|| सा विद्या या विमुक्तये ||

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

"ज्ञानतीर्थ" परिसर, विष्णुपुरी, 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. (Computer Science)*
(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. Computer Science (Affiliated Colleges)

M.Sc. Computer Science (2years) program / degree is a specialized program in latest advances in computer science issues. 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. 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 **M.Sc. 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. 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. Computer Science** 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. Computer Science 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.(CS) Affiliated Colleges

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 computer science 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**	CS-301	Advance Database Administration	1	3	4
2		CS-302	Web Technologies	1	3	4
3		CS-303	Data Mining and Data Warehousing	1	3	4
			Choose any one from below elective subjects			
4	**Elective Subject**	CS-304 A	Artificial Intelligence	1	3	4
		CS-304 B	Mobile Application Development			
		CS-304 C	Research Methodology			
			Practical /Lab			
5	**Lab / Practical**	CS-305	Lab-5: Adv Database Admin	1	1	2
		CS-306	Lab-6: Web Technologies	1	1	2
6	**Open Elective**	CS-307A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School	4	0	4
		CS-307 B	Cyber Security			
7	**Skill based Activity**	CS-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
**FourthSemester**						
1.	**Core Subjects**	CS-401	Digital Image Processing	1	3	4
2		CS-402	Linux Administration	1	3	4
3		CS-403	Major Project development Activity	1	3	4
**Choose any one from below elective subjects**						
4	**Elective Subject**	CS-404 A	Client Server Technology	1	3	4
		CS-404 B	Software Testing Tools			
**Practical /Lab**						
5	**Lab / Practical**	CS-405	Lab-7: DIP	1	1	2
		CS-406	Lab-8: Based on Elective Subject	1	1	2
6	**Open Elective**	CS-407A	University recognized MOOC (NPTEL / SWAYAM / others) OR Intra / Inter Departmental OR Intra / Inter School OR	4	0	4
		CS-407 B	Logical Reasoning and Quantitative Aptitude			
7	**Skill based Activity**	CS-408	SK-04 : Soft Skills	1	0	1
	Total credits					**25**

Course Code: CS-301
Course Title: Advance Database Administration

Course Objectives:
To Introduce the students physical and Logical Structure of database
To aware the students the role of the database administrator

Course Outcomes:
Students Will be able to explain and evaluate the fundamental theories and requirements that influence the design of modern database systems. Students can analyze the background processes involved in queries and transactions, andexplain how these impact on database operation and design

Unit I: Database Architecture
Overview of database, pfile, spfile, Instance, Tablespaces, Datafiles, Other files, Oracle managed Files, Users, Schemas, Indexes, View, Sequences, Synonyms, Privileges, Roles, Clusters, Hash Clusters, Internal memory structure, SGA, PGA ,Background processes, External structure, Redo logs, Control files, Trace files, Alert logs, Creating database manually.

Unit II: Hardware configuration and consideration
Architectural overview, Standalone hosts, Standalone hosts with disk array, Standalone, Hosts with disk shadowing, Multiple databases, Networked hosts, Networks of databases, Remote updates, Remote application options, Real application, Clusters, Multiple processors, The parallel query and parallel load options, Client/server databases application, Standby databases

Unit-III: Physical databases layouts
Database file layouts, I/O connections among data files, I/O bottlenecks among all data files, Concurrent I/O among background processes, Defining recoverability and performance goals for the system, Defining the system hardware and mirroring architecture, Database space using overview, Implementation of the storage clause, Locally managed Tablespaces, Dictionary managed Tablespaces, Table segments, Index segments, Rollback segments, Temporary, Free space, Resizing Datafiles, Control files, Online redo log Files Deallocate space from segments, Shrinking Datafiles, Shrinking Tables, Clusters and indexes, Oracle managed files(OFA)

Unit-IV: Logical Database Layouts
Describe logical structure of a database, Different types of Tablespaces, Changing the Tablespaces size, allocating segments for temporary segments, Temporary segments in permanents Tablespaces, changing tablespace status, changing tablespace storage settings,

Oracle Managed Files (OMFs), Oracle Flexible Architecture (OFA), Different segments types and relationships, Extent usages, Block space utilization.

