Veer Narmad South Gujarat University, Surat

Ph.D. Coursework

Computer Science

Program Outcome	**PO1 : Fundamental Knowledge Enrichment** Program trains students with the core computer science and Information Technology (IT) knowledge domains. It also makes research scholars capable of using core concepts in the conceptualization of domain-specific research. **PO2 : Critical Thinking Development** Critically apply theories, methodologies, and knowledge to address fundamental questions in their primary area of study. **PO3 : Knowledge and Intellectual Abilities** The knowledge, intellectual abilities, and techniques to carry out excellent research. **PO4 : Advanced Tools Usage** The program teaches the researchers to apply the advanced tools to solve research problems. **PO5 : Research governance and organization** The knowledge of the standards, requirements and professional conduct that are needed for the effective management of research. **PO6 : Undertake Research Projects** Develop skills to lead research projects within specified limits and participate constructively in more complex interdisciplinary research projects. **PO7 : General Competence** Train researchers to conduct their research in accordance with recognized ethical standards for research.
Program Specific Outcomes	PSO1 : Develop and strengthen the fundamental core concepts that are required to solve research problems. PSO2 : Develop skills that needs independent logical and analytical thinking to solve research problems. PSO3 : Nurture the researchers to investigate for the design and development of a workable solution for a research problem. PSO4 : Train researchers for self-learning and performing challenging problem solution in their research area. PSO5 : Train researchers to use recent computer science and application domain specific knowledge in their research problem. PSO6 : Train researchers to take-up the real-world challenges to develop workable solution to a domain specific research problem. PSO7 : Inculcate the passion for continuous learning and doing research for making a successful professional career.

Mapping between POs and PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
PO1							
PO2							
PO3							
PO4							
PO5							
PO6							
PO7							

Course Structure :

Paper	**Subject**	**Mark**
I	Research Methodology	100
Electives	ANY TWO from Following	200
I	Advanced Web Technology	
II	Operating System	
III	Database Management System	
IV	Object Oriented Programming Methodology	
V	Digital Image Processing	
Dissertation		400

Paper – I Research Methodology

Course Outcomes	CO1: Discuss different methodologies and techniques used in research work. CO2: Explain basic computer skills necessary for the conduct of research. CO3: Assess the basic function and working of programming and analytical software used in research. CO4: Propose the required numerical skills necessary to carry out research. CO5: Organize and conduct research in an organized and ethical manner.

Mapping between COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1							
CO2							
CO3							
CO4							
CO5							

UNIT – I

Meaning and objectives of research, motivation in research, types of research, research methods VS research methodology, how research is done, criteria of good research, defining a research problem, selection of a research problem, research design and its need.

UNIT – II

Report writing, significance of report writing, steps in report writing, layout of research; figures, tables, graphs, references, foot notes etc. presentation of research, art of writing a good research paper, selection of a journal for paper publication.

UNIT – III (MATLAB-I)

Introduction to MATLAB, MATLAB data types, Arrays and array operations, Expressions in MATLAB, Declaration of variables and numbers, Logical and relational operators, Functions (inbuilt and used defined), Data analysis, String manipulation, Programming in MATLAB, Plotting in MATLAB -Two and three dimensional plotting, Various options for plotting, Property editor, Problem solving techniques, Graphical and tabular representation of results.

UNIT IV (MATLAB – II)

Matrix manipulation, Addition and multiplication of matrices, Matrix inversion, Eigenvalues and eigenvectors of matrices, Solving problems containing matrices, function writing, Tools boxes like; Optimization toolbox, Genetic Algorithms toolbox, Fuzzy logic toolbox, Digital Signal Processing toolbox, Image Processing toolbox, Neural Networks toolbox.

UNIT – V

Latest developments in Computer Science

References

[1] Kothari, C. R., Research Methodology -methods and techniques, 2nd Edition,Wishwa Prakashjan, Newdelhi. 1999.
[2] 2. Berny, H. Durston, M. Poole, “Thesis and Assignment writing”, Wiley Eastern Ltd, ND,
[3] 3. Misra, R P, Research Methodology - A Hand Book , Concept publishing Company, New Delhi, 1988.
[4] Y. Kirani Singh, B.B. Chaudhuri, Matlab Programming,PHI EEE, 2007
[5] Amos Gilat, MATLAB An introduction with applications, Wiley India Edition,
[6] John H. Mathews, Kurtis D. Fink, Numerical Methods using MATLAB, Fourth Edition, PHI EEE
[7] Alasdair Mc Andrew, Introduction to Digital Image Processing with MATLAB, Cengage Learning

Elective I : Advanced Web Technology

Course Outcomes	CO1: Explain researchers the Advanced aspects of the Web based Technology. CO2: Train various web technologies like Java, Microsoft .NET and Open-Source PHP in the aspects of Performance, Security, System Resource Requirement etc. CO3: Train various advanced web technologies like Swing, Silverlight, AJAX, JQuery, MVC etc. CO4: Explain and train researchers to deal with possible problems & their solutions while developing websites. CO5: Expose the researchers with the analysis and development process of Websites and recent trends in Markup Languages.

