



॥ 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

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विज्ञान व तंत्रज्ञान विद्याशाखे अंतर्गत
राष्ट्रीय शैक्षणिक धोरण-२०२० नुसार
पदवी तृतीय वर्षाचे अभ्यासक्रम
(Syllabus) शैक्षणिक वर्ष २०२६-२७
पासून लागू करण्याबाबत.

परिपत्रक

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २२ एप्रिल २०२६ रोजी संपन्न झालेल्या मा.विद्यापरिषद बैठकीतील विषय क्र.०८/६४-२०२६ च्या ठरावानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील राष्ट्रीय शैक्षणिक धोरण-२०२० नुसार पदवी तृतीय वर्षाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६-२७ पासून लागू करण्यास मा.विद्यापरिषदेने मान्यता प्रदान केली आहे. त्यानुसार विज्ञान व तंत्रज्ञान विद्याशाखेतील बी.एस्सी. तृतीय वर्षाचे खालील विषयाचे अभ्यासक्रम (Syllabus) शैक्षणिक वर्ष २०२६-२७ पासून लागू करण्यात येत आहे.

01	B.Sc. III Year Computer Maintenance
02	B.Sc. III Year Information Technology
03	B.Sc. III Year Computer Science
04	B.C.A. III Year (Single Major)
05	B.Sc. III Year Computer Science (Single Major)

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/परिपत्रक/पदवी/बीएस्सी/२०२६-२७/ 93

दिनांक : १०.०७.२०२६

उपकुलसचिव
शैक्षणिक (१-अभ्यासमंडळे) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :-

- १) मा. कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ.
- २) मा. प्र.कुलगुरू महोदयांचे कार्यालय, प्रस्तुत विद्यापीठ.
- ३) मा. अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
- ४) मा. संचालक, परिक्षा व मूल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
- ५) मा. प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
- ६) सिस्टीम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ. यांना 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)**

SYLLABUS

Of

**UNDERGRADUATE PROGRAMME OF
SCIENCE & TECHNOLOGY**

Major in **Computer Science**

Under the Faculty of Science & Technology

B. Sc. Third Year

Effective from the Academic year 2026 – 2027

(As per NEP-2020)

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

Swami Ramanand Teerth Marathwada University, Nanded, enduring to its vision statement “Enlightened Student: A Source of Immense Power”, is trying hard consistently to enrich the quality of science education in its jurisdiction by implementing several quality initiatives. Revision and updating curriculum to meet the standard of the courses at national and international level, implementing innovative methods of teaching-learning, improvisation in the examination and evaluation processes are some of the important measures that enabled the University to achieve the 3Es, the equity, the efficiency and the excellence in higher education of this region. To overcome the difficulty of comparing the performances of the graduating students and also to provide mobility to them to join other institutions the University has adopted the cumulative grade point average (CGPA) system in the year 2014-2015. Further, following the suggestions by the UGC and looking at the better 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 Science as Major program, accurately designed to equip students with cutting-edge knowledge and hands-on expertise in the ever-evolving field of Computer Science.

In today's digital era, computer science forms the backbone of innovation, driving advancements in Artificial Intelligence, Cybersecurity, Data Science, Web Technologies, and more. Our curriculum is structured to provide a strong theoretical foundation while emphasizing practical, industry-relevant skills that prepare students for global challenges.

Our B.Sc. Computer Science (Major) program offers a comprehensive and future-ready syllabus, covering essential domains such as: Core Programming (C, C++, Java, and Python), Web Development Technology (HTML, CSS, JavaScript, WordPress), Database Management (RDBMS, Data Analysis), Cybersecurity & Networking (Cyber Security, Computer Networks) and Emerging Technologies (Machine Learning, Data Science, Digital Image Processing). With a balanced mix of theory, coding labs, and projects. Students will develop problem-solving abilities, logical reasoning, and creativity that are key traits for a successful career in IT.