Unit-V: Backup, Recovery & Networked ORACLE

Types of Logical and Physical backups, Implementations, Integrations of backup procedures, NOARCHIVELOG Mode, ARCHIVELOG Mode, Backup Methods –Closed Database Backup, Open Database Backup, Recovery in NOARCHIVELOG Mode, Recovery in ARCHIVELOG Mode, Recovery manager architecture, Recovery Manager Features, Using Recovery manager & RMAN, Using OEM backup manager, Generating lists and reports. Networked Oracle - Overview of SQL *Net and Net8, Connect descriptors, Service names and Listeners, Net8 assistants, The multi-protocol interchange, Dedicated Server Processes, Oracle Shared Server, Benefits of Oracle Shared Server, Client Server application, Database links.

Reference Books:

1.Oracle 9i DBA Handbook, Eighth Reprint - Kevin Lonely, Marlene Theriault Oracle Press, Tata McGraw Hill Publication ISBN-0- 07-048674-3.
2.OCA Oracle 9i Associate DBA Certification Exam Guide, Sixth Reprint, Jason Couchman, Sudheer N. Marish Oracle Press,Tata McGraw Hill Publication,2005, ISBN-0-07-049893-8

Course Code: CS-302
Course Title:Web-Technologies

Course Objectives
To aware the Students with advanced web technology
To develop a skill to write applications using PHP and Java Script

Course Outcome
Students Will be Students are able to develop a dynamic webpage by the use of PHP and java script. On completion of this course, a student will be able to develop a web application using PHP and java script.

Unit-I: Introduction
Web Technology & XML Internet – current state, hardware and software requirement, ISP, an internet account, web home page, URL, browser, security on web, searching tools, search engines, FTP, Gopher, Telnet, emails, TFTP Web browser architecture, web page and multimedia, static dynamic and active web page, simple mail transfer protocol, simple network management protocol, hypertext transfer protocol

Unit-II: Basics of PHP
Introduction to PHP, what does PHP do? history of PHP, language basics, datatypes,variables, expressions and operators, flow control statements, including code, embedding PHP in web pages.

Unit-III: Functions & Strings
Calling a function, defining a function, variable scope, function parameters, return values, variable functions, anonymous functions. Strings: Accessing individual characters, cleaning strings, encoding and escaping, comparing strings, manipulating and searching strings, regular expressions.

Unit-IV: Arrays & Objects
 Indexed vs. associative arrays, identifying elements of an array, storing data in arrays, multidimensional arrays, extracting multiple values, converting between arrays and variables, traversing arrays, sorting. Objects: Creating an object, accessing properties and methods, declaring a class, introspection.

Unit-V: MySQL Overview
Introduction, connecting to and disconnecting from the server , Entering queries , Creating and using a database , Creating and selecting a database , creating a table , loading data into a table , Retrieving information from a table , selecting all data , selecting particular rows , selecting particular columns , sorting rows , date calculations , working with NULL values , pattern matching , counting rows , using more than one tables. MySQL databases in PHP:

Introduction, connecting to a MySQL database, querying the database, Retrieving and displaying the results, modifying data, deleting data.

Reference Books:

1. Elizabeth Castro, "HTML for the World Wide Web", Peachpit Press Pearson Education.
2. Lehnert Wendy, "Web 101, Making the network for you", Pearson Education, Asia.
3. Naughton Patrick, "The JAVA Hanbook", TataMcgraw Hill 1996. 12.
4. Winston PH &Narsimhan, "On to JAVA 1.2", Addison Wesley.

Course Code: CS-303
Course Title:Data Mining & Data Warehousing

Course Objectives:

To identify the scope and essentiality of Data Warehousing and Mining.
To analyze data, choose relevant models and algorithms for respective applications.

Course Outcome:

Students Will be Understand Data Warehouse fundamentals, Data Mining Principles.
Identify appropriate data mining algorithms to solve real world problems

Unit-I: Introduction

Basic Data Mining task, Data Mining Vs Knowledge discovery in databases, Data mining metrics, Social Implication of Data Mining.

Unit-II:Related Concepts and Data Mining Techniques

Database/OLTP systems, Information Retrieval, Decision Support Systems, Dimensional Modeling, OLAP, Web Search Engines, Statistical perspective on Data Mining, Decision Tree, Neural networks

Unit-III:Classification

Introduction, Statistical based algorithms, Distance based algorithms, Decision tree-based algorithms, Neural network-based algorithm.

