॥ 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 द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२४–२५ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, या विद्यापीठा अंतर्गत येणा–या सर्व संलग्नित महाविद्यालयामध्ये शैक्षणिक वर्ष २०२४–२५ पासून पदवीस्तरावर राष्ट्रीय शैक्षणिक धोरण –२०२० लागू करण्याच्या दृष्टीकोनातून विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत येणा–या अभ्यासमंडळांनी तयार केलेल्या पदवी द्वितीय वर्षाचे अभ्यासक्रमांना मा. विद्यापरिषदेने दिनांक १५ मे २०२४ रोजी संपन्न झालेल्या बैठकीतील ऐनवेळचा विषय क्रमांक ०४/५९–२०२४ च्या ठरावाअन्वये मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील खालील बी. एस्सी द्वितीय वर्षाचे अभ्यासक्रम (Syllabus) लागू करण्यात येत आहेत.

1) B. Sc. II year - Computer Sciene (New Model Degree College Hingoli)
2) B. Sc. II year – Biotechnology (New Model Degree College Hingoli)

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/एनएमडीसी/२०२४–२५/116
दिनांक १८.०६.२०२४

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

प्रत : १) मा. आधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
३) मा. प्राचार्य, न्यू मॉडल डिग्री कॉलेज हिंगोली.
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 Multidisciplinary Degree Program with Multiple Entry and Exit Option)

FOUR YEAR BACHELOR OF SCIENCE

COMPUTER SCIENCE

Under the Faculty of
Science and Technology

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

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	Sr. No	Name of the Member	Designation
1	Prof. Girish V. Chowdhary Professor School of Comp. Sci., S.R.T.M.University, Nanded. Mobile-9421452364 E-Mail- girish.chowdhary@gmail.com	Chairman	7	Dr. Ravindra S. Hegadi Associate Professor Department of Computer science Central university of Karnataka . Kadaganchi , Kalaburagi Mobile 94408023871, E-Mail rshegadi@gmail.com, rshegadi@cuk.ac.in	Member
2	Dr. Santosh D Khamitkar Professor School of Comp. Sci., S.R.T.M.University, Nanded. Mobile-9421458081 EMail-s_khamitkar@yahoo.com	Member	8	Dr. N. P. Bhosale Department of Computer Science Indira Gandhi National Tribul University, Amarkantak-484887, Madyapradesh.	Member
3	Dr. Vikash Tukaram Humbe Assistant Professor School of Technology., S.R.T.M.University, Sub Campous Ausa Road Peth Latur. 415531 Mobile-9326792524 EMail-vikashhumbe@gmail.com	Member	9	Dr. (Mrs.) Maya Ingle Department of Computer Science Indore Institute of Science and Technology, Opp. I.I.M. Pithampur Road, Rau, Indore-453331, M.P.	Member
4	Dr. Mahendra Pundlikrao Dhore Principal Shivaji Science Nagpur 440012 Mobile-9423103043 Email-mpdhore@rediffmail.com	Member	10	Mr.Kaiwalya Katyarmak Manager, Cognizant's Quality Assurance and Engineering Group , Pune	Member
5	Dr. R. R. Manza Associate Professor Department of Computer Science and Information Technology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. Mobile- 9421308853 Email- manzaramesh@gmail.com	Member	11	Mr. Sanjay S. Kurundkar Copgemini India Pvt Ltd.Sr. Manager FSGBU Global Testing Practice Core Team Member	Member
6	Dr. Mohammad Atique Mohammad Junaid. Professor Department of Computer Science & Engineering , Sant Gadge Baba Amravati University Amravati-44602 Mobile: 09823724560 E-mail: mohammadatique@sgbau.ac.in	Member			Member
INVITEE MEMBER					
12	Dr. Premal B. Nirpal Assistant Professor Department of Computer Science S.R.T.M.University, Nanded's New Model Degree College, Hingoli-431513 Mobile: 8055144201 Mail: premal.nirpal@gmail.com	Member			

