।। 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 पदव्युत्तर स्तरावरील द्वितीय वर्षाचे CBCS Pattern नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्याबाबत.

प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, **दिनांक २० जून २०२० रोजी संपन्न झालेल्या ४७व्या मा. विद्या परिषद बैठकीतील विषय क्र.११/४७–२०२०**च्या ठरावानुसार प्रस्तुत विद्यापीठाच्या **संलग्नित महाविद्यालयांतील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील द्वितीय वर्षाचे** खालील विषयांचे **C.B.C.S. (Choice Based Credit System) Pattern** नुसारचे अभ्यासक्रम शैक्षणिक वर्ष २०२०–२१ पासून लागू करण्यात येत आहेत.

1. M.Sc.-II Year-Botany
2. M.Sc.-II Year-Herbal Medicine
3. M.Sc.-II Year-Analytical Chemistry
4. M.Sc.-II Year-Biochemistry
5. M.Sc.-II Year-Organic Chemistry
6. M.Sc.-II Year-Physical Chemistry
7. M.Sc.-II Year-Computer Management
8. M.Sc.-II Year-Computer Science
9. M.Sc.-II Year-Information Technology
10. M.C.A. (Master of Computer Applications)-II Year
11. M.Sc.-II Year-Software Engineering
12. M.Sc.-II Year-System Administration & Networking
13. M.Sc.-II Year-Dairy Science
14. M.Sc.-II Year-Environmental Science
15. M.Sc.-II Year-Applied Mathematics
16. M.Sc.-II Year-Mathematics
17. M.Sc.-II Year-Microbiology
18. M.Sc.-II Year-Physics
19. M.Sc.-II Year-Zoology
20. M.Sc.-II Year-Biotechnology
21. M.Sc.-II Year-Bioinformatics

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

'ज्ञानतीर्थ' परिसर,
विष्णुपुरी, नांदेड – ४३१ ६०६.
जा.क्र.: शैक्षणिक–१/परिपत्रक/पदव्युत्तर–सीबीसीएस अभ्यासक्रम/२०२०–२१/**३३५**

दिनांक : १६.०७.२०२०.

स्वाक्षरित/–
उपकुलसचिव
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.

Swami Ramanand Teerth Marathwada University, Nanded

(NAAC Re-accredited with 'A' Grade)

Syllabus of

Second Year M.Sc. (Software Engineering) *

(Revised CBCS pattern)

Introduced from Academic Year 2020-2021

*(BoS deserves the rights for minor corrections, typographical errors in this syllabus with due approval of Administrations)

M.Sc. Software Engineering

M.Sc. Software Engineering (2years) program / degree is a specialized program in latest advances in computer science industry regarding software development. It builds the student on higher studies and research awareness in overall computational, IT and ICT fields so as to become competent in the current race and development of new computational sciences. The duration of the study is of four semesters, which is normally completed in two years.

CBCS pattern

The M.Sc. Software Engineering 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 **M.Sc. Software Engineering** 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. There are 25 credits per semester. A total of 100 credits are essential to complete this program successfully. The Grading pattern to evaluate the performance of a student is as per the University rules.

Every semester has a combination of Theory (core or elective) courses and Lab courses. Each theory course has 04 credits which are split as 02 external credits and 02 internal credits. The university shall conduct the end semester examination for 02 external credits. For theory internal credit, student has to appear for 02 class test (15 marks) and 01 assignment (20 marks). Every lab course has 02 credits which are split as 01 external credit and 01 internal credit. For lab internal credit, the student has to submit Laboratory Book (05 marks) and remaining 20 marks are for the Lab activities carried out by the student throughout the semester. For lab external credit, 20 marks are reserved for the examinational experiment and 05 marks are for the oral / viva examinations. There is a special skill based activity of 01 internal credits per semester which shall inculcate awareness regarding the domain of computers, IT, and ICT.

The open elective has 04 credits which are purely internal. If students are opting for MOOCs as open elective, then, there must be a Faculty designed as MOOCs course coordinator who shall supervise learning through MOOCS. This is intentionally needed as the MOOCs course coordinator shall verify the MOOC details including its duration, staring date, ending date, syllabus contents, mode of conduction, infrastructure feasibility, and financial feasibility during start of each semester. This is precautionary as the offering of the MOOCs through online platforms are time specific and there must be proper synchronization of semester duration with the MOOCs duration. Students must opt for either institutional / college level open elective or a course from University recognized MOOCs platforms as open electives.

