।। सा विद्या या विमुक्तये ।।

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपूरी, नांदेड - ४३१६०६ (महाराष्ट्र)

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY NANDED

"Dnyanteerth", Vishnupuri, Nanded - 431606 Maharashtra State (INDIA)

Established on 17th September 1994 – Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

ACADEMIC (1-BOARD OF STUDIES) SECTION

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संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, मा. विद्याशाखेने **दिनांक ३१ मे २०२१ रोजीच्या बैठकीतील केलेल्या शिफारशीप्रमाणे व दिनांक १२ जून २०२१ रोजी संपन्न झालेल्या ५१ व्या मा. विद्या परिषद बैठकीतील विषय क्र. २६/५१–२०२१**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदवी स्तरावरील तृतीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२१–२२ पासून लागू करण्यात येत आहेत.

1. B.Sc.-III Year-Biophysics
2. B.Sc.-III Year-Bioinformatics
3. B.Sc.-III Year-Biotechnology
4. B.Sc.-III Year-Biotechnology (Vocational)
5. B.Sc.-III Year-Botany
6. B.Sc.-III Year-Horticulture
7. B.Sc.-III Year-Agro Chemical Fertilizers
8. B.Sc.-III Year-Analytical Chemistry
9. B.Sc.-III Year-Biochemistry
10. B.Sc.-III Year-Chemistry
11. B.Sc.-III Year-Dyes & Drugs Chemistry
12. B.Sc.-III Year-Industrial Chemistry
13. B.C.A. (Bachelor of Computer Application)-III Year
14. B.I.T. (Bachelor of Information Technology)-III Year
15. B.Sc.-III Year-Computer Science
16. B.Sc.-III Year-Network Technology
17. B.Sc.-III Year-Computer Application (Optional)
18. B.Sc.-III Year-Computer Science (Optional)
19. B.Sc.-III Year-Information Technology (Optional)
20. B.Sc.-III Year-Software Engineering
21. B.Sc.-III Year-Dairy Science
22. B.Sc.-III Year-Electronics
23. B.Sc.-III Year-Environmental Science
24. B.Sc.-III Year-Fishery Science
25. B.Sc.-III Year-Geology
26. B.Sc.-III Year-Mathematics
27. B.Sc.-III Year-Microbiology
28. B.Sc.-III year Agricultural Microbiology
29. B.Sc.-III Year-Physics
30. B.Sc.-III Year Statistics
31. B.Sc.-III Year-Zoology

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.: शैक्षणिक–१/परिपत्रक/पदवी–सीबीसीएस अभ्यासक्रम/२०२१–२२/७५

दिनांक : १२.०७.२०२१.

स्वाक्षरित
सहा.कुलसचिव
शैक्षणिक (१–अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :
१) मा. कुलसचिव यांचे कार्यालय, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
४) साहाय्यक कुलसचिव, पदव्युत्तर विभाग, प्रस्तुत विद्यापीठ.
५) उपकुलसचिव, पात्रता विभाग, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ.
७) अधीक्षक, परिक्षा विभाग विज्ञान व तंत्रज्ञान विद्याशाखा प्रस्तुत विद्यापीठ.

Swami Ramanand Teerth Marathwada University,Nanded
(NAAC Re-accredited with 'A' Grade)

Syllabus of

Third Year B.Sc. Optional Computer Science
(Revised CBCS pattern)
Introduced from Academic Year 2021-22

B.Sc. (Optional) Computer Science

B.Sc. Optional Computer Science (3years) program / degree is a general B.Sc. program where students opt computer science as one of the optional subject. It builds the student on studies in computer science tools and techniques and to become competent in the current race in computer science and development. The duration of the study is of six semesters, which is normally completed in three years.

CBCS pattern

The B.Sc. Optional Computer Science program as per CBCS (Choice based credit system) pattern, in which choices are given to the students under open electives and subject electives. The students can choose open electives from the wide range of options to them.

Eligibility and Fees

The eligibility of a candidate to take admission to **B.Sc. Optional Computer Science** program is as per the eligibility criteria fixed by the University. More details on admission procedure and fee structure can be seen from the prospectus of the college / institution as well as on website of the University.

Credit Pattern

Every course has corresponding grades marked in the syllabus structure.

The credit pattern is similar to other optional subjects like Physics, Mathematics, Chemistry, etc.

The Grading pattern to evaluate the performance of a student is as per the University rules.