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)	Subject-2 Minor (DSM) (Basket 1)	Generic Elective (GE) (Basket 2) *(Select one each from Group A and B of Basket 2,should not be related to DSC/DSM in col. 3 and 4)*	Vocational & Skill Enhancement Course (VSEC) *(Related to DSC)*	Ability Enhancement Course (AEC) (Basket 3for L2) Value Education Courses (VEC) / Indian Knowledge System (IKS)*(Common across faculty)*	Field Work / Project/Internship/OJT/ Apprenticeship/ Case Study Or Co-curricular Courses (CC) (Basket 4 for CC) *(Common across faculty)*	Credits	Total Credits
1	2	3	4	5	6	7	8	9	10
2 (5.0)	III	**SBCSC201:** Computer Organization & Architecture (2Cr) (Theory) **SBCSC202:** Data Structure (2Cr) (Theory) **SBCSC203:** Unix Operating System (2Cr) (Practical) **SBCSC204:** SQL (2Cr) (Practical) **8 Credits**	**SBCSM201**: System Analysis & Design (2Cr) **SBCSM202**: Java Programming- I (2Cr) **4 Credits**	**SBCSG201:** Cyber Ethics (2Cr) **2 Credits**	**SBCSV20:** Web Content Development (2Cr) **2 Credits**	**AECEN201:** Team Work & Group Discussion (2Cr) **2 Credits**	**SBCSP201:** (2Cr) **CCXXX201:** (2Cr) ***(XXX any one of NCC/NSS/Sports/ Culture/Health Wellness/ Yoga Education / Fitness)*** **4 Credits**	22	44
	IV	**SBCSC251:** .Net (2Cr) (Theory) **SBCSC252:** Mathematical Foundation for Computer Science (2Cr) (Theory) **SBCSC253:** .Net (2Cr) (Practical) **SBCSC254:** Mathematical Foundation for Computer Science (2Cr) (Practical) **8 Credits**	**SBCSM251:** Software Engineering-I (2Cr) **SBCSM252:** Theory of Computational-I (2Cr) **4 Credits**	**SBCSG251:** Cyber Security-II (2Cr) **2 Credits**	**SBCSS251:** Networking & LAN Maintenance (2Cr) **2 Credits**	**AECXX251:** Ergonomics (2Cr) ***(X: Hin, Mar, Kan, Pal, etc)*** **2 Credits**	**SBCSP251:** (2Cr) (FP/CS) **CCXXX251**: (2Cr) ***(XXX any one of NCC/NSS/Sports/ Culture/Health Wellness/ Yoga Education / Fitness)*** **4 Credits**	22	
Exit option: UG Diploma in Major DSC 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
Major	SBCSC201	Computer Organization & Architecture	02	--	**02**	02	--
	SBCSC202	Data Structure	02	--	**02**	02	--
	SBCSC203	Unix Operating System (practical)	-	02	**02**		04
	SBCSC204	SQL (practical)	-	02	**02**		04
Minor	SBCSM201	System Analysis & Design	02	--	**02**	02	--
	SBCSM202	Java Programming- I	02	--	**02**	02	--
Generic Electives	SBCSG201	Cyber Ethics	02	--	**02**	02	--
Vocational & Skill Enhancement Course	SBCSV201	Web Content Development	--	02	**02**	--	04
Ability Enhancement Course	AECEN201	Team Work & Group Discussion	02	--	**02**	02	--
Community Engagement Services (CES)	CCXXX201	Any one of NCC/ NSS /Sports/ Culture /Health Wellness /Yoga Education / Fitness	-	02	**02**	--	04
Total Credits			**12**	**10**	**22**	**12**	**16**

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

Examination Scheme

[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	SBCSC201	Computer Organization & Architecture	10	10	10	40	--	--	50
	SBCSC202	Data Structure	10	10	10	40	--	--	50
	SBCSC203	Unix Operating System (practical)	--	--	--	--	20	30	50
	SBCSC204	SQL (practical)	--	--	--	--	20	30	50
Minor	SBCSM201	System Analysis & Design	10	10	10	40	--	--	50
	SBCSM202	Java Programming- I	10	10	10	40	--	--	50
Generic Electives	SBCSG201	Cyber Ethics	10	10	10	40	--	--	50
Vocational & Skill Enhancement Course	SBCSV201	Web Content Development	--	--	--	--	20	30	50
Ability Enhancement Course	AECEN201	Team Work & Group Discussion	10	10	10	40	--	--	50
Community Engagement Services (CC)	CCXXX201	Any one of NCC/ NSS /Sports/ Culture /Health Wellness /Yoga Education / Fitness	--	--	--	--	20	30	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
Major	SBCSC251	.Net	02	--	**02**	02	--
	SBCSC252	Mathematical Foundation for Computer Science	02	--	**02**	02	--
	SBCSC253	.Net (practical)	-	02	**02**		04
	SBCSC254	Mathematical Foundation for Computer Science (practical)	-	02	**02**		04
Minor	SBCSM251	Software Engineering-I	02	--	**02**	02	--
	SBCSM252	Theory of Computational-I	02	--	**02**	02	--
Generic Electives	SBCSG251	Cyber Security-II	02	--	**02**	02	--
Vocational & Skill Enhancement Course	SBCSS251	Networking & LAN Maintenance	--	02	**02**	--	04
Ability Enhancement Course	AECXX251	Ergonomics	02	--	**02**	02	--
Community Engagement Services (CES)	CCXXX251	Any one of NCC/ NSS /Sports/ Culture /Health Wellness /Yoga Education / Fitness**(Basket)**	-	04	**04**	--	04
Total Credits			**12**	**10**	**22**	**12**	**16**

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

Examination Scheme

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

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

Subject (1)	Course Code (2)	CourseName (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	SBCSC251	.Net	10	10	10	40	--	--	50
	SBCSC252	Mathematical Foundation for Computer Science	10	10	10	40	--	--	50
	SBCSC253	.Net (practical)	--	--	--	--	20	30	50
	SBCSC254	Mathematical Foundation (practical)	--	--	--	--	20	30	50
Minor	SBCSM251	Software Engineering-I	10	10	10	40	--	--	50
	SBCSM252	Theory of Computational-I	10	10	10	40	--	--	50
Generic Electives	SBCSG251	Cyber Security-II	10	10	10	40	--	--	50
Vocational & Skill Enhancement Course	SBCSS251	Networking & LAN Maintenance	--	--	--	--	20	30	50
Ability Enhancement Course	AECXX251	Ergonomics	10	10	10	40	--	--	50
Community Engagement Services (CC)	CCXXX251	Any one of NCC/ NSS /Sports/ Culture /Health Wellness /Yoga Education / Fitness**(Basket)**	--	--	--	--	20	30	50

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 45lectures.

%%%%%

Swami Ramanand Teerth Marathwada University's

New Model Degree College, Hingoli

Syllabus for B. Sc. (CS) II year III Semester

SBCSC201: *Computer Organization & Architecture*

Course pre-requisite:

Basic knowledge of computer programming, Understanding of fundamental concepts in mathematics, especially algebra and logic, Familiarity with digital systems and Boolean algebra, Basic understanding of data structures and algorithms

Course objectives:

- Understand the fundamental principles of computer organization and architecture.
- Comprehend the representation of data and instructions in a computer system.
- Explore the architecture of central processing units (CPUs) and its operation.
- Examine memory hierarchy and its management in computer systems

Course outcomes:

- After completing this course satisfactorily, a student will be able to:

1. Explain the basic principles of computer organization and architecture.
2. Analyze and interpret the representation of data and instructions in digital systems.
3. Describe the architecture and operation of central processing units (CPUs).
4. Evaluate memory hierarchy and its management techniques.
5. Demonstrate an understanding of input-output organization and its components.
6. Assess the role of secondary storage devices in computer systems.
7. Discuss parallel and distributed computing architectures and their applications.
8. Apply performance evaluation metrics to analyze and compare computer system performance.