The number of hours needed for completion of theory and practical courses as well as the passing rules, grading patterns, question paper pattern, number of students in practical batches, etc shall be as per the recommendations, norms, guidelines and policies of the UGC, State Government and the SRTM University currently operational. The course structure is supplemented with split up in units and minimum numbers of hours needed for completion of the course, wherever possible.

Under the CBCS pattern, students would graduate **M.Sc. Software Engineering** with a minimum number of required credits which includes compulsory credits from core courses, open electives and program specific elective course. All students have to undergo lab / practical activities leading to specific credits and project development activity as a part of professional UG program.

1. M.Sc. **M.Sc. Software Engineering** Degree / program would be of 100 Credits. Total credits per semester= 25
2. Each semester shall consist of three core courses, one elective course, one open elective course and two practical courses. Four theory courses (core+elective) = 16 Credits. Two practical / Lab courses= 4 Credits in total (02 credits each) , One Open elective= 4 credit, One skill
3. enhancement activity of 01 credits.
4. One Credit = 25 marks , Two Credits = 50 Marks, Four Credits = 100 Marks

PEO, PO and CO Mappings

1. **Program Name** : M.Sc.(SE)

2. **Program Educational Objectives**: After completion of this program, the graduates / students would

PEO I :Technical Expertise	Implement fundamental domain knowledge of core courses for developing effective computing solutions by incorporating creativity and logical reasoning.
PEO II : Successful Career	Deliver professional services with updated technologies in computational science based career.
PEO III :Hands on Technology and Professional experience	Develop leadership skills and incorporate ethics, team work with effective communication & time management in the profession.
PEO IV :Interdisciplinary and Life Long Learning	Undergo higher studies, certifications and research programs as per market needs.

3. **Program Outcome(s):** Students / graduates will be able to
PO1: Apply knowledge of mathematics, science and algorithm in solving Computer problems.
PO2: Generate solutions by understanding underlying software development environment
PO3: Design component, or processes to meet the needs within realistic constraints.
PO4: Identify, formulate, and solve problems using computational temperaments.
PO5: Comprehend professional and ethical responsibility in computing profession.
PO6: Express effective communication skills.
PO7: Recognize the need for interdisciplinary, and an ability to engage in life-long learning.
PO8: Actual hands on technology to understand it's working.
PO9: Knowledge of contemporary issues and emerging developments in computing profession.
PO10: Utilize the techniques, skills and modern tools, for actual development process
PO11: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings in actual development work
PO12: Research insights and conduct research in computing environment.

4. **Course Outcome(s):** Every individual course under this program has course objectives and course outcomes (CO). The course objectives rationally match with program educational objectives. The mapping of PEO, PO and CO is as illustrated below

5. Mapping of PEO& PO and CO

Program Educational Objectives	Thrust Area	**Program Outcome**	Course Outcome
PEO I	Technical Expertise	PO1,PO2,PO3,PO6	All core courses
PEO II	Successful Career	PO4,PO5,PO11,	All discipline specific electives courses
PEO III	Hands on Technology and Professional experience	PO8,PO10	All Lab courses
PEO IV	Interdisciplinary and Life Long Learning	PO7,PO9,PO12	All open electives and discipline specific electives

The detailed syllabus is as below,

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
Third Semester						
1.	**Core Subjects**	SE-301	Software Testing Tools	1	3	4
2		SE-302	Client Server Technology	1	3	4
3		SE-303	VB.NET Programming	1	3	4
Choose any one from below elective subjects						
4	**Elective Subject**	SE-304 A	Management Information System	1	3	4
		SE-304 B	Operations Research			
Practical /Lab						
5	**Lab / Practical**	SE-305	Lab-3: Software Testing	1	1	2
		SE-306	Lab-4: VB.NET Programming	1	1	2
6	**Open Elective**	SE-307A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		SE-307 B	Social Media Technology			
7	**Skill based Activity**	SE-308	SK-03: Seminar Presentation Activity	1	0	1
	Total credits					**25**

Sr. No	Course category	Course Code	Course Title	Internal credits	External credits	Total credits
Fourth Semester						
1.	**Core Subjects**	SE-401	Web Technology Tools	1	3	4
2		SE-402	Data Sciences	1	3	4
3		SE-403	Major Project development Activity	0	4	4
Choose any one from below elective subjects						
4	**Elective Subject**	SE-404 A	Cloud Computing	1	3	4
		SE-404 B	Software Quality Assurance			
Practical /Lab						
5	**Lab / Practical**	SE-405	Lab-5: Web Technology	1	1	2
		SE-406	Lab-6: Data Sciences	1	1	2
6	**Open Elective**	SE-407A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		SE-407 B	Numerical Aptitude & Logical Reasoning			
7	**Skill based Activity**	SE-408	SK-04: Soft Skills	1	0	1
	Total credits					**25**

Course Code: SE- 301
Course Title: Software Testing Tools

Course Objectives:
To understand software test automation problems and solutions. To learn how to write software testing documents, and communicate with engineers in various forms. To gain the techniques and skills on how to use modern software testing tools to support software testing projects.