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	Prof Dr Sudhir Baburao Jagtap	Chairman	Swami Vivekananda Mahavidyalaya, Udgir	9422611355
2	Prof Dr Girish Venkatesh Chowdhary	Member	School of Computational Science, SRTMU, Nanded	9421252364
3	Dr Upendra Bhalchandra Parag	Member	School of Computational Sciences, SRTMU, Nanded	9422240301
4	Dr Madhav Motiram Bokare	Member	Institute of Technology and Management, Nanded	9421870580
5	Dr Purushottam Anandrao Kadam	Member	Institute of Information Technology & Management, Nanded	7972098959
6	Dr Gajanan Kurundkar	Member	Shri Guru Buddhiswami Mahavidyalaya, Purna	9850797966
7	Dr Shireeshkumar Rudrawar	Member	DSM's ACS College, Jintur	9421515383
8	Dr Nitish Shankar Zulpe	Member	Computer Science and Information Technology(COCSIT),Latur	9970763030
9	Dr Bhaskar Gangadharrao Koshidgewar	Member	Vai.Dhunda Maharaj Deglurkar College	9423437273
10	Dr Renuka Ramakant Londhe	Member	Rajarshi Shahu Mahavidyalaya (Autonomous),Latur	9545226333
11	Dr Ramesh R. Manza	Member	Dr.Babasaheb Ambedkar Marathwada University, Aurangabad	9421308853
12	Dr Sadanand Awale	Member	Maharashtra Udyagiri Mahavidyalaya Udgir Dist. Latur	9421369569
13	Shri Ajit Bhale	Member	Great Software LabAmar Aamma Jnues Naner Road Pune	02046711000



Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology (Three Optional in the First Year)

Credit Framework for Four Year Multidisciplinary Degree Program

with Multiple Entry and Exit

Subject: Computer Science (CSC) (Major)

Year & Level	Semester	Optional 1 (Major) (From the same Faculty)		Optional 2 (Minor 1) (From the same Faculty)	Optional 3 (Minor 2) (From the same Faculty)	Generic Elective (GE) (select from Basket 3 of Faculties other than Science and Technology)	Vocational & Skill Enhancement Course	Ability Enhancement Course (AEC) (Basket 4) Value Education Courses (VEC) / Indian Knowledge System (IKS) (Basket 5) (Common across all faculties)	Field Work / Project/Internship/ OJT/ Apprenticeship / Case Study Or Co-curricular Courses (CCC) (Basket 6 for CCC) (Common across all faculties)	Credits	Total Credits
1	2	3		4	5	6	7	8	9	10	11
3 (5.5)	V	SCSCCT1301 (3cr) SCSCCP1301 (2cr) SCSCCT1302 (3cr) SCSCCP1302 (2cr) SCSCIKS1301 (2cr) 12 Credits	SCSCET1301 (2cr) OR SCSCET1302 (2cr) SCSCCEP1301 (2cr) OR SCSCCEP1302 (2cr) 4 Credits	--	--	--	VSC 3 SCSCVC1301 2 Credits	--	FP1 (4Cr) (FP/CS) SCSCFP1301 4 Credits	22	44
	VI	SCSCCT1351(3cr) SCSCCP1351(2cr) SCSCCT1352(3cr) SCSCCP1352 (2cr) SCSCCT1353 (2cr) 12 Credits	SCSCET1351 (2cr) OR SCSCET1352 (2cr) SCSCCEP1351 (2cr) OR SCSCCEP1352 (2cr) 4 Credits	--	--	--	VSC 4 SCSCVC1351 2 Credits	--	OJT SCSCOJT1351 4 Credits	22	
Cum. Cr.		56		16	08	08	12	22	10		132



B. Sc. Third Year Semester V (Level 5.5)

Teaching Scheme

Subject	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SCSCCT1301	Software Engineering	03	--	03	03	--
	SCSCCP1301	Lab Course VII SE (Practical)	-	02	02	--	04
	SCSCCT1302	Python Programming	03	--	03	03	--
	SCSCCP1302	Lab Course VIII PP (Practical)	-	02	02	--	04
	SCSCIKS1301	IKS in CS	02	--	02	02	--
Elective	SCSCET1301	PHP Programming	02	--	02	02	--
	SCSCEP1301	Lab Course PHP (Practical)	--	02	02	--	04
Vocational Course	SCSCVC1301	System Security	--	02	02	--	04
Field Project	SCSCFP1301	Project in CS	--	04	04	--	08
Total Credits			10	12	22	10	24



B. Sc. Third Year Semester V (Level 5.5)

Examination Scheme

[40% Continuous Assessment (CA) and 60% End Semester Assessment (ESA)]

Subject (1)	Course Code (2)	Course Name (3)	Theory/Practical				ESA (8)	Total 7+8 (9)
			Continuous Assessment (CA)					
			Test (4)	Assignment (5)	Attendance (6)	Total (7)		
Major	SCSCCT1301	Software Engineering	15	09	06	30	45	75
	SCSCCP1301	Lab Course VII SE (Practical)	10	06	04	20	30	50
	SCSCCT1302	Python Programming	15	09	06	30	45	75
	SCSCCP1302	Lab Course VIII PP (Practical)	10	06	04	20	30	50
	SCSCIKS1301	IKS in CS	10	06	04	20	30	50
Elective	SCSCET1301	PHP Programming	10	06	04	20	30	50
	SCSCPE1301	Lab Course PHP (Practical)	10	06	04	20	30	50
Vocational Course	SCSCVC1301	System Security	10	06	04	20	30	50
Field Project	SCSCFP1301	Project in CS	20	12	08	40	60	100