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**UNIT I**	**8**
	1.1	Introduction to Computer Organization and Architecture: Basic concepts and definitions, Historical perspective	
	1.2	Digital Logic Circuits: Boolean algebra, Logic gates and their implementation, Combinational and sequential circuits Memory elements: flip-flops and registers	
2.0		**UNIT II**	**8**
	2.1	Data Representation: Number systems: binary, decimal, hexadecimal, Binary arithmetic: addition, subtraction, multiplication, division, Two's complement representation	

		Floating-point representation	
	2.2	Processor Architecture: CPU organization and operation Instruction set architecture (ISA), Fetch-decode-execute cycle, Control unit and microprogramming	
3.0		**UNIT III**	
	3.1	Memory Hierarchy: Memory types: RAM, ROM, cache memory, Memory management techniques, Virtual memory	**7**
	3.2	Input-Output Organization: I/O interface and techniques, Interrupts and DMA (Direct Memory Access), Bus architecture	
4.0		**UNIT IV**	
	4.1	Secondary Storage: Magnetic disks, Solid-state drives (SSDs), Optical storage	**7**
	4.2	Parallel and Distributed Computing: Parallel processing concepts, Multiprocessor and multicomputer architectures, Cluster computing	
		Total	**30**

Reference Books:

1. "Computer Organization and Design: The Hardware/Software Interface" by David A. Patterson and John L. Hennessy
2. "Computer Systems: A Programmer's Perspective" by Randal E. Bryant and David R. O'Hallaron
3. "Structured Computer Organization" by Andrew S. Tanenbaum:

SBCSC202: *Data Structure*

Course pre-requisite:

Familiarity with fundamental computer science concepts such as algorithms, time complexity, and space complexity is crucial. A good understanding of a programming language is essential.

Course objectives:

- Students should develop a solid understanding of fundamental data structures like arrays, linked lists, stacks, queues, trees, and graphs.
- This involves knowing how these structures work, their advantages, and when to use them.

Course outcomes:

- After completing this course satisfactorily, a student will be able to:
  1. To learn how the choice of data structures impacts the performance of programs.
  2. To study specific data structures such as arrays, linear lists, stacks, queues, hash tables, binary trees, binary search trees, heaps and trees.
  3. To learn efficient searching and sorting techniques.

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**UNIT I**	**8**
	1.1	The concept of data structure, Abstract data type, data structure operations, algorithms complexity, time-space trade off.	
	1.2	Introduction to strings, storing strings, string operations, pattern matching algorithms.	
2.0		**UNIT II**	**8**
	2.1	Linked list: Introduction and basic operations, Header nodes, Doubly Linked List, Circular Linked List, and Applications of Linked List.	
	2.2	Stack: primitive operation on stack, Representation of Stack as Linked List and array, Stacks applications.	
3.0		**UNIT III**	**8**
	3.1	Introduction to queues, Primitive Operations on the Queues, Circular queue, Priority queue, Representation of Queues as Linked List and array, Applications of queue.	
	3.2	Trees- Basic Terminology, Binary Trees, Tree Representations using Array & Linked List, Basic	

		operation on Binary tree.	
4.0		**UNIT IV**	
	4.1	Introduction to graphs, Definition, Terminology, Directed, Undirected & Weighted graph, Representation of graphs.	**6**
	4.2	Searching: linear search, Binary search, Sorting: Insertion sort, Selection sort, Quick sort, Bubble sort.	
		Total	**30**

Reference Books:

1. Trembley, J.P. And Sorenson P.G., "An Introduction to Data Structures With Applications", Mcgrraw-Hill International Student Edition, New York.
2. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Addison- Wesley, (An Imprint Of Pearson Education), Mexico City.Prentice- Hall Of India Pvt. Ltd., New Delhi.

Text Books:

3. Seymour Lipschutz, "Data Structures", Tata McGraw- Hill Publishing Company Limited, Schaum's Outlines, New Delhi.
4. Yedidyan Langsam, Moshe J. Augenstein, and Aaron M. Tenenbaum, "Data Structures Using C", Prentice Hall of India Pvt. Ltd., New Delhi.

SBCSC203: *UNIX Operating System (Practical)*

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0			**20**
	1.1	1. How do you list the contents of a directory? 2. How do you navigate to a different directory? 3. How do you create a new directory? 4. How do you remove a file? 5. How do you rename a file? 6. How do you search for a specific word within a file? 7. How do you view the permissions of a file? 8. How do you change the permissions of a file? 9. How do you change the owner of a file? 10. How do you change the group of a file? 11. How do you set special permissions like setuid, setgid, and sticky bit?	
2.0			**05**
	2.1	1. How do you create a new empty file? 2. How do you copy a file to a different location? 3. How do you move a file to a different directory? 4. How do you create a symbolic link? 5. How do you archive a group of files into a single file?	
3.0			**05**
	3.1	1. How do you list all running processes? 2. How do you terminate a specific process? 3. How do you suspend a process and resume it later? 4. How do you check the status of a process? 5. How do you change the priority of a process?	
		Total	**30**

SBCSC204: *SQL (Practical)*

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0			**20**
	1.1	1. Creating, altering, and dropping database objects 2. Inserting, updating, and deleting data. 3. Perform query more on SQL 4. Sorting query results 5. Performing joins between tables. 6. Understanding and creating indexes. 7. Implementing constraints (e.g., primary key, foreign key).	
2.0			**05**
	2.1	Creation: Project report preparation based	
3.0			**05**
	3.1	Self Evaluation: Based on checklist provided by instructor.	
		Total	**30**

SBCSM201: *System Analysis & Design*

Course pre-requisite: Basic proficiency in at least one programming language is often required. This helps students understand the logical flow of programs and prepares them for designing systems. Understanding the basics of databases and data management is beneficial as system design often involves working with data structures and databases.

