



॥ 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.

प रि प त्र क

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 Application (Affiliated Colleges)

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/२०२६-२७/127

दिनांक : ०५.०८.२०२६



(Signature)
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 मुल्यमापन 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.



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**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 Application**

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 Application 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 application 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 application (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 Application (CMA) (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	SCMACT1301 (3cr) SCMACP1301 (2cr) SCMACT1302 (3cr) SCMACP1302 (2cr) SCMAIKS1301 (2cr) 12 Credits	SCMAET1301 (2cr) OR SCMAET1302 (2cr) SCMAEP1301 (2cr) OR SCMAEP1302 (2cr) 4 Credits	--	--	VSC 3 SCMAVC1301 2 Credits	--	FP1 (4Cr) (FP/CS) SCMAFP1301 4 Credits	22	44
	VI	SCMACT1351(3cr) SCMACP1351(2cr) SCMACT1352(3cr) SCMACP1352 (2cr) SCSCCT1353 (2cr) 12 Credits	SCMAET1351 (2cr) OR SCMAET1352 (2cr) SCMAEP1351 (2cr) OR SCMAEP1352 (2cr) 4 Credits	--	--	VSC 4 SCMAVC135 1 2 Credits	--	OJT SCMAOJT1351 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	SCMACT1301	Software Engineering	03	--	03	03	--
	SCMACP1301	Lab Course VII SE (Practical)	-	02	02	--	04
	SCMACT1302	Java Programming	03	--	03	03	--
	SCMACP1302	Lab Course VIII JP (Practical)	-	02	02	--	04
	SCMAIKS1301	IKS in CA	02	--	02	02	--
Elective	SCMAET1301	Python Programming	02	--	02	02	--
	SCMAEP1301	Lab Course PP (Practical)	--	02	02	--	04
Vocational Course	SCMAVC1301	System Security	--	02	02	--	04
Field Project	SCMAFP1301	Project in CA	--	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	SCMACT1301	Software Engineering	15	09	06	30	45	75
	SCMACP1301	Lab Course VII SE (Practical)	10	06	04	20	30	50
	SCMACT1302	Java Programming	15	09	06	30	45	75
	SCMACP1302	Lab Course VIII JP (Practical)	10	06	04	20	30	50
	SCMAIKS1301	IKS in CA	10	06	04	20	30	50
Elective	SCMAET1301	Python Programming	10	06	04	20	30	50
	SCMAEP1301	Lab Course PP (Practical)	10	06	04	20	30	50
Vocational Course	SCMAVC1301	System Security	10	06	04	20	30	50
Field Project	SCMAFP1301	Project in CA	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	SCMACT1351	Software Testing	03	--	03	03	--
	SCMACP1351	Lab Course IX ST (Practical)	-	02	02	--	04
	SCMACT1352	Computer Network	03	--	03	03	--
	SCMACP1352	Lab Course X CN (Practical)	-	02	02	--	04
	SCMACT1353	Introduction to AI	02	--	02	02	--
Elective	SCMAET1351	VB Programming	02	--	02	02	--
	SCMAEP1351	Lab Course VB (Practical)	--	02	02	--	04
Vocational Course	SCMAVC1351	Digital Media	--	02	02	--	04
OJT	SCMAOJT1351	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	SCMACT1351	Software Testing	15	09	06	30	45	75
	SCMACP1351	Lab Course IX ST (Practical)	10	06	04	20	30	50
	SCMACT1352	Computer Network	15	09	06	30	45	75
	SCMACP1352	Lab Course X CN (Practical)	10	06	04	20	30	50
	SCMACT1353	Introduction to AI	10	06	04	20	30	50
Elective	SCMAET1351	VB Programming	10	06	04	20	30	50
	SCMAEP1351	Lab Course VB (Practical)	10	06	04	20	30	50
Vocational Course	SCMAVC1351	Digital Media	10	06	04	20	30	50
OJT	SCMAOJT1351	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 Application

Course Type: Major Theory

Course Title: Software Engineering

Course Code: SCMACT1301

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 Application

Course Type: Major Practical

Course Title: Lab Course VII Software Engineering

Course Code: SCMACP1301

Credits: 02

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

Lectures: 60Hrs.