B. Sc. Third Year Semester VI (Level 5.5)

Teaching Scheme

Subject	Course Code	Course Name	Credits Assigned			Teaching Scheme (Hrs/ week)	
			Theory	Practical	Total	Theory	Practical
Major	SCSCCT1351	Computer Network	03	--	03	03	--
	SCSCCP1351	Lab Course IX CN (Practical)	-	02	02	--	04
	SCSCCT1352	Software Testing	03	--	03	03	--
	SCSCCP1352	Lab Course X ST (Practical)	-	02	02	--	04
	SCSCCT1353	Introduction to Data Science	02	--	02	02	--
Elective	SCSCET1351	Machine Learning	02	--	02	02	--
	SCSCEP1351	Lab Course ML (Practical)	--	02	02	--	04
Vocational Course	SCSCVC1351	Digital Media	--	02	02	--	04
OJT	SCSCOJT1351	On Job Training	--	04	04	--	08
Total Credits			10	12	22	10	24



B. Sc. Third Year Semester VI (Level 5.5)

Examination Scheme

[40% Continuous Assessment (CA) and 60% End Semester Assessment (ESA)]

Subject (1)	Course Code (2)	Course Name (3)	Theory/Practical				ESA (8)	Total 7+8 (9)
			Continuous Assessment (CA)					
			Test (4)	Assignment (5)	Attendance (6)	Total (7)		
Major	SCSCCT1351	Computer Network	15	09	06	30	45	75
	SCSCCP1351	Lab Course IX CN (Practical)	10	06	04	20	30	50
	SCSCCT1352	Software Testing	15	09	06	30	45	75
	SCSCCP1352	Lab Course X ST (Practical)	10	06	04	20	30	50
	SCSCCT1353	Introduction to Data Science	10	06	04	20	30	50
Elective	SCSCET1351	Machine Learning	10	06	04	20	30	50
	SCSCEP1351	Lab Course ML (Practical)	10	06	04	20	30	50
Vocational Course	SCSCVC1351	Digital Media	10	06	04	20	30	50
OJT	SCSCOJT1351	On Job Training	20	12	08	40	60	100

Semester V



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester V)

Subject: Computer Science

Course Type: Major Theory

Course Title: Software Engineering

Course Code: SCSCCT1301

Credits: 03

Max. Marks: 75 [CA:30 & ESA:45]

Lectures: 45 Hrs.

Learning Objectives:

1. Understand Software Engineering Process.
2. Understand Requirements and components of Software Engineering.
3. Understand software design and software testing fundamentals.

Course Outcomes:

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

1. Software engineering is art of software designing.
2. It aims to prepare detailed plans and designs as per customer's demands, carry out testing, develop intuitive user interfaces, and integrate all these activities into a system.

Unit No.	Title of Unit & Contents	Hrs.
I	The Nature of Software & Software Engineering	10
	The Nature of Software, The Changing Nature of Software, Defining the Discipline, Software engineering process, Software engineering practice, Software Myths	
II	Software Process Structure & Models and Agile Development	15
	A Generic process model, defining a framework activity, Process patterns, Process assessment & improvement, Prescriptive process models, Introduction to Agility, Agility & Cost of Change, Agility principles, Extreme programming.	
III	Understanding Requirements & Design Concepts	10
	Requirement Engineering, Building the analysis model, Requirement Analysis, Design within the context of software engineering, the design process, Software Architecture, Designing Class based Components	
IV	Web App & Mobile App Design	10
	Web App Design Quality, Design Goals, A Design Pyramid for Web Apps, Web App Interface Design, The Challenges in Mob. App design, Developing Mobile Apps, Mobile App Design-Best Practices	

Reference Books:

1. Software Engineering A practitioner's approach By Rogers S. Pressman, 8th Ed. (McGraw Hill)
2. Software Engineering Principles and practices By Waman S. Jawadekar (Tata McGraw Hill)



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester V)

Subject: Computer Science

Course Type: Major Practical

Course Title: Lab Course VII Software Engineering

Course Code: SCSCCP1301

Credits: 02

Max. Marks: 50 [CA:20 & ESA:30]

Lectures: 60Hrs.

This is suggestive practical list for SE laboratory.

1. At least 5 Practical experiences in unit testing, integration testing, and system testing to ensure code quality and functionality.
2. Creating clear documentation, including Software Requirement Specifications (SRS) and README files, to make code maintainable and understandable.
3. Proficiency in Integrated Development Environments (IDEs), debugging tools, and containerization (e.g., Docker).
4. Moving beyond coding exercises to building full-stack applications (e.g., using Python, JavaScript, React) helps students understand the full Software Development Life Cycle (SDLC).
5. It is foundational for managing code changes, branching, and collaborating on team projects.