Course objectives:

- Learn about different phases of SDLC including requirements analysis, system design, implementation, testing, deployment, and maintenance.
- Learn various techniques for gathering, analyzing, and documenting system requirements including interviews, surveys, and observation.
- Learn to create models such as data flow diagrams, entity-relationship diagrams (ERDs), and UML diagrams to represent system requirements and design.
- Understand the importance of testing in the software development process and learn about different testing techniques and deployment strategies.

Course outcomes:

- After completing this course satisfactorily, a student will be able to:
  1. Gather, analyze, and document system requirements using appropriate techniques and tools.
  2. Create detailed system designs using appropriate methodologies and modeling techniques.
  3. Develop prototypes or mockups to validate system designs and gather feedback from stakeholders.
  4. Apply software engineering principles and best practices throughout the system development life cycle.
  5. Communicate technical concepts and design decisions effectively to stakeholders through documentation, presentations, and discussions.

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		UNIT - I	**8**
	1.1	Define Data, Information, System, System component, System Analysis, Business system concepts, Categories of Information System, Scope of Information System, System Development Life Cycle, system prototype.	
	1.2	Role of information system, Information system planning , Fact finding techniques, Tools for documenting procedure and decisions, Structured Analysis, Data flow analysis, Features and tools of data flow strategy, Advantage of data flow analysis, Physical and Logical data flow diagrams.	

2.0		UNIT - II	**8**
	2.1	Data dictionary features, Processes in the Data dictionary, Application Prototype, Steps in prototype methods, Use of Prototypes, A Prototyping example, System Design, Objectives in Designing an information system, software development specification.	
3.0		UNIT - III	**8**
	3.1	Elements of the design, Design of output, Design of files, Design of Database Interaction, Design of Input, Design of control, Design of Procedure, Design of Program specification.	
4.0		UNIT - IV	**8**
	4.1	Design of computer output, types of output, how to present information – Tabular format, Graphics format, color presentation, screen design, Design of Input and Output controls, data capture guideline, design of source documents.	
		Total	

Reference Book:

1. Analysis & Design of Information system – James A. Senn –McGraw Hill

TEXT BOOK:

1. System Analysis and Design – Awadh Elias; Galgotia Publication.

SBCSM202: *Java Programming-I*

Course pre-requisite:

Basic understanding of computer science fundamentals, Familiarity with fundamental programming concepts like variables, data types, control and functions/methods, Knowledge of basic problem-solving techniques.

Course objectives:

- To introduce students to the Java programming language and its syntax.
- To provide a solid foundation in object-oriented programming (OOP) concepts.
- To enable students to write Java programs to solve real-world problems.
- To develop problem-solving skills through programming assignments and projects.
- To prepare students for advanced Java programming courses and software development roles.

Course outcomes:

- After completing this course satisfactorily, a student will be able to:
  1. Students will be able to understand and apply the fundamental concepts of Java programming language, including syntax, data types, operators, and control structures.
  2. Students will gain a deep understanding of object-oriented programming principles such as encapsulation, inheritance, polymorphism, and abstraction, and they will be able to apply these concepts effectively in Java programming.

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		UNIT -I	**8**
	1.1	Introduction to Java Programming: History and features of Java, Setting up Java Development Environment, Writing and running a simple Java program	
	1.2	Java Basics: Variables and Data Types, Operators and Expressions, Control Statements: if-else, switch, loops	
2.0		UNIT -II	**8**
	2.1	Object-Oriented Programming (OOP) Concepts: Classes and Objects, Constructors and Methods,	
	2.2	Encapsulation and Access Modifiers, Inheritance and Polymorphism, Abstraction and Interfaces	
3.0		UNIT -III	**7**
	3.1	Arrays and Strings: Declaring and Initializing Arrays, Array Operations and Algorithms,	

	3.2	String Manipulation and Methods	
4.0		UNIT -IV	**7**
	4.1	Exception Handling: Understanding Exceptions in Java, try-catch-finally blocks, Custom Exceptions	
	4.2	File Handling: Reading from and Writing to Files, File I/O Streams, Handling File Exceptions	
		Total	

Reference Books:

1. CAY S. HORSTMANN & GRAY CORNELL Core Java 2: Volume-I Fundamentals; Pearson Education.
2. E.BALAGURUSAMY, ”Programming with Java”, TATA McGRAW HILL

Text Books:

1. Java 2: Herbert Schildt, “The Complete Reference”, TATA McGRAW HILL

SBCSG201: *Cyber Ethics*

Course pre-requisite:

Basic understanding of computer systems and the internet, Familiarity with fundamental concepts in ethics or philosophy is helpful but not required.

Course objectives:

- The objective of this course is to introduce students to the fundamental principles and theories of ethics as applied to the field of information technology.
- Explore ethical issues and dilemmas arising from the use of digital technologies, including privacy, security, intellectual property, and access to information.
- Examine legal and regulatory frameworks governing cyber security, data protection, and online behaviour.
- promote critical thinking skills and ethical reasoning abilities through analysis of case studies and real-world scenarios.