Course Outcomes:
Student Learning Outcomes: Apply modern software testing processes in relation to software development and project management. Create test strategies and plans, design test cases, prioritize and execute them. Manage incidents and risks within a project.

Unit I: Basics of Software Testing
Inspection and Testing, what is testing? Testing objectives, Terms: fault, failure, error, fault masking, test, test case, Fundamental Test process: test planning, test specification, Test execution, test records, test completion, Prioritizing the tests, Psychology of testing, Difference between QA and Testing

Unit II: Testing in the Software Lifecycle
The general V-model, Component Testing, Integration testing, System Testing, Acceptance Testing, Maintenance testing

Unit III: Software Testing Process
When Testing should occur? Requirement Phase, Design Phase, Program (Build) Phase, Test Phase, Installation Phase, Maintenance Phase, Testing activities, Test Plan, Test Development, Test Execution, Results, Defect tracking, Reports

Unit IV: Test Plan
Objective of the test, Scope of the test, Approach, Resources, Roles and Responsibilities, Entry and Exit Criteria, Schedules and mile stones, Risks, Defect Management, Deliverables, Sign off, Case Study

Unit V: Test Development
Test Case, Good Test case, Successful Test case, Test case design methods, Business logic base test case design, Input domain base test case design, User interface base test case design ,Common Mistakes in writing Test case, Case Study, Introduction to Test Execution, Why is it important?, Defect tracking, Test Reports, Software Testing Techniques, Test Tools, Types of test tools

Reference Books:
1. Cem Kaner, Jack Falk, and Hung Quoc Nguyen, Testing Computer Software, Second edition, Wiley, New York.
2. Practical Software Testing: A Process-Oriented Approach, Burnstein, Springer, ISBN 978-81- 8128-089-3
3. Edward Kit, Software Testing in the Real World: Improving the Process, Addison Wesley.
4. Glenford J. Myers, The Art of Software Testing, Wiley, New York.
5. Elfriede Dustin, Jeff Rashka, and John Paul, Automated Software Testing: Introduction, Management, and Performance, Addison Wesley, Reading, Mass.

Course Code: SE-302
Course Title: Client Server Technology

Course Objectives:
To understand the different components for developing client/server applications.
To understand the enabling technologies for building Internet and Web database applications.

Course Outcome:
Gain Exposure on most common used servers.
Understand the concept of client-server development and learn problem solving skills through design scenarios for network environment.

Unit-I: Client/Server Computing
DBMS concept and architecture, Single system image, Client Server architecture, mainframe-centric client server computing, downsizing and client server computing, preserving mainframe applications investment through porting, client server development tools, advantages of client server computing.

Unit-II: Components of Client/Server application
The client: services, request for services, RPC, windows services, fax, print services, remote boot services, other remote services, Utility Services & Other Services, Dynamic Data Exchange (DDE), Object Linking and Embedding (OLE), Common Object Request Broker Architecture (CORBA). The server: Detailed server functionality, the network operating system, available platforms, the network operating system, available platform, the server operating system.

Unit-III: Client/Server Network
connectivity, communication interface technology, Interposes communication, wide area network technologies, network topologies (Token Ring, Ethernet, FDDI, CDDI) network management, Client-server system development: Software, Client–Server System Hardware: Network Acquisition, PC-level processing unit, Macintosh, notebooks, pen, UNIX workstation, x-terminals, server hardware.

Unit-IV: Client Server Systems Development
Services and Support, system administration, Availability, Reliability, Serviceability, Software Distribution, Performance, Network management, Help Disk, Remote Systems Management Security, LAN and Network Management issues. Training, Training advantages of GUI Application, System Administrator training, Database Administrator training, End-user training.

Unit-V: Data Storage

Magnetic disk, magnetic tape, CD-ROM, WORM, Optical disk, mirrored disk, fault tolerance, RAID, RAID-Disk network interface cards. Network protection devices, Power Protection Devices, UPS, Surge protectors. The future of client server Computing Enabling Technologies, The transformational system.