Unit-IV:Clustering andAssociation Rules

Introduction, Hierarchical algorithms, Partitioned algorithms, Clustering large databases, Basic algorithms, Parallel and distributed algorithms

Unit-V:Web Mining&Data Warehousing

Introduction, Web content mining, Web structure mining, Web usage mining. Data Warehousing – the only viable solution, Data Warehouse defined

Reference Books:

1. Data Mining Introductory and Advanced Topics, 2008, Margaret H.Dunham and S. Sridhar, Pearson Education, ISBN 81-7758-785-4
2. Data Warehousing Fundamentals, 2009, PaulrajPonniah, Wiley India Publication, ISBN 978-81-265-0919-5

Course Code: CS-304(A)
Course Title:Artificial Intelligence

Course Objectives:

To provide students of with comprehensive and in-depth knowledge of AI principles and techniques by introducing AI's fundamental problems
To expose students to the frontiers of AI-intensive computing and information systems

Course Outcome:

Students will be able to compare AI with human intelligence and traditional information processing and discuss its strengths and limitations as well as its application to complex and human-centered problems.

Students Will be able to apply the basic principles, models, and algorithms of AI to recognize, model, and solve problems in the analysis and design of information systems.

Unit-I: Introduction
Intelligent Agents, Agents and environments, Good behavior, the nature of environments, Structure of agents, Problem Solving, Problem solving agents, Example problems, searching for solutions, Uniformed search strategies, avoiding repeated states, Searching with partial information.

Unit-II: SEARCHING TECHNIQUES
Informed search and exploration, informed search strategies, Heuristic function, Local search algorithms and optimistic problems, Local search in continuous spaces, Online search agents and unknown environments, Constraint satisfaction problems (CSP)

Unit-III: Backtracking search and Local search for CSP
Structure of problems, Adversarial Search, Games, Optimal decisions in games, Alpha Beta Pruning, Imperfect real-time decision, Games that include an element of chance.

Unit-IV: KNOWLEDGE REPRESENTATION and Ontological Engineering
First order logic, Representation revisited, Syntax and semantics for first order logic, Using first order logic, Knowledge engineering in first order logic, Inference in First order logic, Prepositional versus first order logic, Unification and lifting, Forward chaining, Backward chaining, Resolution, Knowledge representation, Ontological Engineering-Categories and objects, Actions, Simulation and events, Mental events and mental objects

Unit-V: LEARNING
Learning from observations - forms of learning, Inductive learning - Learning decision trees, Ensemble learning - Knowledge in learning , Logical formulation of learning, Explanation based learning, Learning using relevant information, Inductive logic programming, Statistical learning methods, Learning with complete data, Learning with hidden variable, EM algorithm

- Instance based learning, Neural networks - Reinforcement learning, Passive reinforcement learning, Active reinforcement learning, Generalization in reinforcement learning. Introduction to Communications

Reference Books:

1. "Artificial Intelligence – A Modern Approach" by Stuart Russell, Peter Norvig, 2nd Edition, Pearson Education / Prentice Hall of India, 2004, ISBN 978-0137903955
2. "Artificial Intelligence: A new Synthesis", by Nils J. Nilsson,Harcourt Asia Pvt.Ltd.,2000, ISBN: 9814033 464
3. "Artificial Intelligence" by Elaine Rich and Kevin Knight, 2nd Edition, Tata McGraw-Hill, 2003, ISBN: 0-07-008770-9
4. "Artificial Intelligence-Structures and Strategies For Complex Problem Solving" by George F. Luger,Pearson Education / PHI, 2002, ISBN 9780201648669

Course Code: CS-304(B)
Course Title:Mobile Application Development

Course Objectives:

To quickly get you up to speed with writing apps for Android devices.
The student will learn the basics of Android platform and get to understand the application lifecycle

Course Outcome:

Student will be able to write simple GUI applications.
Students will be also able to use built-in widgets and components, work with the database tostore data locally.

Unit-I: Introduction

About Mobile Programming &Android, Smartphones future, preparing the Environment- Installing the SDK, Creating Android Emulator, Installing Eclipse, Installing Android Development Tools, choosing which Android version to use, Android Stack, Android applications structure

Unit-II: Android Architecture

Android Stack, Android applications structure, creating a project, working with the, AndroidManifest.xml, Using the log system, Activities

Unit-III: UI Architecture

Application context, Intents, Activity life cycle, u0supporting multiple screen sizes

Unit-IV: User Interface Widgets

Text controls, Button controls, Toggle buttons, Images, Notification and Toast- Parameters on Intents**,** Pending intents**,** Status bar notifications**,** Toast notifications

Unit-V: Menus, Dialogs &Animation

Localization, Options menu, Context menu, Dialogs- Alert dialog, Custom dialog, Dialog as Activity, Animation -View animation, Draw able animation