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester V)

Subject: Computer Science

Course Type: Major Theory

Course Title: Python Programming

Course Code: SCSCCT1302

Credits: 03

Max. Marks: 75 [CA:30 & ESA:45]

Lectures: 45Hrs.

Learning Objectives:

1. To acquire programming skills in core Python
2. To acquire Object Oriented Skills in Python
3. To develop the skill of designing Graphical user Interfaces in Python
4. To develop the ability to write database applications in Python

Course Outcomes:

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

1. Upon successful completion of this course, student will be able to
2. Explain basic principles of Python programming language
3. Implement object-oriented concepts
4. Implement database and GUI applications

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction	15
	Introduction to Python, Features of python, What Can I Do with Python? Python Interpreter, Data types, Variables, Comments, Operators, expressions; input, processing and output statements, Control Structures: loops and decision	
II	String Handling, Classes, Modules and Package	10
	Strings, String operations and String Slicing, Defining Classes, Defining and calling functions passing arguments to functions, Python and OOP – Inheritance, polymorphism, Modules – datetime, math, Packages	
III	Exception Handling and Collections	10
	Exception in python, Exception roles, Exception Handling, Collections in Python – List, Tuples, Dictionaries, Sets	
IV	GUI Programming and Database Connectivity Using Python	10
	Graphical User Interfaces, Using the tkinter Module, Creating Label, Text, Button, info Dialog Boxes, Radiobutton, Checkbutton, Getting Input, Importing MySQL for Python, Connecting with a database, Forming a query in MySQL, Passing a query to MySQL.	

Reference Books:

1. Mark Lutz, Learning Python, 5th Ed. O'REILLY
2. Tony Gaddis, STARTING OUT WITH Python, Addison-Wesley
3. John Paul Mueller, Beginning Programming with Python For Dummies
4. Albert Lukaszewski, MySQL for Python, Packet Publishing



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester V)

Subject: Computer Science

Course Type: Major Practical

Course Title: Lab Course VIII Python Programming

Course Code: SCSCCP1302

Credits: 02

Max. Marks: 50 [CA:20 & ESA:30]

Lectures: 60Hrs.

This is suggestive practical list for Python code laboratory.

1. Program to demonstrate different data types.
2. Program to demonstrate decision making statement.
3. Program to demonstrate Looping statement.
4. Program to demonstrate different string methods.
5. Program to demonstrate function declaration and passing arguments.
6. Program to demonstrate inheritance and its Types.
7. Program to demonstrate polymorphism.
8. Program to demonstrate exception handling.
9. Program to demonstrate different collections.
10. Program to demonstrate database connectivity.



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester V)

Subject: Computer Science

Course Type: Major Theory

Course Title: IKS in Computer Science

Course Code: SCSCI1301

Credits: 02

Max. Marks: 50 [CA:20 & ESA:30]

Lectures: 30 Hrs.

Learning Objectives:

1. To understand: Analyze foundational concepts & contributions of Indian Mathematics, Machine Learning.
2. To implement mathematical principles in solving machine learning problems.
3. To assess the integration of Indian mathematical techniques into modern machine learning models.
4. To develop innovative machine learning algorithms inspired by Indian Mathematics.

Course Outcomes:

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

1. Gain in-depth knowledge of Indian Mathematics and its relevance in modern computational techniques.
2. Develop the ability to apply mathematical foundations to design and optimize machine learning models.
3. Evaluate and analyze real-world applications and future trends of AI in the Indian context..

Unit No.	Title of Unit & Contents	Hrs.
I	Foundation of Indian Mathematics	08
	Vedic Mathematics: Speed Mathematics Techniques, Contributions of Aryabhata, Brahmagupta, and Bhaskara II, Concepts of Zero and Infinity in Indian Mathematics, Ancient Algebra and Geometry: Sulba Sutras and their Applications,	
II	Ancient of AI	08
	Artificial Neural Networks: Concepts and Applications, Support Vector Machines (SVMs) and Kernel Methods, Ensemble Methods: Random Forests, Bagging, and Boosting,	
III	Machine Learning	08
	Optimization Techniques in Machine Learning: Gradient Descent, Handling Large Datasets: Scalability and Big Data Integration	
IV	Neural Network	06
	Artificial Neural Networks: Concepts and Applications, Support Vector Machines (SVMs) and Kernel Methods,	

Reference Books:

1. The Great Indian Mathematicians: 15 Pioneers Who Put Indian Mathematics on the World Map by Gaurav Tekriwal.
2. Mathematics in India by Kim Plofker
3. Vedic Mathematics Made Easy by Dhaval Bathia.
4. Introduction to Machine Learning with Python by Andreas C. Müller and Sarah Guido
5. Machine Learning: A Probabilistic Perspective by Kevin P. Murphy
6. Artificial Intelligence: A Modern Approach by Stuart Russell and Peter Norvig.



