
Credits: 02 **Max. Marks: 50** **Lectures: 30 Hrs.**

Course Objectives:

1. To find insights within organizational data.
2. To explore Tableau creator functionality required for new Tableau users.
3. To build Interactive dashboards and share them with others.
4. To create simple visualizations and moves to an in-depth look at the different chart and graph functions, calculations, mapping and other functionality.

Course Outcomes:

After completion of the course, the student will be able to –

1. Explain the fundamentals of analysis of data in Excel and Tableau.
2. Work with different Data Collection Structures.
3. Handle various sources of data using MS Excel, Tableau.
4. Formulate the organizational data, create charts or graphs to provide visuals of the data.
5. Predict the business scope using visualizing and analyzing techniques of MS Excel and Tableau.

Unit No.	Title of Unit & Contents	Hrs.
I	**Data Analysis Using Ms-Excel**	**15**
	Introduction Data Analysis, Excel, Excel Formatting, Excel Table with sort & filter Excel Chart & Graphs.	
II	**Working on Tableau Desktop**	**15**
	Introduction Tableau, Creating Basic Visualizations, Creating Groups and Hierarchies, Create Bin & Parameter, Bar chart, Geographic map, Crosstab report, Scatter plot, Line chart Tableau Desktop UI, Visual cues, Connecting to Data Live connection, Extract data, combine data sources, Join tables, Blend data sources, Cross-database join, Filtering and Sorting data Function in Tableau: Date functions, String function etc., Create Dashboard in Tableau	
	Note: Perform Practical Assignments on above Contents	

Reference Books:

1. Fundamentals of Data Visualization: A Primer on Making Informative and Compelling, Claus O. Wilke, Shroff/O'Reilly
2. Microsoft Excel 2019 Step by Step, Curtis Frye, Microsoft Press
3. Learning Tableau 10, Joshua N. Milligan, Packt Publishing
4. Practical Tableau, Ryan Sleeper, O'Reilly

Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

Subject: Computer Maintenance

Course Type: Skill Course (Related to Major)

Course Title: Web Programming using WordPress

Course Code: SCMVSC1251

Credits: 02 **Max. Marks: 50** **Lectures: 60Hrs.**

Course Objectives:

1. To understand the fundamentals of web development and content management systems.
2. Manage content effectively using WordPress's built-in tools.
3. Develop responsive websites compatible with various devices.
4. Deploy and maintain WordPress websites on web hosting platforms.

Course Outcomes:

After completion of the course, the student will be able to-

1. Install and set up a WordPress website.
2. Customize WordPress themes to match design requirements.
3. Integrate plugins to extend the functionality of WordPress websites.
4. Develop responsive websites compatible with various devices.

Unit No.	Title of Unit & Contents	Hrs.
I	**Introduction to WordPress**	**15**
	Overview of WordPress Installing WordPress Setting up a development environment Dashboard and Admin Area Posts vs Pages Media Library Themes Plugins	
II	**Managing WordPress**	**15**
	Creating and editing posts Creating and editing pages Using the block editor Adding images and videos Managing categories and tags Customizing the theme Using widgets and menus Adding custom code	

Unit No.	Title of Unit & Contents	Hrs.
	Creating custom post types and taxonomies	
III	**Practical**	**30**
	Installation and Setup: Install WordPress on your server or localhost environment. Configure basic settings like site title, tagline, timezone, etc. Choose and customize a theme for your website. **Customization:** Customize the theme further using the WordPress Customizer. Add a custom logo, favicon, and site icon. Modify colors, fonts, and layout as per your requirements. **Content Creation:** Create pages for different sections of your website (Home, About Us, Services, Contact, etc.). Write and publish blog posts if your website includes a blog. Upload and optimize images for faster loading times.	

Reference Books**:**

1. WordPress for Beginners 2022: A Visual Step-by-Step Guide to Mastering WordPress by Dr. Andy Williams
2. Professional WordPress: Design and Development by Brad Williams, David Damstra
3. WordPress All-in-One For Dummies by Lisa Sabin-Wilson
4. WordPress Plugin Development Cookbook" by Yannick Lefebvre