Reference Books:

1.Professional Android 4 Application Development,Edition 3,Reto Meier,Wrox John Wiley & Sons, 2012,ISBN 1118237226, 9781118237229.
2. Beginning Android 4 Application Development, Edition illustrated, Wei-Meng Lee, John Wiley & Sons, 2012, ISBN 1118240677, 9781118240670.
3.Sams Teach Yourself Android Application Development in 24 Hours, Edition illustrated, Lauren Darcey& Shane Conder, Sams Publishing, 2012, ISBN 0672335697, 9780672335693

Course Code: CS-304(C)
Course Title:Research Methodology

Course Objectives:
To introduce research and research methodologies in CS to students going to peruse research in CS. To understand the strengths and weakness of each of different research methods.

Course Outcome:
Students Will be demonstrate knowledge of research processes (reading, evaluating, and developing), Perform literature reviews using print and online databases.

Unit-I: Introduction, the Purpose and Product of Research
What is research? Evaluating Research, the 6Ps of research, Reasons for doing Research, possible products, Finding and choosing research topics, evaluating the purpose and product of research.

Unit-II: Overview of the Research Process, Internet Research
A model of the research process, Alternative models of the research process, evaluating the research process, Background of the Internet and WWW, Internet research topics, The Internet and a literature review, The Internet and research strategies and methods, Internet research, the law and ethics.

Unit-III:Reviewing the literature, Surveys and Design Creation
Purpose of literature review, literature resources, The Internet and literature reviews, conducting literature reviews, evaluating literature reviews, Define Surveys, Planning and Designing surveys, the internet and surveys, Example of Surveys, defining design and creation, Planning and conducting design and creation research, Creative computing and digital art.

Unit-IV:Experiments, Case studies, Action Research
Defining experiments, Planning and conducting experiments, the internet and experiments, defining case studies, Planning and conducting case studies, the internet case studies, Defining Action research, Planning and conducting Action research, The internet and Action research

Unit-V:Interviews, Observations, Questionnaires
Defining Interviews, Planning and conducting Interviews, Group Interviews Internet based Interviews, Defining Observations, Planning and conducting systematic Observations, Planning and conducting participant Observations, The internet and Observations. Introduction to Quantitative data analysis, Qualitative data analysis and Presentation of Research

Reference Books:

1. Researching Information System and Computing by Briony J Oates, SAGE Publications, ISBN 978-81-7829-759-0

2. Research Design. Qualitative, Quantitative, and Mixed Methods Approaches. By John W. Creswell, Fourth Edition. SAGE Publication, 2014

3. The Craft of Research, By Wayne C. Booth, Gregory G. Colomb, Joseph M. Williams, Joseph Bizup, William T. FitzGerald, Third Edition, The University of Chicago Press, 2008

Course Code: CS-305
Course Title:Lab-5: Adv. Database Admin

- Advance Database Admin At least 15 practical's which covers all Adv. Database Administration Concepts. All commands

Course Code: CS-306
Course Title:Lab-6: Web Technologies

- At least 15 Practical Based Programs on Web Technologies.

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

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

Course Code: CS-307-B
Course Title:Cyber Security

Course Objectives:
To get knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks.
To understand key terms and concepts in cyber law, intellectual

Course Outcome:
Students will understand principles of web security.
Students will understand key terms and concepts in cyber law, intellectual property and cybercrimes, trademarks and domain theft.

Unit I:
Why Learn About Cyber Crime. Introduction to Cyber Crime. Types of Cyber Crime.

Unit II:
Hacking passwords of MS-Office Files & Email for ethical use. Sending Fake Emails/SMS. Email Tracing.

Unit III:
Chatting In LAN/ Transferring Files in LAN. Sharing Desktop. Preventing Credit/Debit card Fraud. Screen Recording.

Unit IV:
Introduction to Cyber Security. Online Safety Tips. Protecting Password.

Unit V:
Stenography/Hiding Information. Encrypting Decrypting Information. Identifying secure websites, Introduction to Cyber Laws.

Reference Books:
1. Network Security and Cryptography, Atul Kahate, McGraw Hill, 2003.
2. Cryptography and Network Security: Principles and Practices, William Stalling,Fourth Edition, Prentice Hall, 2013.
3. Introduction to Cryptography with coding theory, second edition, Wade Trappe,Lawrence C. Washington, Pearson, 2005.