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The detailed syllabus structure is as belwo,

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

CHOICE BASED CREDIT SYSTEM (CBCS)

SEMESTER PATTERN

Faculty of Science Third YearComputer Science (Optional)

(w.e.f. Academic Year 2021-2022)

Year/ Sem	Code	Paper	Title of Paper	Periods /Week	Credit	Exam Hrs.	Marks		
							Ext.	Int.	Tot.
Sem-V	OCS-301	XII	Software Engineering	03	02	02	40	10	50
	OCS-302	(Elective) XIII-A **OR** XIII-B	(Elective) Programming in Visual Basic [A] **OR** Advanced Java Programming[B]	03	02	02	40	10	50
	OCS-303 Section-A	SEC-III	**Skill Enhancement Course-III:** A) System Security **OR** B) Data Science	03	02	02	25	25	50
Sem-VI	OCS-304	XIV	Software Testing	03	02	02	40	10	50
	OCS-305	(Elective) XV-A OR XV-B	(Elective) Relational Database Management System[A] **OR** Data Mining[B]	03	02	02	40	10	50
	OCS-306 Section-B	SEC-IV	**Skill Enhancement Course-IV:** A) WebsiteDevelopment **OR** B) Image Processing Software's	03	02	02	25	25	50
Annual Practical	OCS-307	XVI	Practical's based on theory papers-XIII&XV	04	02	03	40	10	50
	OCS-308	XVII	Project Work	04	02	03	40	10	50
Total				26	16		290	110	400

Note: A Practical group/ batch for practical papers is recommended to have 10-15 students as per the SRTMUN and UGC Guidelines under CBCS (Choice Base Credit System)

Code: OCS-301
Paper No. XII
Software Engineering

Silent Features: Software engineering is art of software designing. It aims to prepare detailed plans anddesigns as per customer's demands, carry out testing, develop intuitive user interfaces, and integrate allthese activities into a system.

Learning Objectives:
- Understand Software Engineering Process.
- Understand Requirements and components of Software Engineering.
- Understand software design and software testing fundamentals.

Utility of the course: Confidence of becoming a Software developer in order to get placement as well research activities

Prerequisite: Knowledge of Computer Programming & Data Structure

Unit 01: The Nature of Software & Software Engineering [period 10]

The Nature of Software, The Changing Nature of Software, Defining the Discipline, Software engineering process, Software engineering practice, Software Myths

Unit 02: Software Process Structure & Models and Agile Development [period 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.

Unit 03: Understanding Requirements & Design Concepts

[period10]Requirement Engineering,Building the analysis model, Requirement Analysis, Design within thecontext of software engineering, the design process, Software Architecture, Designing Class based Components

Unit 04: Web App & Mobile App Design [period10]

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)

CODE – OCS 302

Paper No-XIII(A)

(Elective)
Programming in Visual Basic

Silent Features: Visual Basics is a Graphical User Interface language. We can design various forms and reports by drag and drop models. It is very convenient GUI platform for modern software designing.

Learning Objectives:

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

Utility of the course: Confidence of becoming a Software developer in order to get placement as well as in research activities.

Prerequisite: Knowledge of programming

Unit 01: Getting Started with VB **period 10**

The IDE, The Elements of user interface, designing user interface, Programming an Application Visual Development and Event Driven Programming.

Unit 02: Visual Basic The language **period 10**

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.

Unit 03: Working with forms **period 10**

Form types, Appearance of forms, Form properties, designing menu structure, adding code to menus,Building dynamic forms at run time, Introduction to MDI forms.

Unit 04: Basic Active X controls **period 15**

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.

Reference Books:

1. Mastering Visual Basic 6 by Evangelos Perroutosos (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

CODE – OCS 302

Paper No-XIII(B)

(Elective)
Advanced JAVA Programming

Salient Features:

To understand the Graphics and Applet programming
To give the knowledge on basics concepts of multithreading programming.
To understand web-based programming.

Utility of Course:

To encourage the students to develop web-based applications.

Prerequisite: Knowledge of C, C++, JAVA programming

Unit 01: Introduction to java And Multithreaded Programming period 15

Basics of Object-oriented programming, Implementation of java program, creating, defining class and methods, introduction to threads, extending thread class, stopping and blocking threads, Life cycle of thread, using thread methods, synchronization

Unit 02: Managing Errors and Exception period 10

Types of Errors, Exception, Syntax of Exception Handling code, Multiple catch statement, throwing own exception, Using Exception for debugging.