Reference Books:

1.Patrick Smith & Steave Guengerich, "Client / Server Computing", PHI
2. Dawna Travis Dewire, "Client/Server Computing", TMH
3. Majumdar & Bhattacharya, "Database management System", TMH

Course Code: SE-303
Course Title: VB .Net Programming

Course Objective:
NET training course, you will develop the skills to leverage the object-oriented capabilities of Visual Basic to create multi-tier applications that include relational database access. Visual Basic enables developers to rapidly assemble well-architected applications that run on the Microsoft.

Course Outcome:
Design, formulate, and construct applications with VB.NET. Integrate variables and constants into calculations applying VB.NET. Determine logical alternatives with VB.NET decision structures. Implement lists and loops with VB.NET controls and iteration.

Unit-I:
Introduction to .NET, NET Framework features & architecture, CLR, Common Type System, MSIL, Assemblies and class libraries. Introduction to Visual studio, Project basics, types of project in. Net, IDE of VB.NET-Menu bar, Toolbar, Solution Explorer, Toolbox, Properties Window, Form Designer, Output Window, Object Browser. The environment: Editor tab, format tab, general tab, docking tab. visual development & event driven
Programming -Methods and events.

Unit-II:
The VB.NET Language- Variables -Declaring variables, Data Type of variables, forcing variables declarations, Scope & lifetime of a variable, Constants, Arrays, types of array, control array, Collections, Subroutines, Functions, passing variable, Number of Argument, Optional Argument, Returning value from function. Control flow statements: conditional statement, loop statement. Msgbox & Inputbox.

Unit-III
Working with Forms: Loading, showing and hiding forms, controlling One form within another. GUI Programming with Windows Form: Textbox Properties, Methods and Events, Label Properties, Methods and Events, Button, Listbox Properties, Methods and Events, Combobox Properties, Methods and Events, Checkbox Properties, Methods and Events, PictureBox Properties, Methods and Events, Radio Button Properties, Methods and Events, Panel, Scroll bar, Timer, List View, Tree View, Toolbar, Status Bar OpenFile Dialog, SaveFileDialog, FontDialog, ColorDialog, Print Dialog. LinkLabel. Designing menus: Context Menu, access & shortcut keys.

Unit-IV
Object Oriented Programming: Classes & objects, fields properties Methods & Events, constructor, inheritance. Access Specifiers: Public, Private, Protected. Overloading, My Base & My class keywords. Overview of OLE.

Unit-V
Database programming with ADO.NET – Overview of ADO, from ADO to ADO.NET, Accessing Data using Server Explorer. Creating Connection, Command, Data Adapter and Data Set with OLEDB and SQLDB. Display Data on data bound controls, display data on data grid.

Reference Books:

1.Visual Basic.Net Black Book by Steven Holzner Dreamtech Press The Complete Reference
2. Visual Basic .NET Jeffery R. Shapiro Tata McGraw Hills
3.Schneider, "An Introduction to Programming Using Visual Basic .NET", 5th Edition, PHI, 2003.
4. Kan, "Visual Basic .NET A Beginners guide", TMCH, 2002.

Course Code: SE-304 A
Course Title: Management Information System

Course Objectives:
A comprehensive understanding of how information systems are changing organizational structures and how they can be used effectively to create a basis of competitive advantage; A comprehensive introduction to the principles of management;

Course Outcomes:
Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making. Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives.

Unit-1: Evolution of MIS
Concepts, framework for understanding and designing MIS in an Organization. Organization and Information Systems: The Organization: Structure, Managers and activities, Data, information and its attributes, The level of people and their information needs, Types of Decisions and information, Information System, categorization of information on the basis of nature and characteristics.

Unit-II: Kinds of Information Systems
Transaction Processing System (TPS), Office Automation System (OAS), Management Information System (MIS), Decision Support System (DSS) and Group Decision Support System (GDSS), Expert System (ES), Executive Support System (EIS or ESS).

Unit-III: Manufacturing and Service Systems
Information systems for Accounting, Finance, Production and Manufacturing, Marketing and HRM functions - IS in hospital, hotel, bank. Enterprise System Enterprise Resources Planning (ERP): Features, selection criteria, merits, issues and challenges in Implementation - Supply Chain Management (SCM): Features, Modules in SCM - Customer Relationship Management (CRM): Phases.

Unit-IV: Choice of IT
Nature of IT decision - Strategic decision - Configuration design and evaluation Information technology implementation plan.

Unit-V: Security and Ethical Challenges
Ethical responsibilities of Business Professionals – Business, technology. Computer crime – Hacking, cyber theft, unauthorized use at work. Piracy – software and intellectual property. Privacy – Issues and the Internet Privacy. Challenges – working condition, individuals. Health and Social Issues, Ergonomics and cyber terrorism.