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester V)

Subject: Computer Science

Course Type: Major Elective Theory

Course Title: PHP Programming

Course Code: SCSCET1301

Credits: 02

Max. Marks: 50 [CA:20 & ESA:30]

Lectures: 30 Hrs.

Learning Objectives:

1. Learn Core-PHP, Server Side Scripting Language.
2. Learn to design dynamic and interactive Web pages.
3. Learn PHP-Database handling.

Course Outcomes:

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

1. Able to design dynamic and interactive web pages, websites.
2. Able to run PHP scripts on server and retrieve results.
3. Able to handle databases like MySQL using PHP in web sites.

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to PHP	10
	Introduction to PHP , History and Features of PHP, Installation & Configuration of PHP, Embedding PHP code in Your Web Pages, Understanding PHP, HTML, and White Space. Writing Comments in PHP, Sending Data to the Web Browser, Data types in PHP, Keywords in PHP, Using Variables, Constants in PHP, Expressions in PHP, Operators in PHP.	
II	Programming with PHP	10
	Conditional statements: if, if-else, switch, The? Operator, looping statements: while Loop, do...while Loop, for Loop, Arrays in PHP: Introduction- What is Array? Types of Arrays: Indexed Vs. Associative arrays, Multidimensional arrays, Creating Array, Accessing Array, Manipulating Arrays, Displaying arrays.... use of for. each as loop, Using Array Functions, Including and Requiring Files- use of Include () and Require (), Implicit and Explicit Casting in PHP	
III	Using Functions	05
	Functions in PHP: Defining and calling a function, Returning Value from function, Date and Time in PHP: Date and Time Functions, Strings in PHP: String Functions	
IV	Class and Object	05
	Objects in PHP: What is Class & Object, Creating and accessing a Class & Object, Object properties, object methods, Overloading, inheritance, Constructor and Destructor	

Reference Books:

1. PHP: The Complete Reference by Steven Holzner
2. Programming PHP by Kevin Tatroe, Peter MacIntyre



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester V)

Subject: Computer Science

Course Type: Major Elective Practical

Course Title: Lab Course PHP

Course Code: SCSCEP1301

Credits: 02

Max. Marks: 50 [CA:20 & ESA:30]

Lectures: 60Hrs.

This is suggestive practical list for PHP code laboratory.

1. Write a program in PHP to demonstrate looping statements in PHP.
2. Write a program in PHP to demonstrate conditional statements in PHP.
3. Write a program in PHP to Create an Array, Insert elements in Array,
4. Accessing Elements from Array and Displaying elements of Arrays.
5. Write a program in PHP to demonstrate including multiple files in PHP webpage.
6. Write a program in PHP to Creating and Calling Your Own Functions.
7. Write a program in PHP to declare a class, creating an Object, demonstrates
8. Writing Methods & Declaring Properties, Accessing Objects.
9. Write a program in PHP to demonstrate String Functions.
10. Write a program in PHP to demonstrate Date and Time Functions.



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester V)

Subject: Computer Science

Course Type: Vocational & Skill Enhancement Course

Course Title: System Security

Course Code: SCSCVC1301

Credits: 02

Max. Marks: 50 [CA:20 & ESA:30]

Lectures: 60Hrs.

Learning Objectives:

1. Fundamental issues and first principles of security and information assurance.
2. Security policies, models and mechanisms related to confidentiality, integrity, authentication, identification, and availability issues
3. It related to information and information systems.

Course Outcomes:

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

1. Expected to possess in-depth knowledge of formal modelling techniques for secure computer systems
2. Advanced knowledge of common vulnerabilities, attack mechanisms, and methods against computer and information systems

Unit No.	Title of Unit & Contents	Hrs.
I	Security Basics	15
	General overview and definitions, Security models and policy issues	
II	Basic Cryptography and Network security	15
	Introduction to cryptography and classical cryptosystem, Authentication protocols and Key Management, IPSec, VPNs, E-commerce issues.	
III	Systems Design Issues	15
	Design principles, Security Mechanisms, Auditing Systems	
IV	Information assurance	15
	Risk analysis, System verification and evaluation	

Reference Books:

1. Security in Computing, 2nd Edition, Charles P. Pfleeger, Prentice Hall
2. Building Secure Software: How to avoid the Security Problems the Right Way, John Viega, Gary McGraw, Addison-Wesley, 2002



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester V)

Subject: Computer Science

Course Type: Field Project / Project / Case Study etc.