Unit 03: Applet Programming period 10

Introduction, preparing to write Applet, Applet life cycle, creating executable Applet, designing a web page, Applet tag, Running the Applet, aligning a Display, displaying numerical values, Getting input from user.

Unit 04: Graphics, Managing Input Output Files in Java period 10

The graphics class, Lines, Rectangles, Circles and Ellipse, Drawing Arcs and Polygons, Line graphs. Concept of stream, Byte and character stream classes, using streams, Using files class, creation of files, Reading / Writing files, Random Access files.

Text/Reference Books:

1. Programming with Java - A primer-By E. Balguruswamy (Tata McGraw Hill)
2. The Complete Reference JAVA by Herbert Schildt (Tata McGraw)
3. The Complete Reference JAVA by PatrikNoughton

OCS-303 (SEC-III) Section-A
Skill Enhancement Course-III:
(Chose Any one)

A) System Security

Learning Objective: course covers fundamental issues and first principles of security and information assurance. The course will look at the security policies, models and mechanisms related to confidentiality, integrity, authentication, identification, and availability issues related to information and information systems.

Learning outcome: Candidates who have successfully completed this course, should have achieved the following total learning outcome
Knowledge
-Candidates are expected to possess in-depth knowledge of formal modelling techniques for secure computer systems
-Candidates have advanced knowledge of common vulnerabilities, attack mechanisms, and methods against computer and information systems

Security Basics

- General overview and definitions
- Security models and policy issues

Basic Cryptography and Network security

- Introduction to cryptography and classical cryptosystem
- Authentication protocols and Key Management
- IPSec, VPNs, E-commerce issues

Systems Design Issues and Information assurance

- Design principles
- Security Mechanisms
- Auditing Systems
- Risk analysis
- System verification and evaluation

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

B) Data Science

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

Learning outcome:
Students will develop relevant programming abilities. Students will demonstrate proficiency with statistical analysis of **data**. Students will develop the ability to build and assess **data**-based models. Students will execute statistical analyses with professional statistical software.

Unit:1 - Defining Data Science

- What is data science?
- There are many paths to data science
- Any advice for a new data scientist?
- What is the cloud?

Unit: 2 - What do data science people do?

- A day in the life of a data science person
- Introduction to R and Python
- Data science tools and technology
- "What is Regression"

Unit: 3 - Data Science in Business

- How should companies get started in data science?
- Tips for recruiting data science people

Unit: 4 - Use Cases for Data Science

- 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.

Code: OCS-304
Paper No. XIV
Software Testing

Silent Features: Software testing is one of the important phases in software development. Before the software is deployed to customer, it should be testing on various aspects. So that any kind of execution, interface, security etc issue should be generated while user works with software. Hence Software Testing Professional is a important designation in Software development Industry.

Learning Objectives:
- Understand Software Testing Process
- Understand Various types of software testing
- Understand how to handle testing process

Utility of course: Set the basic path to students towards becoming aSoftware Professional.

Prerequisite: Knowledge of Software Engineering

Unit-01: Software Quality Assurance **[period10]**
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.

Unit-02:Software Testing Strategies **[period10]**
A Strategic Approach to Software Testing, Strategic Issues Test Strategies for Conventional Software, Test Strategies for WebApps& Mobile Apps, Validation Testing, System Testing,

Unit-03: Testing Conventional Applications **[period15]**
Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing, Control Structure Testing, Black-Box Testing,

Unit-04: Testing Web Applications & Mobile Applications **[period10]**
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

CODE – OCS 305

Paper No-XV (A)

(Elective)
Relational Database Management System

Course Objectives:

-To teach fundamental concepts of RDBMS
-To teach database management operations

Course Outcomes:

Knowledge of RDBMS
Knowledge about the Use of SQL & PL/SQL for RDBMS

Unit 1: Introduction **[period10]**
Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Design, Database Engine, Database and Application Architecture, Database Users and Administrators,

Unit 2: Relational Model **[period10]**
Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages,

Unit 3: Relational Database Design **[period10]**
Features of Good Relational Designs, Decomposition Using Functional Dependencies, Normal Forms

Unit4: Introduction to SQL **[period15]**
Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional BasicOperations, SetOperations, Null Values, Aggregate Functions, Modification of the Database, JoinExpressions, Views

Reference Books:

1. Database System Concepts (7^{th} Ed.) By Abraham Silber Schatz,Henry F. Korth, S. Sudarshan (McGraw Hill Publication)
2. An Introduction to Database Systems, Bipin C Desai , Galgotia Publication
3. SQL, PL/SQL the programming language of ORACLE 4th Edition, Ivan Bayross

CODE – OCS 305

Paper No-XV (B)

(Elective)
Data Mining[B]

Unit -01: Introduction to Data Mining **[period10]**

Data Mining; Introduction, From Data Warehousing to Data Mining, Steps of Data Mining, introduction to Data, Mining algorithm,

Unit- 02: Tools, Application, Case Study of Data Mining. **[period10]**

Tools for Data Warehousing, Performance Considerations, Crucial Decisions in Designing A Data Warehouse, Various Technology Considerations, Application of Data Warehousing and Data Mining.

Unit 03: Association Rule Mining & Classification **[period15]**

Mining Frequent Patterns, Associations andCorrelations – Basic Concepts-: Frequent Itemset Mining Methods – The Apriori Algorithm – Mining Various, Kinds of Association Rules – Classification and Prediction - What Is Classification? What Is Prediction?Classification by Decision Tree Induction.

Unit 04: Cluster Analysis: **[period10]**

What Is Cluster Analysis? - Categorization of Major clustering Methods, Partitioning Methods: K means –Hierarchical Methods: Agglomerative and Divisive Hierarchical Clustering- Data Mining Applications.

Reference Books:

1) AmiteshSinha, “Data Warehousing”, Thomson pub., ISBN-0790612496
2) Claude Seidman,“Data Mining”, PHI Pub, ISBN -13-078-1-55860-901-3
3) Introduction to Data Mining with Case Studies by G.K.Gupta, PHI 3rd Edition
4) Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Second Edition, Elsevier

OCS-306 (SEC-IV) Section-B
Skill Enhancement Course-IV:
(Chose Any one)

Website Development

Course Objectives:
Become familiar with graphic **design** principles that relate to **web design** and learn how to implement theories into practice. **Develop** skills in analysing the usability of a **web** site. Understand how to plan and conduct user research related to **web** usability. Learn the language of the **web**: HTML and CSS.

Course Outcome:
Simple and impressive design techniques, from basics till advanced to focus on goal oriented and user centric designs. How to and where to start research, planning for website & actually build excellent web sites. To create web elements like buttons, banners & Bars and of course complete UI designs. Forms and validations for your website. Setting up page layout, color schemes, contract, typography in the designs.

- Website Designing
- Website Development
- Study of sites.google.com for Web development
- Accessing google sites
- Creating a Google Site
- Adding content
- Adding pages
- Customizing the design
- Sharing a Google Site
- Publishing a Google Site

References:

1. **https://edu.google.com/teacher-center/products/sites/?modal_active=none**
2. **https://sites.google.com/a/tech.washk12.org/google-sites-training/Home/google-sites-outline**
3. **https://sites.google.com/site/tiesitestutorial/**

OCS-306 (SEC-IV) Section-B
Skill Enhancement Course-IV:
(Chose Any one)

Image Processing Software's

Course Objective:

Describe and explain basic principles of digital image processing, design and implement algorithms that perform basic image processing (e.g., noise removal and imageenhancement), Design and implement algorithms for advanced image analysis (e.g., image compression, image segmentation & image representation), assess the performance of image processing algorithms and systems.

Course Outcomes:

Understand the need for image transforms different types of image transforms and their properties.Develop any image processing application. Understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.

To Study different types of Image Processing Software's

Computer Graphics: It is a fine point, but worthy of note. Examples include maps, posters, videos, and movies.

Photo Editing: This type focuses on processing that helps improve photographs, like changing the brightness, contrast, or colour skew.

Annual Practical Papers

CODE – OCS 307

Paper No-XVI
(Practical's based on theory papers-XIII&XV)

- At least 10 Practical based assignments based on Paper No XIII-A OR XII-B
- At least 10 Practical based assignments based on Paper No XV-A OR XV-B

CODE – OCS 308

Paper No-XVII
(Project Work)

- Maximum a group of 03 students are allowed to work on a project.
- Project Synopsis should be submitted by the students to their concern faculty and a
- declaration should be submitted by the students regarding the originality of work.
- Project report should prepare by the students & it should be certified by concern faculty& head of the department.
- Students should submit one hardcopy of report with CD to the department.

Distribution of marks for project is as

Project Work: 30
Project Viva: 10
Project Report: 10

Total Marks: 50