Reference Books:
1. “Management Information Systems”, Kenneth J Laudon, Jane P. Laudon, Pearson/PHI,10/e, 2007 2. “Management Information Systems”, W. S. Jawadekar, Tata McGraw Hill Edition, 3/e, 2004
3. “Introduction to Information System”, James A. O’ Brien, Tata McGraw Hill, 12th Edtion.
4. “Management Information Systems”, S.Sadagopan, PHI, 1/e, 2005
5. “Management Information Systems”, Effy Oz, Thomson Course Technology, 3/e, 2003

6. Corporate Information Strategy and Management", Lynda M AppleGate, Robert D Austin et al, Tata McGraw Hill, 7th Edition.

Course Code: SE-304 B
Course Title: Operation Research

Course Objectives:
This module aims to introduce students to use quantitive methods and techniques for effective decisions–making; model formulation and applications that are used in solving business decision problems.

Course Outcomes:
Knowledge and understanding - Be able to understand the characteristics of different types of decision-making environments and the appropriate decision-making approaches and tools to be used in each type. Cognitive skills (thinking and analysis) Communication skills (personal and academic), Practical and subject specific skills (Transferable Skills).

Unit-I:
Introduction to Operations Research (OR) Operations Research definition and origin. Essential features of the OR approach. Quantification of factors. Stages in OR study.

Unit-II:
Introduction to Foundation mathematics and statistics Linear Programming (LP), LP and allocation of resources, LP definition, Linearity requirement

Unit-III:
Linear Programming: Introduction to Linear algebra. Solution of a system of Linear Equations, Linear independence and dependence of vectors, Concept of Basis, Basic Feasible solution, Convex sets. Extreme points, Hyperplanes and Half spaces, Convex cones, Polyhedral sets and cones.

Unit-IV:
Linear Programming Problem Formulation, solution by Graphical Method, Theory of Simplex Method, Simplex Algorithm, Two phase Method, Charnes-M Method, Degeneracy, Theory of Duality, Dual-simplex method.

Unit-V:
Linear Programming – Graphical Solutions, Introduction to Graphical LP Maximization solution, Sensitivity Analysis: Changes in Objective Function, Transportation Model Basic Assumptions. The Assignment Model: -Basic Assumptions Solution Methods: - Different Combinations Method

Reference Books:
1. Operations Research: Applications and Algorithms by Wayne L Winston,Indian University, 4 th edition, 2004
2. Hamdy A. Taha: Operations Research-An Introduction, Prentice Hall, 9th Edition, 2010.
3. F.S. Hillier. G.J. Lieberman: Introduction to Operations Research- Concepts and Cases, 9th Edition, Tata Mc-Graw Hill, 2010.

Course Code: SE-305
Course Title: Lab-3: Software Testing

- At least 15 Logical programs covering all concepts of Software Testing (Using Free testing tools.). Test Scenario, Test Case automated and Manual.

Course Code: SE-306
Course Title: Lab-4: VB .NET Programming

- At least 15 Logical programs covering all concepts of VB .NET Programming

Course Code: SE-307-A
Course Title: University recognized MOOC

- **Open Elective**: University recognized MOOC (NPTEL / SWAYAM / others) OR Intra /Inter Departmental courses.

  OR

Course Code: SE-307-B
Course Title: Social Media Technology

Course Objectives:
Understand to the basic concepts of social network analysis (Evaluation: problem sets) Collaborative with peers to apply these methods to a variety of social media (Evaluation: projects), This Course Teaches students to use social media strategically to create value for a client or organization.

Course Outcomes:
Understand the link between qualitative and quantitative methods of social network analysis (Evaluation: short analysis papers) Understand how these social technologies impact society and vice versa (Evaluation: in-class exercises), Students will master the skills necessary to become successful social media managers.

Unit-I: Introduction To Social Media
Introduction to Social Media, importance of social Media, History and evolution of Social Media, Managing Information, Aggregators. Facebook, Twitter, Instagram, LinkedIn, Youtube, Blogs.

Unit-II: Using Social Media
Strategy Plan for Social Media Management, Touchpoint, Analysis Scheduling, Creating Content, Managing Content programs, Planning Worksheet, Social media campaign.