Mapping between COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1							
CO2							
CO3							
CO4							
CO5							

UNIT - I

Introduction to Advanced Web Technology, The World Wide Web, WWW Architecture, Web Search Engines, Web crawling, Web indexing, Web Searching

UNIT - II

Web Technologies like Java, Microsoft .Net technology and Open source PHP, Comparison of Performance, Security, System Resource Requirement etc. in various Webtechnologies

UNIT – III

Advance Concepts in Web Technologies, **Java:** Swing, Threading, Basic XML processing in XML, Web Services etc. **Asp .Net :** Silverlight, WCF ,WPF ,LINQ ,AJAX, Web Services ,MVC pattern , jquery etc. , **PHP :** Ajax ,Jquery ,GD library ,Web Services ,Template based programming etc. , Basic concept of Service Oriented Architecture (SOA)

UNIT - IV

Recent Trends in Markup Languages

Reference Books :

1. Java Programming Advance Topics – Joe Wigglesworth and Paula Lumby - Thomson Learning
2. Java Server and Servlets : Building Portable Web Applications – Peter Rossbach & Hendrick Schreiber – Addition Wesley
3. Special Edition Using ASP.NET – Richard Leinecker – Pearson Education.
4. PHP and MySQL Bible – Tim Converse and Joyce Park with Clark Morgam By Wiley INDIA
5. PHP MySQL Website Programming - Chris Lea, Mike Buzzard, Jessey White-Cinis & Dilip Thomas - Wrox Press Inc

Elective II : Operating Systems

Course Outcomes	CO1: Explain and train the researchers with different implementations of the policies for scheduling, process synchronization, deadlocks, memory management, system calls, and file systems. CO2: Expose the researchers with the core concepts of multi-processing/multithreading, that will help them to manage and synchronize the concurrent tasks/transactions while developing professional program of their research problem using any platform. CO3: Impart knowledge of various algorithms for memory management that will make the researchers efficiently utilize memory while developing a software. CO4: Expose the researchers with the core concepts of distributed systems and distributed resource management. CO5: The researchers will be able to compare various Operating Systems in the aspects of Memory Management, File System and Security.
Mapping between COs with PSOs	

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1							
CO2							
CO3							
CO4							
CO5							

UNIT – I

Process management, memory management, File system, I/O management, security

UNIT - II

Multiprocessor, multiprocessor operating system types, multiprocessor, synchronization, scheduling

UNIT – III

Multicomputers, Architecture of distributed systems, Distributed resource management

UNIT – IV

Comparative study of operating systems, Memory management, File system, security

Reference Books:

1. Modern Operating Systems by Andrew S. Tanenbaum, Pearson Edu./PHI, 3rd edition
2. Advanced Concepts In Operating Systems, Mukesh Singhal**,** Niranjan Shivaratri, Tata McGraw Hill
3. Distributed Operating Systems by Tanenbaum, Pearson.
4. Operating Systems: A Concept-based Approach by Dhamdhere, TMH
5. Unix Concepts and Application - Das – McGrawHill

Elective III : Database Concepts and Knowledge Management

Course Outcomes	CO1: The researchers will get an insight on how the data is stored in various types of Files. CO2: The researchers will get an insight of internal structure of various types of indices, their merits, and demerits. They will understand how these indices will be affected and updated whenever the data is updated. CO3: The researchers will be able to optimize query which will, in turn, help in improving the performance of the overall system. CO4: The researchers will study recent trends in database. They will also get an idea about the Spatial & Temporal Data. CO5: This course will help the researchers to understand the internal working of data storage and indices. This will help them in choosing an appropriate database for their research.

Mapping between COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1							
CO2							
CO3							
CO4							
CO5							

UNIT - I

Introduction of Various Types of File Organizations, Serial Files, Sequential Files Index Sequential Files, Direct Files, File Organization, Organization of Records in Files, Data Dictionary Storage

UNIT - II

Introduction to Indexing & Hashing, Ordered Indices, Dense & Sparse Indices,Multi Level Indices, Index Update, Secondary Indices, Indices on Multiple Keys, B^+ Tree Index Files, Structure of a B^+ Tree, Queries on B^+ Trees, Updates on B^+ Trees (Insertion & Deletion), B-Tree Index Files, Static Hashing, Hash Functions, Handling of Bucket Overflows, Hash Indices,Dynamic Hashing, Data Structure, Queries & Updates, Bitmap Indices, Index Definition in SQL

UNIT - III

Query Optimization overview, Transformation of Relational Expressions, Equivalence Rules, Join Ordering, Estimating Statistics of Expression Results, Catalog Information,

Selection Size Estimation, Join Size Estimation, Size Estimation for Other Operations, Choice of Evaluation Plans, Cost Based Join Order Selection, Cost Based Optimization with Equivalence Rules

UNIT - IV

Recent Trends in Database, Introduction to Data Warehousing & Mining, Introduction to Spatial & Temporal Data, Technical Comparison of at least Two Current DBMS & RDBMS Packages(Broadly on parameters like locking, concurrency, parallel execution, performance, indexing, partitioning, clustering etc.)