Course outcomes:

- After completing this course satisfactorily, a student will be able to:
  1. Analyze ethical issues and dilemmas arising from the use of digital technologies.
  2. Evaluate the ethical implications of cyber security practices, privacy concerns, and intellectual property rights.
  3. Apply ethical theories and frameworks to real-world scenarios in the field of information technology.
  4. Demonstrate awareness of legal and regulatory frameworks governing cyber security and digital privacy.
  5. Engage in critical thinking and ethical decision-making related to technology use and professional conduct.
  6. Communicate effectively about ethical issues in cyber security and digital technology to diverse audiences.

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**UNIT I**	**8**
	1.1	Introduction to Cyber Ethics: Definition and scope of cyber ethics, Historical development and importance of ethical considerations in the digital age, Ethical theories and frameworks	
	1.2	Privacy and Surveillance: Privacy rights and expectations in the digital world, Surveillance technologies and their implications for privacy,Privacy-enhancing technologies	

		and practices	
2.0		**UNIT II**	**8**
	2.1	Cyber security and Legal Frameworks: Legal and regulatory frameworks governing cyber security, Ethical considerations in cyber security practices, Ethical hacking and penetration testing	
	2.2	Intellectual Property and Digital Rights: Copyright, patents, and trademarks in the digital era, Open source software and the culture of sharing, Digital rights management and piracy issues	
3.0		**UNIT III**	**8**
	3.1	Cybercrime and Cyber Warfare: Types of cybercrime and their impact on society, Ethics of cyber warfare and cyber defense, International cooperation and legal challenges	
	3.2	Social Media and Online Behavior: Ethical issues in social media use and online communities, Cyber bullying, trolling, and harassment, Digital citizenship and responsible online behavior	
4.0		**UNIT IV**	**6**
	4.1	Professional Ethics in Technology: Ethical responsibilities of technology professionals, Codes of conduct and professional standards, Whistleblowing and ethical dilemmas in the workplace	
	4.2	Emerging Ethical Issues: Ethical considerations in emerging technologies, Ethical implications of big data and data analytics	
		Total	**30**

Reference Books:

1. "Cyber Ethics: Morality and Law in Cyberspace" by Richard A. Spinello
2. "Ethics for the Information Age" by Michael J. Quinn".
3. "Computer Ethics: A Global Perspective" by Duncan Langford

SBCSV201: *Web Content Development*

Course pre-requisite:

Basic Knowledge of Computer

Course objectives:

- The primary objective of this course is gain proficiency in HTML, CSS, and JavaScript, the fundamental technologies used in web development.
- Develop the ability to plan and implement a content strategy aligned with organizational goals.
- Understand the importance of audience analysis and user personas in shaping effective content.

Course outcomes:

- On successful completion of the course, students will be able to:
- Describe the concepts of World Wide Web, and the requirements of effective web design.
- Develop web pages using the HTML and CSS features with different layouts as per need of applications.
- Use the JavaScript to develop the dynamic web pages. and graphics editor.

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Unit I**	
	1.1	Introduction to Internet and World Wide Web (WWW), Evolution and History of World Wide Web, Web Pages and Contents, Web Clients, Web Servers, Web Browsers, Hypertext Transfer Protocol, URLs. Searching and Web-Casting Techniques, Search Engines and Search Tools, Scripting Languages.	**6**
2.0		**Unit II**	
	2.1	Web Publishing: Hosting Web Site. Internet Service Provider. Planning and designing Web Site. Web Content Authoring, Web Graphics Design, Web Programming, Steps For Developing Web Site, Choosing the Contents, Home Page, Domain Names, Creating a Website and Markup Languages (HTML, DHTML).	**8**
3.0		**Unit III**	
	3.1	Web Development: HTML Document Features, HTML and XHTML, Standard XHTML Document Structure, Images, Headers, Text Styles, Text Structuring, Text Colours and Background, Formatting Text, Page Layouts. Hypertext Links, Syntactic Differences between HTML and XHTML. Overview and Features of HTML5.	**8**
4.0		**Unit IV**	
	4.1	Images. Ordered and Unordered lists, Inserting Graphics. Table Creation and Layouts, Frame Creation and Layouts, Working with Forms and Menus, Working with Radio Buttons, Check Boxes. Text Boxes. CSS: Introduction, Types of style sheets, Style specification formats, Font properties, List properties, Color, Alignment of text, Background images, The and tags, Features of CSS3.	**8**
		Total	**30**

Reference Books:

1. Ramesh Bangia, "Learning Desktop Publishing(DTP) Second Edition", Khanna publishing
2. Kogent Learning Solutions Inc., Web Technologies Black Book, Dreamtech Press, 2009
3. Joel Sklar, Principles of Web Design, Cengage Learning, 6th Edition, 2015.

Swami Ramanand Teerth Marathwada University's

New Model Degree College, Hingoli

Syllabus for B. Sc. (CS) II year IV Semester

SBCSC251: *.NET*

Course pre-requisite:

Basic understanding of computer programming concepts such as variables, data types, control structures, and functions. Familiarity with object-oriented programming (OOP) concepts such as classes, objects, inheritance, and polymorphism.

Course objectives:

- This course is introducing students to the Microsoft .NET framework and its components.
- Familiarize students with object-oriented programming (OOP) concepts in the context of .NET development.
- Enable students to design and develop desktop, web, and mobile applications using .NET technologies.
- Provide hands-on experience in using Visual Studio IDE for .NET application development.