Unit-III: Evaluating Social Media
Evaluation of Social Media Platforms, Tools to manage and measure performance of social media content and campaigns, Handling critical issues in social media management and legal aspects of social media

Unit-IV: Setting-up own professional site
Content management, design, connectivity with social media, Budget for social media plan: Based on the understanding of your client, prepare a budget for social media management. Include the individual cost of your tactic, your proposed social media campaign and social media tools. Include the total cost as a bottom line of your budget. Include the ROI of your plan and why that budget should be allocated to social media.

Unit-V: Social Media Implementation
Explain social media management tool., Describe social media analytics tool in bried with example. Detailed social media campaign: The campaign can be any example presented in social media for Lead Generation. Describe the objectives for campaign, outline the tools, prepare budget for campaign.,

Reference Books:
1.Guy Kawasaki & Peg Fitzpatrick, "The art of social media: power tips for power users
2. Social media marketing all in one for dummies, Jan Zimmerman & Deborah N
3. Social media explained by Mark W. Schaefer

Course Code: SE-308
Course Title: Seminar Presentation Activity
(SK-03 Skill Based Activity)

Purpose:

1. To enable a student to be familiar with Communication skills
2. Student is expected to Learn – how to make a presentation
3. Every student must deliver a seminar on advanced topic and submit a copy of the seminar report.

Course Code: SE-401
Course Title: Web Technology Tools

Course Objectives:
This Subject is useful for Making own Web page and how to host own web site on internet. Along with that Students will also learn about the protocols involve in internet technology.

Course Outcome:
After Studying that subject students would have capability to make own web site and host their own web site on internet. Also, students would have enough knowledge about what are the technologies used in internet.

Unit-I: Introduction to WWW
Protocols and programs, secure connections, application and development tools, the web browser, what is server, choices, setting up UNIX and Linux web servers, Logging users, dynamic IP Web Design: Web site design principles, planning the site and navigation,
Unit-II: Introduction to HTML, the development process, Html tags and simple HTML forms, web site structure Introduction to XHTML: XML, Move to XHTML, Meta tags, Character entities, frames and frame sets, inside browser.

Unit-III: Style sheets
Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2

Unit-IV: JavaScript
Client side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition, Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations DHTML : Combining HTML, CSS and JavaScript, events and buttons, controlling your browser, Ajax: Introduction, advantages & disadvantages ,Purpose of it ,ajax based web application, alternatives of ajax

Unit-V: XML
Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Well formed, using XML with application.XML, XSL and XSLT. Introduction to XSL, XML transformed simple example, XSL elements, transforming with XSLT

Reference Books:
1. Steven Holzner,"HTML Black Book", Dremtech press.
2. Web Technologies, Black Book, Dreamtech Press
3. Web Applications : Concepts and Real World Design, Knuckles, Wiley-India
4. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson.

Course Code: SE-402
Course Title: Data Science

Course Objective:
Data Science program is to develop skilled professional workforce that is prepared to address the increasing needs in the rapidly expanding area of big data analytics. The program aims to provide skills in quantitative data analysis, data mining, data modeling and prediction, data storage and management, big data processing, data visualization, multimedia big data, programming and communication skills.

Course Outcomes:
This Programme is a quality assured alternative for the employed learners who generally prefer the Distance learning. Accelerate business value with a scalable data science platform. Infusing AI into your business? Learn how to deploy models faster. Data Driven Solutions. Automatic Recommendations. Interactive Content. Scalable Platform. Personalized Experience.

Unit-I:
Essentials of Algorithms and Data structures; Introduction to Programming paradigms Functional, Imperative and Object Oriented, Software Engineering Trends and techniques, Databases and Data warehousing, Data preparation, Data Science using R, Excel, Python, SQL, Tableau.

Unit-II:
Descriptive and Inferential statistics, Data visualization, Exploratory data analytics, Hypothesis testing, Introduction to Artificial intelligence, conventional techniques and Logic programming, Introduction to Machine learning, regression, classification (ANN, SVM and Decision tree) and clustering

Unit-III:
Concepts in Soft and Evolutionary computing GA and other nature inspired search algorithms, Fuzzy, Rough and Granular computing, Big data, parallel algorithms, Association rule mining, time series analysis,

Unit-IV:
Introduction to Research Methodology, Literature survey and referencing, Problem formulation, Data preparation, Managing Big data with Hadoop and SPARK

Unit-V:
Design and implementation of experiment, writing and publishing results, IPR, patent, copyright and Free knowledge sources

Reference Books:
1. Foreman, Data Smart: Using Data Science to Transform Information into Insight, John Wiley
2. Fundamentals of mathematical statistics by Gupta and Kapoor
3. Database Design and Relational Theory: Normal Forms and All That Jazz by C.J. Date
4. Dunham, Data Mining: Introductory and Advanced Topics, Pearson

Course Code: SE-403
Course Title: Major Project development Activity

Course Objectives:

To provide a postgraduate level knowledge in computer science, including understanding, analysis, management, and handling of real-life information technology problems in workplace. Students are encouraged to problems from real life / NGO/ / state-central govt projects/ hackathon/ etc

Course Outcome:

Project based learning will increase their capacity and learning through shared cognition. Students will have an ability to identify, formulate and implement computing solutions. Students will be able to design a system, component or process as per needs and specification.