This is suggestive practical list for SE laboratory.

- 1. Study and Comparison of Software Development Life Cycle (SDLC) Models**
Prepare a comparative analysis of Waterfall, Prototype, Spiral, Incremental, and Agile models.
- 2. Preparation of Software Requirement Specification (SRS) Document**
Develop an SRS document for a mini-project such as Library Management System, Student Information System, or Online Shopping System.
- 3. Requirement Analysis using Use Case Modeling**
Draw Use Case Diagrams and identify actors, use cases, and relationships for a selected software project.
- 4. Software Design using UML Diagrams**
Design UML diagrams such as Class Diagram, Sequence Diagram, Activity Diagram, and State Chart Diagram.
- 5. Designing Data Flow Diagrams (DFD) and ER Diagram**
Create Context Diagram, Level-0/Level-1 DFDs and ER diagram for a software application.
- 6. Agile Development Practice using User Stories and Scrum Artifacts**
Prepare product backlog, sprint backlog, user stories, and simulate sprint planning for a mini-project.
- 7. Software Architecture and Component Design**
Design modular architecture and class-based components for a selected application.
- 8. Web Application Interface Design Prototype**
Create wireframes or prototypes for a web application using tools such as Figma, Balsamiq, or any prototyping tool.
- 9. Mobile App Interface Design and Prototype Development**
Design screens and navigation flow for a mobile application following mobile UI/UX best practices.
- 10. Mini Project: Software Engineering Case Study Implementation**
Perform complete software engineering activities (problem definition, requirements, design models, prototype, testing plan, documentation) for a small project.



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester V)

Subject: Computer Application

Course Type: Major Theory

Course Title: Programming in Java

Course Code: SCMACT1302

Credits: 03

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

Lectures: 45 Hrs.

Learning Objectives:

1. To write syntactically correct Java programs.
2. To implement control structures to manage program flow.
3. To design classes with constructors, methods, and overloading, applying OOP concepts.
4. To utilize inheritance and method overriding to create hierarchical class structures.
5. To organize code using packages and handle errors via exception handling.

Course Outcomes:

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

1. Demonstrate the ability to set up a Java environment (JDK, IDE) and execute simple programs.
2. Construct programs using control structures for logical flow.
3. Apply OOP concepts (classes, objects, inheritance) to solve problems.
4. Create and manipulate data structures (arrays, strings) efficiently.
5. Design reusable code using packages and handle runtime errors with try-catch blocks.
6. Debug and optimize Java programs for correctness and readability.

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to Java	10
	Introduction to Object Oriented Programming, A Short History of Java, Features of Java, Difference between Java and C++, Java Virtual Machine (JVM), Java program structure, Java statement and Types of Comments, Keywords, Data Types, Variables, Constants and Operators, Output using println() method, Setting up Java Development Environment (JDK, IDE), Writing and executing simple Java programs	
II	Control Structures and Object Oriented Programming Concepts	15
	Decision making statements: Simple if statement, if...else statement, nesting of if...else Switch statement, Looping Statements: while statement, do-while statement, for statement. Introduction to Class: defining a class, adding variables, Adding Methods, Accessing Class Members. Constructors, Method Overloading. Inheritance: Extending a class, Method Overriding.	
III	Arrays, Strings & Packages	10
	Introduction, One-dimensional Arrays: Creating one dimensional array Two- dimensional Arrays: Creating two- dimensional array String Arrays, String Methods Java API package	

Unit No.	Title of Unit & Contents	Hrs.
	Using system packages Creating Packages: accessing a package, using a package, adding a class to a package.	
IV	Exception Handling and Applet Programming	10
	Dealing with errors, Catching exception and exception handling Create user defined exception. Applet Life Cycle, Applet HTML Tags, Passing parameters to Applet repaint() and update() method	

Learning Resources:

1. Programming with Java, A primer, Fourth edition, By E. Balagurusamy
2. Complete reference Java by Herbert Schildt (5th edition)
3. Java 2 programming black books by Steven Horlzner



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

Course Type: Major Practical

Course Title: Lab Course VIII Java

Course Code: SCMACP1302

Credits: 02

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

Lectures: 60 Hrs.