Course Code: CS-308
Course Title:SK-03 Seminar Presentation Activity

Course Objectives:

To help the student increase self-motivation, personal responsibility, and understanding of his or her role in being an informed participant in the educational process.
To develop a Stage Courage for putting his concepts strongly in front of the audience.

Course Outcome:

Help the student increase self-motivation, personal responsibility, and understanding of his or her role in being an informed participant in the educational process.
Create an environment that helps the student establish healthy relationships and support networks.

Guidelines for Seminar Presentation Activity

1. Each student has to give seminar individually
2. The topic should be Unique for each student
3. Students must approve seminar topic from seminar incharge faculty.
4. Student must prepare at least Ten Power point slides seminar presentation.
5. Students have to give at least two seminars on the selected topic throughout the semester.

Students must prepare a seminar report. The signed seminar report from Head of department and Seminar Incharge must be submitted during final seminar.

Course Code: CS-401
Course Title:Digital Image Processing

Course Objectives:
To study the image fundamentals and mathematical transforms necessary for image processing.
To study the image enhancement, image restoration procedures and image compression techniques.

Course Outcome:
Students will be Analyze images in the frequency domain using various transforms.
Evaluate the techniques for image enhancement and image restoration and also categorize various compression techniques.

Unit-I: **Digital Image Processing Systems**
What is DIP? Fundamental steps in DIP, Components of an Image Processing System, Elements of Visual Perception, Lights and Electromagnetic Spectrum, Image sensing and acquisition, Image sampling and quantization

Unit-II:Introduction to Digital Image Representation
Digital Image Representation, Read & Displaying Images, Data Classes & Image types, Converting between Data Classes and Image types

Unit-III:Intensity transformation &Spatial filtering
Intensity Transformation function, Histogram processing & Function plotting, Spatial filtering

Unit-IV:Frequency Domain Processing
2D –discrete Fourier transform, Filtering in frequency domain, Obtaining Frequency Domain Filters from spatial filters

Unit-V:Image Restoration
A Model of the Image Degradation /Restoration Process, Noise Models, Restoration in presence of Noise only –spatial filtering, Periodic Noise Reduction by Frequency domain Filtering, introduction Color Image Processing and Introduction to Wavelets.

Reference Books:

1. Digital Image Processing by R.C. Gonsales R. E. Woods, Second Edition, Pearson Education,ISBN: 978-0201180756.
2. Fundamentals of Image Processing by Anil K. Jain, First Edition, PHI, ISBN 9788120309296.
3. Digital Image Processing using MATLAB by R.C. Gonsales R. E. Woods,Second Edition, Pearson Education,ISBN 9780130085191

Course Code: CS-402
Course Title:Linux Administration

Course Objectives:
To describe the relationship between GNU and Linux
To describe various operating system concepts such as multitasking, virtual memory and multiuser environments as they apply to Linux.

Course Outcome:
Students will be able carry the duties of a Unix system administer.
Students will learn to do file processing, process management, IO management, queues management, networking, storage backup, account management, proper system start-up and shutting down, as well as other tasks.

Unit-I:Introduction to RED Hat LINUX
Hardware Requirements, Red Hat LINUX Installation, Advantages of LINUX, Other LINUX distributions, Concept of Linux loader

Unit-II:Working with Linux
LINUX file system, Shells, Text editors, Changing User Information, File Permissions, Virtual Consoles

Unit-III:The X Window System
Basic X window system, Configuring X window systems, Starting X, Selecting & using X window.

Unit-IV:Managing Services, Software & System Resources
LINUX Boot Process, System services and run levels, controlling services at boot with administrative tools, Starting and stopping services manually, Using RPM for software management, Using RPM on the command line, extracting a single file from & RPM file, Graphical Package Management, System monitoring tools

Unit-V:Printing with Linux
Configuring & managing print services, Local printer installation, Network printer installation, LINUX printing commands, Using the Common UNIX Printing System (CUPS), Console print control, Introduction to Network Connectivity Networking with TCP/IP

Reference Books:

1. Red Hat Linux Unleashed, Edition illustrated reprint, "Bill Ball, David Pitts", Sams, 2001, ISBN 0672319853, 9780672319853.

2. Red Hat Fedora 2 Unleashed, Edition illustrated, "Bill Ball, David Pitts", Sams, 2005, ISBN 067232721X, 9780672327216.

Course Code: CS-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.

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: CS-404-A
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 &SteaveGuengerich, "Client / Server Computing", PHI
2. Dawna Travis Dewire, "Client/Server Computing", TMH
3. Majumdar & Bhattacharya, "Database management System", TMH

Course Code: CS-404-B
Course Title:Software Testing Tools

Course Objectives:

The student should be made to expose the criteria for test cases.
Learn the design of test cases and be familiar with test management and test automation techniques.