Guidelines for Project Development:

1. A group of maximum three students should be formed at the beginning of the semester
2. Each project will be allotted one project guide.
3. Students must submit the project topic and synopsis to the project guide.
4. Students will be given a project approval letter signed by the head of department and the project guide.
5. After receiving a project approval letter, students must submit at least three progress reports of their development in project to the guide, one per month.
6. After completion of project students have to give pre-exam demo to his guide.
7. After finalization of the project, students must prepare minimum 03 copies of the project reports, out of which one copy is for the college and one copy is for the university records. University/College copy must be bind with black covering with golden embossment and it should contain
   i. First Page
   ii. Certificate
   iii. Declaration
   iv. Acknowledgement
   v. Project Approval letter
   vi. Three Progress reports
   vii. System Flow Diagram/DFD
   viii. Chapter wise briefing, results, conclusions, snapshots, code, etc
   ix. Bibliography

Course Code: SE-404-A
Course Title: Cloud Computing

Course Objective:
The objective of this course is to provide graduate students with the comprehensive and in-depth knowledge of Cloud Computing concepts, technologies, architecture and applications by introducing and researching state-of-the-art in Cloud Computing fundamental issues, technologies, applications.

Curse Outcomes:
explain the core issues of cloud computing such as security, privacy, and interoperability. choose the appropriate technologies, algorithms, and approaches for the related issues. identify problems, and explain, analyze, and evaluate various cloud computing solutions.

Unit-I: Introduction
Cloud computing definition, reference model, Characteristics, Benefits, Challenges, Distributed Systems, Virtualization, Service-oriented computing, Utility-oriented computing, Overview on computing platforms & technologies – AWS, Google AppEngine, MS Azure, Hadoop, Saleforce.com, Manjrasoft Aneka

Unit-II: Parallel & Distributed Computing
Parallel vs. Distributed computing, Elements of parallel computing, Parallel processing - hardware architecture & approaches, Concept & Component of Distributed Computing, RPC, Service-oriented computing

Unit-III: Virtualization
Cloud reference model IaaS, PaaS, SaaS, Types of clouds – Public, Private, Hybrid, Community, Cloud interoperability & standards, scalability & fault tolerance, Security, trust & privacy

Unit-IV: Concurrent Computing, High-throughput Computing
Programming applications with Threads, Thread API, Parallel computation with Threads, Task computing, Frameworks for Task computing, Task-based application model, Data-intensive computing, characteristics, technology

Unit-V: Cloud Platforms and Applications
Overview on Amazon Web Services, Google AppEngine and Microsoft Azure, Cloud applications in scientific, business and consumer domain

Reference Books:
1.Buyya, Vecciola and Selvi, Mastering Cloud Computing: Foundations and Applications Programming, Tata McGraw Hill
2. Rittinghouse and Ransome, Cloud Computing: Implementation, Management, and Security, CRC Press
3. Aravind Doss, Cloud Computing, Tata McGraw Hill
4. Kris Jamsa, Cloud Computing: SaaS, PaaS, IaaS, Virtualization, Business Models, Mobile, Security and More, Jones & Bartlett Learning

Course Code: SE-404-B
Course Title: Software Quality Assurance

Course Objective:
Software Quality Assurance (SQA) goal is to objectively evaluate software processes and provide project staff with feedback about non-compliance issues. This course introduces the concepts and methods required for effective and efficient SQA.

Course Outcomes:
Student Learning Outcomes: Create test strategies and plans, design test cases, prioritize and execute them. Manage incidents and risks within a project. Contribute to efficient delivery of software solutions and implement improvements in the software development processes. critically evaluate alternative standards, models and techniques aimed at achieving quality assurance in a variety of software.