Course outcomes:

- On successful completion of the course, students will be able to:
  1. Understand the architecture and components of the Microsoft .NET framework.
  2. Design and develop desktop, web, and mobile applications using .NET technologies.
  3. Utilize .NET framework libraries and tools to build efficient and reliable applications.
  4. Debug and troubleshoot .NET applications using Visual Studio debugger.

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**UNIT I**	**8**
	1.1	Introduction to .NET Framework: Understanding the .NET framework architecture and its components,	
	1.2	Overview of Common Language Runtime (CLR), Common Type System (CTS), and Common Language Specification (CLS).	
2.0		**UNIT II**	**8**
	2.1	Introduction to Programming Concepts: Basic programming concepts such as variables, data types, control structures (if-else, loops), functions,	
3.0		**UNIT III**	**7**
	3.1	Introduction to object-oriented programming (OOP) concepts like classes, objects, inheritance, polymorphism, encapsulation, and abstraction.	
4.0		**UNIT IV**	**7**
	4.1	.NET Framework Libraries: Working with .NET Framework class libraries for common tasks such as file I/O, string manipulation, collections, Understanding namespaces and assemblies.	
		Total	**30**

Reference Books:

1. "Programming in C#", E. Balagurusamy, 4th Edition, Tata McGraw-Hill, 2017.
2. “Visual Basic.NET”, Shirish Chavan, 3rd Edition, Pearson Education, 2009.
3. “ASP.NET and VB.NET Web Programming”, Matt J. Crouch, Edition 2012.

SBCSC252: *Mathematical Foundation for Computer Science*

Course pre-requisite:

Programming abstraction or equivalent

Course objectives:

- To get the knowledge about the Sets, matrices, relational functions etc..
- To study the basics of differential and integral calculus

Course outcomes:

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

1. Perform operations on matrices and sparse matrices
2. Compute the determinant, rank and eigen values of a matrix DRAFT
3. Perform operations on vectors, the dot product and cross product
4. Represent vectors geometrically and calculate the gradient, divergence, curl
5. Apply linear algebra and vector calculus to solve problems in sub-disciplines of computer science.

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**Unit I**	
	1.1	Set Theory: Introduction, Basic Concepts, Terminology and notation, Sub set, Operation on sets	**6**
	1.2	Algebra sets, Venn Diagram, Collection of sets, Multi set, Countable and Uncountable sets, Ordered pairs and Cartesian product, Computer representation of sets, fuzzy sets.	
2.0		**Unit II**	
	2.1	Relation and Function: Introduction, Relations on Sets, Some operations on sets, Types of Relations in a set, Properties of Relations, Representation of Relations, Composition of Relations, Closure of Relations.	**8**
	2.2	Function: Introduction, Classification of Functions, Types of Functions, Composition of Functions, Recursively defined function, Some Special Function.	
3.0		**Unit III**	**8**

	3.1	Graph Theory: Introduction, Basic terminology, Simple graph, Multigraph, pseudo graph, Degree of vertex, Types of Graphs, Subgraphs and Isomorphic graphs, Operation of Graphs,	
	3.2	Paths, Cycles and Connectivity, Eulerian and Hamiltonian graph, Shortest path problems, Representation of graph, Planar Graphs, Graph Coloring.	
4.0		**Unit IV**	
	4.1	Trees: Introduction, Trees and their properties, Spanning Tree, Binary Tree, Tree Traversal.	**8**
	4.2	Probability: Introduction, Random Experiment, Sample Space, Set Notations, Probability Events, Compound Event, Conditional Probability.	
		Total	**30**

Reference Books:

1. Swapan Kumar Sarkar, S.Chand "A Textbook of Discrete Mathematics"
2. Tremblay and Manohar, McGraw Hill "Discrete Mathematical Structures with Application to Computer Science"
3. Erwin Keryzig "Advanced Engineering Mathematics"
4. K.D.Joshi "Foundations of Discrete Mathematics" Wiley Eastern Ltd.

SBCSC253: *.NET (Practical)*

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0			**20**
	1.1	1. Program for changing the properties of form at run time and displaying the message in the textbox "Welcome to VB.Net". 2. Console program for checking the odd/even number using simple if statements. 3. Console program for checking the prime number from 1-100 using while and for loop. 4. Console program for decision making in grade of the students as per their percentage using select case. 5. Write a console program to accept any character from keyboard and display whether it is vowel or not using select case. 6. Windows application for designing GUI with command button, list box and combo box and write a code for adding, deleting items into the list box. 7. Windows application for designing GUI with command button, Textbox, checkbox and ration button. Write a code for changing the font and its style according to checkbox and radio button selection. 8. Develop a form in VB.NET to pick a date from Calendar control and display the day, month, and year details in separate text boxes. 9. Windows application for designing GUI with command button, Progress bar Timer control and write a code for showing the status of application loading into the progress bar. 10. Develop a menu based VB.Net windows application to implement a text editor with cut, copy, paste, save and close operations	
2.0			**05**
	2.1	Creation: Project report preparation based	
3.0			**05**
	3.1	Self Evaluation: Based on checklist provided by instructor.	
		Total	**30**

SBCSC254: *Mathematical Foundation for Computer Science (Practical)*

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0			**20**
	1.1	1. Given two sets A = {1, 2, 3, 4} and B = {3, 4, 5, 6}, perform the following set operations: • Union of sets A and B. • Intersection of sets A and B. • Set difference of sets A and B. 2. Construct the truth table for the simplified expression and verify its correctness. 3. Design a logic circuit using AND, OR, and NOT gates to implement the Boolean expression: 4. Draw the truth table for the logic circuit and validate its functionality. 5. Find the degree of each vertex in the graph.	
2.0			**05**
	2.1	Creation: Project report preparation based	
3.0			**05**
	3.1	Self Evaluation: Based on checklist provided by instructor.	
		Total	**30**

SBCSM251: *Software Engineering-I*

Course pre-requisite:

Basic understanding of programming concepts and logic, Familiarity with at least one programming language, Basic knowledge of data structures and algorithms.

