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UNIVERSITY

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ArcadiaGrant,P.O.Chandanwari, Premnagar,Dehradun, Uttarakhand-

248007,INDIA

Detailed Course Structure & Syllabus
of
Pre Ph.D. (Computer Science & Engineering)
Course Work
(As per CBCS system)
W.E.F Session 2022-23

Course Structure of the Pre-Ph.D (Computer Science & Engineering) Course Work:
Applicable for Batch: 2022-23

SCHEME OF EXAMINATION

Ph.D(Computer Science & Engineering)
(Effective from Academic Year 2022-23)

Under Choice Based Credit System (CBCS)

Course Structure of the Pre-Ph.D (Computer Science & Engineering) Course Work:

Applicable for Batch: 2022-23

Scheme of Pre-Ph.D. Course Work

S.No	Course Code	Subject	Credits	Period			Sessional			Examination	
				L	T	P	CT- I	CT-II	Total	ESE	Sub. Total
Courses											
1.	RM-101	Research Methodology	4	4	0	0	20	20	40	60	100
2.	RM-102	Computer & Stats Application in Research	2	2	0	0	20	20	40	60	100
3.	RPE-103	Research & Publication Ethics	2	2	0	0	20	20	40	60	100
4.	DSE-104	Discipline Specific Electives	3	3	0	0	20	20	40	60	100
5.	RS-105	Seminar Presentation	2	0	0	4	20	20	40	60	100
		Total	13	11	0	4	100	100	200	300	500

List of Electives

S. No.	Course Code	Course Name
1	IIOT-104	Industrial Internet of Things
2	CS-104 (1)	Advanced Information Security Systems
3	CS-104 (2)	Digital Image Processing
4	CS-104 (3)	Neural Network
5	CSE-104 (4)	Advance Topics in Database Systems

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SYLLABUS

of

Ph.D(Computer Science & Engineering)

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Programme Name	**Pre-Ph.D. Course Work**	Programme Code	23-
Course Code	RM-101	Credit	4
Year/Sem	1/1	L-T-P	4-0-0
Course Name	Research Methodology		

Objectives of the Course:
1. To Equip the Students with the Concept and Methodology of Research.
2. To provide knowledge about type of research, preparation of reports and thesis, designing of Research using Scientific Methods.

UNIT I (Total Topics- 7   and   Hrs-12)

 Introduction to Research: Definition, Nature and significance, Role and Objectives; Types of Research: exploratory, descriptive, experimental and diagnostic research, social and legal research and traditional, analytical, empirical & fundamental research, Doctrinal and non-doctrinal research methods; Various Research Designs; Scientific Research Process: Overview, Problem identification and formulation of research statement.

UNIT II(Total Topics- 7   and   Hrs- 12)

 Data Collection: sources, primary and secondary methods, significance of Primary and Secondary Data, questionnaire Vs. schedules; Data Processing: Editing, Coding Organization and Presentation; Attitude Measurement and scaling: Measurement Scales, Sources of Errors in Measurement, Techniques of Developing Measurement Tools, Classification and Testing (Reliability, Verification and Validity) Scales, Designing Questionnaires and Interviews.

UNIT- III (Total Topics- 5   and   Hrs- 10)

 Sampling, Sampling Methods, Sampling Plans, Sampling Error, Sampling Distributions: Theory and Design of Sample Survey, Census Vs Sample Enumerations, Objectives and Principles of Sampling, Types of Sampling, Sampling and Non-Sampling Errors, Concept of Permutation, Combination & Probability for research analysis.

UNIT-IV(Total Topics- 5 and Hrs- 10)

 Interpretations and Report Writing: Meaning of Interpretation, Techniques of Interpretation, Precautions in Interpretation, Significance of Report Writing, Steps in Report Writing, Layout of Report and Precautions in Writing Research Reports. Limitations of RM: Ethics in Research, Philosophical Issues in Research.

CO1. Acquire in-depth knowledge of various fundamentals, theories and principles related to the research and apply the acquired knowledge in carrying out research studies in the area of interest.

CO2. Identify, formulate and critically investigate research problems by applying research-oriented knowledge and analyze relevant data to reach certain conclusions in the form of alternative solutions to these problems.

CO3. Apply the acquired knowledge and skills to develop minds to think out of the box while carrying out research operations to conclude something.

CO4. Apply parametric and non-parametric statistical tests to verify the developed hypothesis to suggest innovative solutions to the problem being investigated.

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Reference Books

1. William G. Zikmund, "Business Research Methods", Orlando: Dryden Press.
2. C. William Emory and Cooper R. Donald, "Business Research Methods", Boston, Irwin.
3. Fred N Kerlinger, "Foundations of Behavioural Research", New Delhi: Surjeet Publications.
4. Naresh Malhotra, Marketing Research : An Applied Orientation, Pearson publication David Nachmias and ChavaNachmias, "Research Methods in the Social Sciences", New York: St.Marlia's Press.
5. Bhattacharya, D. K. (2004) Research Methodology, New Delhi, Excel Books.