This is suggestive practical list for code laboratory.

1. Introduction to Java & Environment Setup: Install JDK and IDE (e.g., IntelliJ/Eclipse).
2. Write a "Hello World" program using System.out.println().
3. Demonstrate Java keywords, data types, and variables (e.g., int, String).
4. 3 Control Structures: Implement decision-making and loops.
5. Use if-else to check even/odd numbers, Implement a switch-case for arithmetic operations (+, -, *, /),
6. Print patterns (e.g., pyramid) using for/while loops.
7. Add constructors (default, parameterized) to the Student class.
8. Implement method overloading (e.g., add(int a, int b) and add(double a, double b)).
9. Inheritance: Create a Parent class and a Child class inheriting from it (single inheritance),
10. Override a method (e.g., display()) in the child class.
11. Implement a multilevel inheritance hierarchy (e.g., Animal → Dog → Puppy).
12. Applet Programming: Create an applet to display "Hello Java" with paint().



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester V)

Subject: Computer Application

Course Type: Major Theory

Course Title: IKS in Computer Application

Course Code: SCMAIKS1301

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 Application

Course Type: Major Elective Theory

Course Title: Python Programming

Course Code: SCMAET1301

Credits: 02

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

Lectures: 30Hrs.

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 Application

Course Type: Major Elective Practical

Course Title: Lab Course Python Programming

Course Code: SCMACP1301

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 Application

Course Type: Vocational & Skill Enhancement Course

Course Title: System Security

Course Code: SCMAVC1301

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
	D 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 Application

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

Course Title: Project in CA

Course Code: SCMAFP1301

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 Application

Course Type: Major Theory

Course Title: Software Testing

Course Code: SCMACT1351

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 Application

Course Type: Major Practical

Course Title: Lab Course IX Software Testing

Course Code: SCMACP1351

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 Application

Course Type: Major Theory

Course Title: Computer Network

Course Code: SCMACT1352

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 Application

Course Type: Major Practical

Course Title: Lab Course X Computer Network

Course Code: SCMACP1352

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 Application

Course Type: Major Theory

Course Title: Introduction to AI

Course Code: SCSCT1353

Credits: 02

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

Lectures: 30 Hrs.

Learning Objectives:

1. To familiarize students with the fundamental concepts, theories, and applications of artificial intelligence.
2. To insight into the various subfields of AI, such as machine learning, natural language processing, computer vision, and robotics.

Course Outcomes:

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

1. have a clear understanding of the fundamental concepts and terminology of Artificial Intelligence, enabling them to discuss and comprehend AI-related topics.

Unit No.	Title of Unit & Contents	Hrs.
I	Introduction to Artificial Intelligence	8
	Definition and history of AI. Basic concepts and goals of AI, Applications of AI, Evolution of AI, Classification/Types of AI, Ethical and Societal Impacts of AI	
II	Problem-Solving and Search Algorithms	8
	Problem-solving methods in AI, Search Algorithms in Artificial Intelligence- Terminologies, Properties of search Algorithms, Types of search algorithms: uninformed search and informed search, Search algorithms: breadth-first search, depth-first search, A* search, etc, Heuristic search techniques,	
III	Natural Language Processing and Understanding	6
	Overview , Definition, Why is natural language processing important?,History of NLP ,Symbolic NLP (1950s – early 1990s):Statistical NLP (1990s–2010s): , NLP Working, NLP Uses Real World Applications:, NLP benefits, Challenges of Natural Language Processing	
IV	Introduction to ML	8
	Introduction to Machine Learning, History of ML, Examples of Machine Learning Applications, Learning Types - Introduction to Supervised and Unsupervised Learning with Examples, ML Life cycle, AI & ML, Overview of Common ML Algorithms (e.g., Linear Regression, Decision Trees, K-Means)	

Reference Books:

1. S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach, Prentice

Hall

2. M. Tim Jones, “Artificial Intelligence: A Systems Approach (Computer Science)”, Jones and Bartlett Publishers, Inc.; 1st Edition, 2008.
3. Nils J. Nilsson, “The Quest for Artificial Intelligence”, Cambridge University Press, 2009
4. J. Gabriel, Artificial Intelligence: Artificial Intelligence for Humans (Artificial Intelligence, Machine Learning), Create Space Independent Publishing Platform, First edition, 2016
5. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012

E-Book:

1. Introduction to AI
2. AI for Everyone: Fundamental, Shireeshkumar Sharadkumar Rudrawar, Dnyanopasak Shikshan Mandal's Arts, Commerce & Science College, Jintur Publication



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

Course Type: Major Elective Theory

Course Title: Programming in VB

Course Code: SCMAET1351

Credits: 02

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

Lectures: 30Hrs.

Course / Learning Objectives:

1. To learn Graphical User Interface Language.
2. To develop an application using GUI Language.
3. Implement VB programs to solve simple problems

Course Outcomes:

After successful completion of this course, students will be able to:

1. Understand the fundamentals of Visual Basic programming, the IDE environment, event-driven programming, and user interface design concepts.
2. Apply variables, constants, data types, operators, arrays, procedures, and control structures to develop Visual Basic programs.
3. Design and develop applications using decision-making, looping constructs, and modular programming techniques in Visual Basic.
4. Create and manage different types of forms, menus, and MDI applications using form properties and design tools.
5. Develop GUI-based applications using ActiveX controls such as command buttons, text boxes, list boxes, combo boxes, labels, picture boxes, option buttons, and check boxes.
6. Use Visual Data Manager for basic database handling and data-driven application development.
7. Analyze problems and develop event-driven desktop applications using Visual Basic programming techniques.
8. Demonstrate practical skills in designing, coding, debugging, and testing simple Windows-based applications.

Unit No.	Title of Unit & Contents	Hrs.
I	Getting Started with VB	10
	The IDE, The Elements of user interface, designing user interface, Programming an Application Visual Development and Event Driven Programming.	
II	Visual Basic The language	15
	Variable, Constants, data types, operators, arrays, collections, Procedures, control flow & loop statements - If-else, Nested If else, select case, do loop, for loop, nested for loop	
III	Working with forms	10
	Form types, Appearance of forms, Form properties, designing menu structure, Introduction to MDI forms.	

Unit No.	Title of Unit & Contents	Hrs.
IV	Basic Active X controls	10
	Command button control-properties, Text Box control- properties, List Box & Combo Box control properties, label control-properties, picture box control properties, Option button and check box control properties, Understanding Visual data manager.	

Learning Resources:

1. Mastering Visual Basic 6 by Evangelos Perroustos (BPB Publications)
2. Gary Cornell - Visual Basic 6 from the Ground up - Tata McGraw Hill
3. Noel Jerke - Visual Basic 6 (The Complete Reference) - Tata McGraw Hill



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

Course Type: Major Elective Practical

Course Title: Lab Course VB

Course Code: SCMAEP1351

Credits: 02

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

Lectures: 60Hrs.

This is suggestive practical list for VB code laboratory.

1. Write a program to solve a general quadratic equation $ax^2 + bx + c = 0$.
2. Create a solution to display the following series:-
 - a) 1, 3, 5, 7.....15
 - b) 0.2, 0.4, 0.6.....2.0
3. Write a program to display the square and cube of the numbers from 1 to 100 using
 - i) For-next loop
 - ii) While-wend loop
 - iii) Do while loop
4. Write a program to find out factorial of a number.
5. Write a program to check whether the entered number is Armstrong or not.
6. Write a program on VB to check the number is even or odd.
7. Write a program on VB to check the number is prime or not.
8. Write a program on VB on summation of given number.
9. Write a program on Arithmetic operations.
10. Write a program to print the Fibonacci Series within a given range.



Swami Ramanand Teerth Marathwada University, Nanded

Faculty of Science and Technology

B.Sc. Third Year (Semester VI)

Subject: Computer Application

Course Type: Vocational & Skill Enhancement Course

Course Title: Digital Media

Course Code: SCMAVC1351

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 Application

Course Type: OJT

Course Title: On Job Training

Course Code: SCMAOJT1351

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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