Unit-I: Quality Management & Review Techniques
What is Software Quality, Quality Dimensions, The SQ Dilemma, Achieving Software Quality Software Defects, Defect amplification and removal, Review Metrics and their use, Informal Reviews, Formal technical reviews, Review reporting and record keeping

Unit-II: Software Quality Assurance
Elements of SQA, SQA Task, Goals and Metrics, Formal Approaches to SQA, Statistical SQA, Software Reliability, The ISO 9000 Quality Standards, The SQA Plan

Unit-III: Software Testing Strategies
The Strategic Approach for ST, Verification and Validation, Organizing for Software Testing, Criteria for Completing of Testing, Strategic Issues.

Unit-IV: System Testing
Recovery Testing, Security Testing, Stress Testing, Performance Testing, Deployment Testing, The Art of Debugging, White box testing, Basis Path Testing, Central Structure Testing, Black box Testing

Unit-V: The software quality challenge
The uniqueness of software quality assurance, Software quality – definition, Software quality assurance – definition and objectives, Software quality assurance and software engineering, Product operation software quality factors, Product transition software quality factors

Reference Books:
1.P. Ammann and J. Offutt. Introduction to Software Testing. Cambridge University Press, 2008. ISBN 978-0-521-88038-1
2.Software Testing and Analysis: Process, Principles and Techniques, by Mauro Pezze, and Michal Young, Wiley. ISBN-10: 0471455938 ISBN-13: 978-0471455936
3.Software Engineering: A Practitioner's Approach, Roger S Pressman, McGraw-Hill, Chapters 14-20, 4. Software Quality Assurance From theory to implementation by DANIEL GALIN Pearson

Course Code: SE-405
Course Title: Lab-5: Web Technology

- At least 15 Logical programs covering all concepts of Web Technology

Course Code: SE-406
Course Title: Lab-6: Data Science

- At least 15 Logical programs covering all concepts of Data Science

Course Code: SE-407-A
Course Title: University recognized MOOC

- **Open Elective**: University recognized MOOC (NPTEL / SWAYAM / others) OR Intra /Inter Departmental courses.

OR

Course Code: SE-407-B
Course Title: Numerical Aptitude & Logical Reasoning

Course Objectives:
This course is designed to suit the need of the outgoing students and to acquaint them with frequently asked patterns in quantitative aptitude and logical reasoning during various examinations and campus interviews.

Course Outcome:
On successful completion of the course the students will be able to Understand the basic concepts of quantitative ability, Understand the basic concepts of logical reasoning Skills, Acquire satisfactory competency in use of reasoning, Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning Ability, Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

Unit-I: Quantitative Ability (Basic Mathematics)
Number Systems, LCM and HCF, Decimal Fractions, Simplification, Square Roots and Cube Roots, Average, Problems on Ages, Surds & Indices, Percentages, Problems on Numbers

Unit-II: Quantitative Ability (Applied & Engineering Mathematics)
Logarithm, Permutation and Combinations, Probability, Profit and Loss, Simple and Compound Interest, Time, Speed and Distance, Time & Work, Ratio and Proportion, Area, Mixtures and Allegation

Unit-III: Data Interpretation
Data Interpretation, Tables, Column Graphs, Bar Graphs, Line Charts, Pie Chart, Venn Diagrams

Unit-IV: Logical Reasoning (Deductive Reasoning)
Analogy, Blood Relation, Directional Sense, Number and Letter Series, Coding, Decoding, Calendars, Clocks, Venn Diagrams, Seating Arrangement, Syllogism, Mathematical Operations

Unit-V: Numerical Ability
Numerical computation, numerical estimation, numerical reasoning and data interpretation. Conditional Probability; Mean, Median, Mode and Standard Deviation; Random Variables; Distributions; uniform, normal, exponential, Poisson, Binomial. Sets; Relations; Functions; Groups; Partial Orders; Lattice; Boolean Algebra.

Reference books:
1. A Modern Approach To Verbal & Non Verbal Reasoning By R S Agarwal
2. Analytical and Logical reasoning By Sijwali B S
3. Quantitative aptitude for Competitive examination By R S Agarwal
4. Analytical and Logical reasoning for CAT and other management entrance test By Sijwali B S
5. Quantitative Aptitude by Competitive Examinations by Abhijit Guha 4 th edition

Course Code:SE-408
Course Title:Skill Based Activity
(SK-04 Soft Skills)

- Soft skill Necessary for IT recruitment and further studies
- Strong technical skills are essential for any IT (information technology) position. However, IT employees also need soft skills, sometimes known as interpersonal skills. IT professionals need to be able to interact successfully with others, as well as manage projects and teams.
- Employers have found that many IT professionals possess as many interpersonal skills as anyone else. Technology experts suffering from more severe social handicaps (such as functional forms of autism) are able to practice and learn interpersonal and other soft skills to help them integrate well within a team.