Course Title: Project in CS

Course Code: SCSCFP1301

Credits: 04

Max. Marks: 100 [CA:40 & ESA:60]

Lectures: 120Hrs.

Guidelines

1. Maximum a group of 03 students are allowed to work on a project.
2. Project Synopsis should be submitted by the students to their concern faculty and a
3. Declaration should be submitted by the students regarding the originality of work.
4. Project report should prepare by the students & it should be certified by concern Faculty & head of the department.
5. Students should submit one hardcopy of report with Soft copy to the department.

Evaluation Scheme (100 Marks)

➤ **Continuous Assessment 40 Marks**

➤ **Final Evaluation 60 Marks**

- Demonstration / results: 25 marks
- Project report: 15 marks
- Presentation: 10 marks
- Viva Voce: 10 marks

Semester VI



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester VI)

Subject: Computer Science

Course Type: Major Theory

Course Title: Computer Network

Course Code: SCSCCT1351

Credits: 03

Max. Marks: 75 [CA:30 & ESA:45]

Lectures: 45 Hrs.

Learning Objectives:

1. Understanding basics of computer networking, connectivity techniques and related protocols.
2. This introduces the students to computer networks and concentrate on building a firm Foundation for understanding data communication.

Course Outcomes:

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

1. Students would be able to choose, escalate and establish a computer network

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to Computer Network	15
	Computer Network definition & Applications, Data Transmission Modes, Protocol Hierarchies, Design issues for layers, Connection Oriented & Connectionless services. Service Primitives. Network Models – OSI/ISO Reference Model & TCP/IP Model.	
II	Network Topology and Devices	10
	Network Topologies, Network Devices - NIC Cards, Hub, Switch, Bridges, Wireless access points, Router, Gateways, Modems, Repeaters, Types of Networks.	
III	Transmission Medium	10
	Magnetic Media, Twisted pair, Co-axial cable, fibre optics, radio transmission, Wireless transmission, Bluetooth. Structure of telephone system, Transmission & Switching. Email Architecture	
IV	Network Protocols and Advanced Technology	10
	Network Protocols, Web server, Browsers, Domain Name System, introduction to IP addresses & IP Protocol, Introduction to Wi-Fi & 4G technology, Introduction to Security & Cryptography, Firewall	

Reference Books:

1. Computer Networks by Andrew S Tanenbaum (PHI) 4th edition
2. Computer Networking & Internet by Fred Halsall, Addison Wesley
3. Computer Networks – A Systems approach by Peterson MK Publishers



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester VI)

Subject: Computer Science

Course Type: Major Practical

Course Title: Lab Course IX Computer Network

Course Code: SCSCCP1351

Credits: 02

Max. Marks: 50 [CA:20 & ESA:30]

Lectures: 60 Hrs.

This is suggestive practical list for code laboratory.

1. Implementation of ISO OSI Model
2. Implementation of TCP/IP Model
3. Implementation of Network and their types
4. Implementation of Different Network Topology
5. Implementation of Network Devices
6. Implementation of Transmission media
7. Implementation of Bluetooth Technology
8. Implementation of Wireless Transmission
9. Implementation of 4G and 5G Technology
10. Implementation of Security & Cryptography
11. Study of network devices.
12. Study of different connectors.
13. Crimping of LAN cable and testing.
14. Configuration of IP address in a system.
15. Study of network topologies.
16. Basic router configuration.
17. Basic switch configuration.
18. Wi-Fi configuration and security settings.
19. Study of DNS and email configuration.
20. Demonstration of firewall settings.



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester VI)

Subject: Computer Science

Course Type: Major Theory

Course Title: Software Testing

Course Code: SCSCCT1352

Credits: 03

Max. Marks: 75 [CA:30 & ESA:45]

Lectures: 45 Hrs.

Learning Objectives:

1. Understand Software Testing Process
2. Understand Various types of software testing
3. Understand how to handle testing process

Course Outcomes:

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

1. Set the basic path to students towards becoming a Software Testing Professional.

Unit No.	Title of Unit & Contents	Hrs.
I	Software Quality Assurance	10
	Software Quality, Formal Technical Reviews, Elements of Software Quality Assurance, SQA Processes and Product Characteristics, SQA Tasks, Goals, and Metrics, The ISO 9000 Quality Standards.	
II	Software Testing Strategies	10
	A Strategic Approach to Software Testing, Strategic Issues Test Strategies for Conventional Software, Test Strategies for WebApps & Mobile Apps, Validation Testing, System Testing	
III	Testing Conventional Applications	15
	Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing,	
IV	Testing Web Applications & Mobile Applications	10
	Testing Concepts for WebApps, The Web Testing Process—An Overview, Testing Guidelines for Mobile Apps, The Testing Strategies of mobile apps, Considering the Spectrum of User Interaction	