Course objectives:

• To learn the way of developing software with high quality and the relevant techniques.

• To introduce software engineering principles for industry standard.

• To focus on Project management domain and Software risks management.

Course outcomes:

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

1. Understand and explain the software development lifecycle and various software development methodologies.
2. Elicit, analyze, specify, validate, and manage software requirements effectively.
3. Apply software design principles and techniques to design software solutions for given problems.
4. Implement and execute software testing strategies to ensure software quality.
5. Discuss the importance of software maintenance and apply appropriate strategies for software evolution.

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		UNIT I	
	1.1	Introduction –S/W Engineering Paradigm – life cycle models (water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping, object oriented) - system engineering – computer based system – verification – validation – life cycle process – development process – system engineering hierarchy.	**8**
2.0		UNIT II	
	2.1	Functional and non-functional - user – system –requirement engineering process – feasibility studies – requirements – elicitation – validation and management	**8**
	2.2	Software prototyping – prototyping in the software process – rapid prototyping techniques – user interface prototyping - S/W document. Analysis and modeling – data, functional and behavioral models – structured analysis and data dictionary.	
3.0		UNIT III	
	3.1	Real time systems - Real time software design – system design – real time executives – data acquisition system - monitoring and control system.	**7**
	3.2	SCM – Need for SCM – Version control – Introduction to SCM process – Software configuration items.	
4.0		UNIT IV	
	4.1	Taxonomy of software testing – levels – test activities – types of s/w test – black box testing – testing boundary conditions – structural testing – test coverage criteria based on data flow mechanisms – regression testing – testing in the large.	**7**
	4.2	S/W testing strategies – strategic approach and issues - unit testing – integration testing – validation testing – system testing and debugging.	
		Total	**30**

Reference Books:

1. Software engineering,- . Ian Sommerville Pearson education Asia, 6th edition, 2000.
2. Pankaj Jalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
3. “Software Engineering – An Engineering Approach”, James F Peters and Witold Pedryez, John Wiley and Sons, New Delhi, 2000.

Text Book

1. Roger S.Pressman, Software engineering- A practitioner’s Approach, McGraw-Hill International Edition, 5th edition, 2001.

SBCSM252: *Theory of Computational-I*

Course pre-requisite:

It is recommended that the candidate has done a course in Data Structures and Algorithms.

Course objectives:

- To learn about fundamental concepts of finite automata and formal language
- To enhance student's ability to understand and solve mathematical proofs for computation and algorithm
- To learn about deterministic and non- deterministic machines.
- To design grammars and recognizers for different formal languages

Course outcomes:

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

1. Students will have clear understanding of abstract models of computation.
2. Students will be able to analyses and design the finite automata, pushdown automata, formal language and language.
3. Students will be able to apply mathematical and formal techniques for solving problems in computer science.

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**UNIT I**	**8**
	1.1	Introduction to Finite Automata: The central concepts of Automata theory; Deterministic finite automata;	
	1.2	Nondeterministic finite automata. Applications of finite automata, Finite automata with Epsilon transitions.	
2.0		**UNIT II**	**8**
	2.1	Finite Automata and Regular Expressions: Applications of Regular Expressions; Regular languages; Proving languages not to be regular languages;	
	2.2	Closure properties of regular languages; Decision properties of regular languages; Equivalence and minimization of automata	
3.0		**UNIT III**	**7**
	3.1	Context–free grammars: Parse trees; Applications; Ambiguity in grammars and Languages. Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's	
	3.2	Deterministic Pushdown Automata: Normal forms for CFGs; The pumping lemma for CFGs; Closure properties of CFLs.	
4.0		**UNIT IV**	**7**
	4.1	The Turing machine: Programming techniques for Turing Machines, Extensions to the basics Turning machines, Turning machines and computers.	
		Total	**30**

Reference Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman: Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson Education, 2011.
2. John C Martin: Introduction to Languages and Automata Theory, 3rd Edition, Tata McGrawHill, 2007.
3. Daniel I.A. Cohen: Introduction to Computer Theory, 2nd Edition, John Wiley & Sons, 2009.
4. Thomas A. Sudkamp: An Introduction to the Theory of Computer Science, Languages and Machines, 3rd Edition,Pearson Education, 2006.

SBCSG251: *Cyber Security-II*

Course pre-requisite:

Basic understanding of computer networks and operating systems, Familiarity with programming concepts Knowledge of basic security principles.

Course objectives:

- To introduce students to the fundamental principles of cybersecurity.
- To provide an understanding of common cyber threats and vulnerabilities.
- To equip students with knowledge and skills to protect computer systems and networks from cyber attacks.
- To introduce students to various security tools and techniques used in cybersecurity.
- To raise awareness about legal, ethical, and social issues related to cybersecurity.