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Programme Name	**Pre-Ph.D. Course Work**	Programme Code	23-
Course Code	RM-102	Credit	2
Year/Sem	1/1	L-T-P	2-0-0
Course Name	Computer & Stats Application in Research		

Objectives of the Course:
1. To appraise computational skills for research application.
2. To assess statistical method for research analysis.

UNIT I

Characteristics of Computers, Evolution of computers, computer memory, computer generations, Basic computer organization; System software, Application software, introduction to operating system, single user, multi-user, multi-tasking single tasking, application of computer for business and research, MS-windows, Linux .Application of Internet in research : INFLIBNET, Use of Internet, sights (DOAJ), Use of E Journals, Use of E library, use of EBSCO HOST online database of Academic Libraries. Subject/field specific tools on www.freeware.com

UNIT II

Computer Application in Research,. Basic concept of Computer, Use of Internet for Research Purpose: E-mail, WWW, Web browsing, technical skills, drawing inferences from data, Research publishing tools-MS Word, Adobe acrobat, Graphics tool-MS Excel, Presentation tool-MS Power, Data Analysis Software and Analysis Techniques point. Creating presentation and adding effects, Introduction to Data analysis software-SPSS: Definition, objectives and features, data analysis using SPSS.

UNIT- III

Statistical methods for research application in analysis of data,Measurement in Research , data interpretation, Measures of Central Tendency, Measures of Dispersion, Measures of Asymmetry (Skewness), std deviation, Measures of Relationship, Simple Regression Analysis, Correlation and Regression, Partial Correlation.

UNIT-IV

Statistical Tools-Hypothesis and Hypothesis Testing: Parametric & Non-Parametric Tests, Important Parametric Tests ,Hypothesis Testing of Correlation Coefficients ,U Test, Chi Square Test, ,T-Test.Analysis of Variance (ANOVA) , The Basic Principle of ANOVA ,ANOVA Technique, Setting up Analysis of Variance Table, Short-cut Method for One-way ANOVA, Coding Method, Two-way ANOVA .

Course Outcomes:

CO1. Acquire knowledge of concept of computer with application in Research.
CO2. Apply acquired knowledge of computer for presentation skills.
CO3. Acquire knowledge of statistical methods for Research.
CO4. Apply acquired knowledge to describe the inductive nature of quantitative data analysis.

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Reference Books
1. C. R. Kothari, "Research Methodology: Methods and techniques", New Delhi: Vishwa Prakashan.
2. Brymann, Alan and Carmer, D. (1995) Qualitative data analysis for social scientist, New York, Routledge Publication.
3.Jain, Satish: "Introduction to Computer Science and basic Programming." BPB Publications, New Delhi, 1990. • Rajaraman, V., "Fundamental of Computers", Prentice Hall of India, New Delhi, 1996.

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Programme Name	**Pre-Ph.D. Course Work**	Programme Code	23-
Course Code	RPE-103	Credit	2
Year/Sem	1/1	L-T-P	2-0-0
Course Name	Research& Publication Ethics		

Objectives of the Course:

Its objectives to provide knowledge about ethics and code of research publication with concept of plagiarism.

UNIT I (Total Topics- 2 and Hrs-8)

1. Introduction to philosophy: definition, nature and scope, concept, branches

2. Ethics: definition, moral philosophy, nature of moral judgments and reactions

UNIT II(Total Topics- 5 and Hrs- 5)

1. Ethics with respect to science and research

2. Intellectual honesty and research integrity

3. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP)

4. Redundant publications: duplicate and overlapping publications, salami slicing

5. Selective reporting and misrepresentation of data

UNIT- III (Total Topics-7 and Hrs-7)

1. Publication ethics: definition, introduction and importance

2. Best practices/ standards setting initiatives and guidelines: COPE, WAME,etc.

3. Conflicts of interest

4. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, types

5. Violation of publication ethics, authorship and contributorship

6. Identification of publication misconduct, complaints and appeals

7. Predatory publishers and journals

UNIT- IV (Total Topics-4and Hrs-4)

Practice

Open Access Publishing

1. Open access publications and initiatives

2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies

3. Software tool to identify predatory publications developed by SPPU

4. Journal finder/ Journal suggestion tools viz. JANE, Elsevier Journal finder, Springer Journal Suggester, etc.

CO1. Recognize the basics of philosophy of science & ethics, research integrity, publication ethics and theories of research ethics.

CO2. Familiarize with important issues in research ethics, research integrity, scientific misconduct and misinterpretation of data.