Reference Books:

1. Software Engineering A Practitioner's Approach (eighth edition) By Roger S.Pressman (McGraw Hill Pub.)
2. The Art of Software Testing, 3rd Edition Author: Glenford J. Myers, Corey Sandler, Tom Baggett. The First Edition



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester VI)

Subject: Computer Science

Course Type: Major Practical

Course Title: Lab Course X Software Testing

Course Code: SCSCCP1352

Credits: 02

Max. Marks: 50 [CA:20 & ESA:30]

Lectures: 60 Hrs.

Study and perform following practical based on course contents.

1. Write programs in C language in demonstration of the working of the following constructs
(i). do..while (ii) while..do (iii) if...else (iv) switch(v) for
2. Write the test cases for FACEBOOK, TWITTER etc.
3. Take any system (e.g. ATM system) and study its system specifications and report the various bugs.
4. Write the test cases for GMAIL.
5. Create a test plan document for any application (e.g. Library Management System)
6. Study of any testing tool (e.g. Win runner)
7. Study of any web testing tool (e.g. Selenium)
8. Study of any bug tracking tool (e.g. Bugzilla, bugbit)
9. Study of any test management tool (e.g. Test Director)
10. Study of any open source-testing tool (e.g. Test Link)



Swami Ramanand Teerth Marathwada University, Nanded
Faculty of Science and Technology
B.Sc. Third Year (Semester VI)
Subject: Computer Science

Course Type: Major Theory

Course Title: Introduction to Data Science

Course Code: SCSCCT1353

Credits: 02

Max. Marks: 50 [CA:20 & ESA:30]

Lectures: 30 Hrs.

Learning Objectives:

1. The key objective of Data Science is to extract valuable information for use in strategic decision making, product development, trend analysis, and forecasting.

Course Outcomes:

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

2. Students will develop relevant programming abilities.
3. Students will demonstrate proficiency with statistical analysis of data. Students will develop the ability to build and assess databased models.
4. Students will execute statistical analyses with professional statistical software.

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to Data Science	8
	What is data science? There are many paths to data science Any advice for a new data scientist? What is the cloud?	
II	What do data science people do?	8
	A day in the life of a data science person, Introduction to R and Python, Data science tools and technology, "What is Regression"	
III	Data Science in Business	6
	How should companies get started in data science? Tips for recruiting data science people	
IV	Use Cases for Data Science	8
	Applications for data science, Thing's data science people say, "What Makes Someone a Data Scientist?"	

Reference Books:

1. Cathy O'Neil and Rachel Schutt, "Doing Data Science", O'Reilly, 2015.
2. David Dietrich, Barry Heller, Beibei Yang, "Data Science and Big data Analytics", EMC 2013
3. Raj, Pethuru, "Handbook of Research on Cloud Infrastructures for Big Data Analytics", IGI Global.



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester VI)

Subject: Computer Science

Course Type: Major Elective Theory

Course Title: Machine Learning

Course Code: SCSCET1351

Credits: 02

Max. Marks: 50 [CA:20 & ESA:30]

Lectures: 30 Hrs.

Learning Objectives:

1. Basic knowledge of statistics and probability.
2. Familiarity with fundamental programming concepts and proficiency in Python

Course Outcomes:

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

1. Define and explain machine learning concepts, types, and basic metrics.
2. Implement and apply supervised learning techniques (e.g., KNN, Linear Regression),
3. Develop and evaluate simple machine learning models (e.g., Perceptron, neural networks).
4. Analyze and apply appropriate machine learning algorithms

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to Machine Learning	08
	Introduction: Definition, History and Application of Machine Learning, Types of Machine Learning: Supervised, Unsupervised, Semi-Supervised, and Reinforcement Learning. Labelled and Unlabelled Dataset.	
II	Learning Task	08
	Supervised Learning Tasks: Regression vs. Classification, Learning Framework: Training, Validation and Testing of ML models. Performance Evaluation Parameters: Confusion matrix, Accuracy, Precision, Recall, F1 Score, and AUC.	
III	Supervised Learning	06
	Regression: Linear and non-linear Regression, Logistic Regression. Classification: Naïve Bayes, K-Nearest Neighbours, Decision Trees.	
IV	Application	08
	Linear model: Introduction to Artificial Neural Networks, Perceptron Learning Algorithm, Single Layer Perceptron, Introduction to Support Vector Machine for linearly separable data. Clustering: KMeans, Hierarchical Clustering, DBSCAN, Clustering Validation Measures.	