Course outcomes:

- On successful completion of the course, students will be able to:
  1. Understand the Fundamentals of Cyber security
  2. Identify Common Cyber Threats and Vulnerabilities
  3. Apply Cryptographic Techniques
  4. Secure Web Applications and Services

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**UNIT I**	**8**
	1.1	Introduction to Cyber security: Defining Cyberspace and Overview of Computer and Web-technology, Architecture of cyberspace, Communication and web technology, Internet, World wide web,	
	1.2	Advent of internet, Internet infrastructure for data transfer and governance, Internet society, Regulation of cyberspace, Concept of cyber security, Issues and challenges of cyber security.	
2.0		**UNIT II**	**8**
	2.1	Cyber crime and Cyber law: Classification of cyber crimes, Common cyber crimes- cyber crime targeting computers and mobiles, cyber crime against women and children, financial frauds, social engineering attacks, malware and ransomware attacks, zero day and zero click attacks,	
3.0		**UNIT III**	**6**
	3.1	Cybercriminals modus-operandi, Reporting of cyber crimes, Remedial and mitigation measures, Legal perspective of cyber crime,	
	3.2	IT Act 2000 and its amendments, Cyber crime and offences, Organizations dealing with Cybercrime and Cyber security in India, Case studies.	
4.0		**UNIT IV**	**8**
	4.1	Social Media Overview and Security: Introduction to Social networks. 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,	
	4.2	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.	
		Total	**30**

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)

SBCSS251: *Networking & LAN Maintenance*

Course pre-requisite:

Basic understanding of computer hardware and operating systems.
Familiarity with networking fundamentals, including IP addressing and subnetting.
Knowledge of basic troubleshooting techniques.

Course objectives:

- To provide students with a comprehensive understanding of computer networks and their components.
- To introduce students to local area network (LAN) technologies, protocols, and architectures.
- To equip students with practical skills for configuring, managing, and troubleshooting LANs.
- To prepare students for industry-standard network certifications.

Course outcomes:

- On successful completion of the course, students will be able to:
  1. Understand the principles and concepts of computer networking and LAN technologies.
  2. Configure, manage, and troubleshoot Ethernet LANs, including VLANs and switching.
  3. Design and implement IP addressing schemes and subnetting techniques for LANs.
  4. Implement basic LAN security measures to protect network resources.
  5. Analyze and diagnose LAN-related problems using appropriate troubleshooting techniques and tools.

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**UNIT I**	**8**
	1.1	Introduction to Networking: Overview of computer networks and their types, Network topologies, architectures, and protocols, OSI and TCP/IP models.	
	1.2	Ethernet LANs: Ethernet standards and protocols, Ethernet frame structure, Ethernet switching concepts and VLANs.	
2.0		**UNIT II**	**8**
	2.1	IP Addressing and Subnetting: IPv4 and IPv6 addressing schemes, Subnetting and supernetting techniques, IP address allocation and management.	
	2.2	LAN Infrastructure Components: Network devices: routers, switches, hubs, and access points, Structured cabling systems and network media, Power over Ethernet (PoE) technology.	
3.0		**UNIT III**	**8**
	3.1	LAN Configuration and Management: Configuration of routers and switches, VLAN configuration and management, IP addressing and DHCP configuration	
	3.2	LAN Security: Common network threats and vulnerabilities. Network security best practices, Implementation of access control lists (ACLs) and port security.	
4.0		**UNIT IV**	**6**
	4.1	Network Troubleshooting: Network troubleshooting methodologies, Use of network diagnostic tools, Identifying and resolving common LAN issues.	
	4.2	Wireless LANs (Wi-Fi): Wireless networking standards and technologies, WLAN configuration and security, Site survey and deployment considerations.	
		Total	**30**

Reference Books:

1. "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross
2. "CCNA Routing and Switching Portable Command Guide" by Scott Empson
3. “Computer Networks” Tanenbaum Andrew, PHI 2.
4. “Data Communication and Networking” Forouzan Behrouz A., Tata Mcgraw Hill

AECXX251: *Ergonomics*

Course pre-requisite:

Basic understanding of human anatomy and physiology.

Familiarity with workplace environments and computer usage.

Knowledge of basic principles of occupational health and safety.

Course objectives:

- Learn broad based introduction to ergonomic principles and their application in the design of work, equipment and workplace.
- Learn Musculo-skeletal disorders, manual handling, ergonomic aspects of the environment.
- Learn the key features in the design of workplaces
- Learn the sources of standards covering ergonomics, social aspects and training, instruction and supervision requirements.

Course outcomes:

- On successful completion of the course, students will be able to:
  1. Demonstrate ergonomic principles to the creation of safer, healthier and more efficient and effective activities in the workplace;
  2. Perform ergonomic risk assessments
  3. Design appropriate control measures for ergonomic risk factors

Curriculum Details

Module No.	Unit No.	Topic	Hrs. Required to cover the contents
1.0		**UNIT I**	
	1.1	Overview of Ergonomics: Introduction General Principles, Aims, objectives and benefits of ergonomics, Biological Ergonomics, Psychology, Developing an Ergonomics Strategy at Work	**10**
	1.2	Ergonomics Methods and Techniques: Work Design, Ergonomics Risk Assessment, Measurements and Information, Gathering	
2.0		**UNIT II**	
	2.1	Musculo-Skeletal Disorder: Manual Handling, Work Related Upper Limb Disorders (WRULD)	**10**
	2.2	Workplace, Job and Product Design: Workplace Layout and Equipment Design, Controls, Displays and Information	
3.0		**UNIT III**	
	3.1	Relevant Physical Factors of the Work Environment: Lighting, Noise, Thermal Environment, Other Considerations, Clothing and Protective Equipment	**10**
	3.2	Standards and Social Aspects: Standards, Selection and Training, Instruction and Supervision	
		Total	**30**

Reference Books:

1. Konz SA, Johnson S. Work Design: Industrial Ergonomics, , Holcomb Hathaway Publishers, 6th Edition, 2004.
2. Konz SA, Johnson S. Work Design: Occupational Ergonomics., Holcomb Hathaway Publishers, 7th Edition, 2008.
3. Jan Dul , Bernard Weerdmeester, Ergonomics for Beginners, CRC Press; 3 rd Edition
4. Celine McKeown, Michael Twiss , Workplace Ergonomics: A Practical Guide, IOSH services, 2001