Course Outcome:

At the end of the course the students will be able to Design test cases suitable for a software development for different domains.Identify suitable tests to be carried out and prepare test planning based on the document.Document test plans and test cases designed and Use of automatic testing tools.

Unit-I: Introduction

Testing as an Engineering Activity, testing as a Process, Testing axioms, Basic definitions: Software Testing Principles, The Testers Role in a Software Development Organization Origins of Defects, Cost of defects, Defect Classes, The Defect Repository and Test Design, Defect Examples, Developer/Tester Support of Developing a Defect Repository, Defect Prevention strategies.

Unit-II: Test Case Design

Test case Design Strategies, Using Black Bod Approach to Test Case Design, Random Testing, Requirements based testing, Boundary Value Analysis,Equivalence Class Partitioning, Statebased testing, Cause-effect graphing, Compatibilitytesting, user documentation testing, domain testing, Using White Box Approach to Testdesign, Test Adequacy Criteria, static testing vs. structural testing code functional testing Coverage and Control Flow Graphs Covering Code Logic Paths code complexity testing Evaluating Test AdequacyCriteria

Unit-III: Levels Of Testing

The need for Levers of Testing Unit Test, Unit Test Planning, Designing the Unit Tests, The Test Harness, Running the Unit tests and Recording results, Integration tests, Designing Integration Tests, Integration Test Planning, Scenario testing, Defect bash elimination System Testing, Acceptance testing, Performance testing, Regression Testing, Internationalization testing Ad-hoc testing, Alpha, Beta Tests, Testing OO systems, Usability and Accessibility testing, Configuration testing, Compatibility testing, Testing the documentation, Website testing.

Unit-IV: Test Management

People and organizational issues in testing, Organization structures for testing teams testing services, Test Planning, Test Plan Components, Test Plan Attachments, Locating Test Items, test management, test process, Reporting Test Results, The role of three groups in Test

Planning and Policy Development, Introducing the test specialist, Skills needed by a test specialist, Building a Testing Group.

Unit-V: Test Automation

Software test automation, skill needed for automation, scope of automation, design and architecture for automation, requirements for a test tool, challenges in automation, Test metrics and measurements, project, progress and productivity metrics.

Reference Books:

1. Srinivasan Desikan and Gopalaswamy Ramesh, "Software Testing – Principles and Practices", Pearson Education, 2006.
2. Ron Patton, "Software Testing", Second Edition, Sams Publishing, Pearson Education, 2007.

Course Code: CS-405
Course Title:Lab-7: DIP(Digital Image Processing)

- At least 15 programs on Digital Image Processing using MATLAB

Course Code: CS-406
Course Title:Lab-8: Based on Elective Subject

- At least 15 Practical Based on Elective Subject.

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

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

Course Code: CS-407-B
Course Title:Logical Reasoning and Quantitative Aptitude

Course Objectives:
To acquire the skill to solve the problems on Logical Reasoning
To acquire the skill to solve the problems on Quantitative Aptitude

Course Outcome:
Understand the basic concepts of QUANTITATIVE ABILITY and LOGICAL REASONING Skills, acquire satisfactory competency in use of VERBAL REASONING and Solve campus placements aptitude papers covering Quantitative Ability, Logical Reasoning and Verbal Ability

Unit-I:General Mental Ability-I
Series Completion, Coding and Decoding, Blood relations, Seating Arrangement, Comparison type questions.

Unit-II:General Mental Ability-II
Directions sense test, logical ven diagrams, Inserting the missing character, data sufficiency.

Unit-III:Logical Deduction
Logic, statement arguments, statement assumptions, statement conclusion.

Unit-IV:Arithmetical Ability-I
Numbers, Simplification, Average, Problems on ages, Percentage, Probability.

Unit-V:Arithmetical Ability-II
Profit and loss, ratio and proportion, time and work, simple interest compound interest, calendar. Data InterpretationTabulation, Bar graphs, Pie charts, line graphs

Reference Books:
1. Quantitative Aptitude by Dr. R S Aggarwal, Revised edition, ISBN 81-219-2498-7
2. A Modern Approach to Verbal Reasoning by Dr. R S Aggarwal, S. Chand and Company pvt. Ltd., ISBN 81-219-0552-4

Course Code: CS-408
Course Title: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.