Reference Books:

1. Rajiv Chopra (2024), Machine Learning and Machine Intelligence, Khanna Publishing House.
2. Jeeva Jose (2023), Introduction to Machine Learning, Khanna Publishing House.
3. Mitchell T. (1997). Machine Learning, First Edition, McGraw-Hill.
4. Kalita, J. K., Bhattacharyya, D. K., & Roy, S. (2023). Fundamentals of Data Science: Theory and Practice. Elsevier. ISBN9780323917780



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester VI)

Subject: Computer Science

Course Type: Major Elective Practical

Course Title: Lab Course ML

Course Code: SCSCEP1351

Credits: 02

Max. Marks: 50 [CA:20 & ESA:30]

Lectures: 60Hrs.

Study and perform following practical based on course contents.

1. Implement linear regression on a dataset and visualize the regression line.
2. Implement logistic regression on a binary classification dataset and plot the decision boundary.
3. Implement and evaluate the performance of Decision tree ID3/Cart classifier for any given dataset.
4. Implement and evaluate the performance of the Naive Bayes Classifier on a given dataset.
5. Build and evaluate a random forest classifier using a numerical dataset.
6. Implement a support vector machine for linearly separable classes and visualize the margins and Decision boundary.
7. Implement K-Means clustering on a point dataset and visualize and evaluate the clusters.
8. Implement hierarchical clustering on a dataset and plot the dendrogram.
9. Implement DBSCAN clustering on a dataset and visualize and evaluate the clusters.
10. Perform Principal Components Analysis (PCA) and apply any one or more classifiers to show the Performance variation with or without feature reduction.



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester VI)

Subject: Computer Science

Course Type: Vocational & Skill Enhancement Course

Course Title: Digital Media

Course Code: SCSCVC1351

Credits: 02

Max. Marks: 50 [CA:20 & ESA:30]

Lectures: 60 Hrs.

Learning Objectives:

1. The course is designed to build practical skills in the creation and publication of digital Technologies.

Course Outcomes:

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

2. Student will be able to use essential skills for digital media

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction	15
	Presentation Software, Introduction to power point, Creating Presentation with power point, Introduction to Flash, Creating Presentation with flash	
II	Blog	15
	Blogging, Fundaments of blog, Common examples of Blog, Create a blog with multimedia content	
III	Digital Photography	15
	Digital photography, Basics of Digital Photography, Camera and shooting, Digital image editing, Digital image management	
IV	Podcast	15
	Podcast, Fundaments of Podcast, Audio recording and editing, Publishing and hosting podcast, Social Media tools, Writing content for the web, Search engine optimisation	

Reference Books:

1. Digital Photography for dummies by Julie A King
2. Learning to use Powerpoint by A Bassant
3. Podcasting by Steve Shippide



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester VI)

Subject: Computer Science

Course Type: OJT

Course Title: On Job Training

Course Code: SCSCOJT1351

Credits: 04

Max. Marks: 100 [CA:40 & ESA:60]

Lectures: 120Hrs.

Learning Objectives:

1. These objectives are designed to balance technical growth, professional skills, and practical application.
2. Apply programming fundamentals (e.g., data structures, algorithms) in real-world projects.
3. Gain proficiency in software development tools (IDEs, version control systems like Git).
4. Understand and implement database design and management (SQL/NoSQL).
5. Develop skills in web and application development (front-end, back-end, APIs).
6. Practice debugging, testing, and optimization for reliable software.

Course Outcomes:

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

1. **Apply theoretical knowledge in real-world settings:** Students will be able to implement programming, database, and system concepts in practical projects.
2. **Demonstrate proficiency in software development tools and practices:** Students will use IDEs, version control systems, and debugging tools effectively in workplace scenarios.
3. **Develop and deploy computer applications:** Students will design, code, test, and deploy applications that meet organizational or project requirements.
4. **Collaborate effectively in professional environments:** Students will work in teams, follow agile methodologies, and communicate technical ideas clearly.
5. **Analyse and solve industry-relevant problems:** Students will apply problem-solving and critical thinking skills to address technical challenges.
6. **Understand organizational workflows and professional ethics:** Students will gain exposure to workplace culture, project management practices, and ethical responsibilities in computing.
7. **Document and present project outcomes:** Students will prepare technical documentation and deliver presentations to stakeholders.
8. **Adapt to emerging technologies and industry trends:** Students will explore new tools, frameworks, and practices relevant to modern computer science fields.

General Guidelines for OJT in Computer Science

Please refer following circular for General Guidelines: (Available on Swami Ramanand Teerth Marathwada University Nanded Website)

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