Reference Books:

1. Database System Concepts, H. F. Korth, S. Sudarshan, A. Silberschatz, McGraw Hill
2. Database Systems, Models, Languages, Design & Application Programming, R. Elmasri, S. B. Navathe, Pearson
3. Database Systems, A Practical Approach to Design, Implementation & Management, T. Connolly, C. Begg, Pearson
4. An Introduction to Database Systems, Bipin Desai, Galgotia Publication
5. Database Systems, Design, Implementation & Management, Peter Rob, Carlos Coronel, Cengage Learning
6. Database Processing Fundamentals, Design & Implementation, David M. Kroenke, PHI

Elective IV : Object-Oriented Programming Methodology

Course Outcomes	CO1: The researcher will get an insight into the principles of Object-Oriented Problem solving and programming. CO2: The researcher will be able to compare the object-oriented features of at least three programming languages. CO3: The researcher will be able to compare and implement advanced object-oriented features like generic programming across at least three programming languages. CO4: The researcher will be able to understand and study the object-oriented features incorporated in various Database Management Systems. CO5: The researcher will be able to do gap analysis and proceed further in Research area of Object-Oriented Methodology and Data Management.

Mapping between COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1							
CO2							
CO3							
CO4							
CO5							

UNIT - I

Overview of Object-Oriented Properties, Introduction to Object-Oriented Analysis & Design, Introduction to Object-Oriented Database Management Systems

UNIT - II

Comparison of Object-Oriented Languages (C ++, Java, VB.Net) with regards to Encapsulation, Abstraction, Inheritance, Static Polymorphism, Dynamic, Polymorphism, Genericity, Persistence

UNIT – III

Object Modeling Techniques, Links and Associations, Classification of Object, Aggregation & Generalization, OMT Models, Introduction & Overview of UML, Comparison of recent Object Modeling Techniques

UNIT - IV

Object-Oriented Database Management System (OODBMS), Impedance Mismatch, Object Persistence Framework, Advantages of OODBMS over other RDBMS and ORDBMS, Comparison of currently available OODBMS

Reference Books :

1. The C++ Programming Language, Stroustrup, Addison Wesley
2. The Complete Reference C++, Schildt, Tata McGraw Hill
3. OOP in Tourbo C++, Robert Lafore, Galgotia Publication
4. C++ Primer, Lippman, Addition Wesley
5. Object Oriented Modelling & Design, Rumbaugh, PHI
6. Object Oriented Analysis & Design with Application, Grady Booch, LPE
7. Object Oriented Programming with Visual Basic .Net , J P Hamilton, O'Reilly
8. Object Oriented Programming in Visual Basic .Net, Alastair McMonnies, Addison Wesley Longman
9. Java- The Complete Reference, Patrick Naughton, Tata McGraw Hill

Elective V - Digital Image Processing

Course Outcomes	CO1: Explain the fundamentals of digital image and its processing. CO2: Perform image enhancement techniques in spatial and frequency domain. CO3: Explain the mathematical modelling of image restoration and compression. CO4: Apply the concept of image segmentation. CO5: Describe object detection and recognition techniques.

Mapping between COs with PSOs

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7
CO1							
CO2							
CO3							
CO4							
CO5							

Unit I - Digital Image Fundamentals

Introduction, Digital Image representation, Fundamentals of Image processing, Elements of Digital Image Processing system, Applications. Sampling and Quantization,.
Elements of visual perception, a simple image model, Sampling and quantization, Some basic relationships Basic Relationship among pixels-neighbor, connectivity, regions, boundaries, distance measures

Unit II - Image Transformation and Image Enhancement

Introduction to the Fourier Transform, The Discrete Fourier Transform, some propertiesof the Two - Dimensional Fourier Transform, The fast Fourier Transform.
Image Enhancement - Image Enhancement in spatial model, mask based processing , histogram processing, enhancement in frequency domain

Unit III - Image Restoration, Image Compression and Colour Processing

Degradation Model, Degradation functions, Noise Models, Signal – to noise ratio, Restoration Models, Discrete formation, Inverse filtering, Least mean square (wiener) filter, Constrained least squares Restoration, Interactive Restoration.
Image Compression - Image compression fundamentals, Image compression models, Image compression standards.
Color fundamentals, Color models, The RGB, CMY, CMYK, HSI model, Pseudo colorImage processing, Color Transformations, Smoothing and sharpening, Color segmentation.

Unit IV - Edge Detection, and Image Segmentation

Introduction to Edge Detection, Edge Detection Techniques, First and Second order ofdetection, Finite-difference edge detectors
Segmentation; Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region base segmentation.

Reference Books

1. Digital Image Processing – Gonzalez and Woods, 3rd Edition, Pearson Education Publication
2. Digital Image Processing Using MATLAB- Gonzalez, Woods, Eddins, 2nd Edition, McGraw Hill
3. Digital Image Processing – B.Chanda, D.Dutta and Majumdar, Analysis ,PHI Publication
4. Digital Image Processing and Pattern Recognition – Malay K.
Pakhira, PHI5 Introduction to Image Processing - Alasdair
McAndrew, Cengage Learning
6. Digital Image Processing and Computer Vision – Sonka, Klavac, Boyle, Cengage Learning