CO3. Analyze the best practices for publications, publication ethics and identify the predatory publishers & journals.

CO4. Demonstrate &use plagiarism software tools, open-source software tools, citation databases and

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research metrics.

CO5. Publish credible & scholarly publications in reputed peer-reviewed journals.

References-
Research and Publication Ethics, Dr Sumanta Dutta, Bharti Publications,2021
Research and Publication Ethics, Dr Santosh kumar Yadav, Anne Publications,2020

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Programme Name	**Pre-Ph.D. Course Work**	Programme Code	23-
Course Code	RS- 105	Credit	2
Year/Sem	1/1	L-T-P	0-0-4
Course Name	Seminar Presentation		

Objectives of the Course:

Main objective of this course is to develop presentation skills in the scholars and knowledge about review of literature so that they can review properly for utilisation in their research work.

Seminar Presentation-Candidate/Research Scholar has to go through the review of literature in the concerned field of research. Review of literature guidelines will be given by the concerned faculty/Dean of Department/School/College. Research Scholar has to prepare presentation on review of literature in the concerned field/ topic assigned by the department (DRC) periodically during course work. There will be minimum 3 presentations of review of literature during pre-Ph.D. course work.

- First presentation will be required in DRC/FRC for review of literature with concerned Department focus on area of research. It will be evaluated and assessment sheet will be sent from Department to Dean Research & Studies office.
- Similarly second presentation will be required by research scholar with extension of first presentation and more number of references would be added.

Internal & end term examination marks will be as per scheme. Each presentation is to be assessed by the department as per instructions from Dean-Research & Studies.

Final presentation would be required at the time of end term/sem. examination on proposed synopsis. General guidelines would be issued by Dean-Research for seminar presentation.

Course outcomes

CO1. Research Scholar would be able to develop & explore the review of literature in concerned area.
CO2. Analyze review of literature critically for finding the research gap.
CO3. Apply acquired knowledge in making systematic seminar presentations.
CO4. Apply acquired knowledge for improving development of all-round research.

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Programme Name	**Pre-Ph.D. Course Work**	Programme Code	23-
Course Code	IIOT-104	Credit	3
Year/Sem	1/1	L-T-P	3-0-0
Course Name	Industrial Internet of Things		

Objectives of the Course:

1. Its objectives to provide knowledge about Basics of IoT and its applications in different domains

UNIT I (Total Topics- 8 and Hrs- 8)

Introduction to Internet of Things

1. Introduction to embedded system, Challenges and design issues in embedded systems

2. Types of microcontrollers, General introduction of Arduino, NodeMCU, Raspberry Pi

3. Selection of microcontrollers

4. Definition of IoT, Components of IoT

5. Levels of IoT

6. Evolution of IoT, Challenges in IoT Design challenges

7. Introduction to Python

8. Introduction to AI & ML

UNIT II (Total Topics- 7 and Hrs- 7)

Communication Protocol

1. Machine to Machine, Difference between IoT and M2M

2. Software define Network Communication Protocols : ZigBee, RFID, Wi-Fi, Bluetooth

3. LoRA, CAN, Cellular network

4. NFC, SPI protocol, I2C protocol

5. Communication with Bluetooth devices: Bluetooth standard, AT commands, Setting Bluetooth in command mode

6. Cloud platforms : Overview of cots cloud platforms

7. Cloud services business models: SaaS, PaaS, IaaS.

UNIT- III (Total Topics- 6 and Hrs- 7)

Introduction to Computing Platform

1. Getting Started with Arduino : Setting up Arduino board

2. Using the Integrated Development Environment (IDE) to prepare an Arduino Sketch

3. Uploading and Running the Blink Sketch

4. Creating and saving a Sketch, Installing Arduino IDE

5. Raspberry Pi

6. Edge & Fog Devices

UNIT- IV (Total Topics- 7   and Hrs- 7)
Interfacing of I/O Devices

1. Interfacing with LEDs

2. 7-segment interfacing

3. Interfacing LCD

4. Getting Input from Sensors : Detecting movement

5. Interfacing with ultrasonic sensor

6. Temperature and humidity sensor

7. Actuators : Interfacing DC motor, Controlling direction and speed of DC motor

UNIT- V (Total Topics- 4   and Hrs- 8)
Case Studies

1. Energy Management 4.0- Smart Metering, Smart Grid

2. Manufacturing

3. Agriculture 4.0

4. Automotive Applications

CO-1 Understand the concepts of Internet of Things

CO-2 Analyze basic protocols in wireless network

CO-3 Implement IoT in different domains and innovation

Reference Books

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach", University Press, 2015
2. Raj,kamal, Internet of Things : Architecture and Design Principles, Mcgraw Hills,2017
3. Rajesh Singh, Anita Gehlot, Bhupendra Singh, Chimata, Raghuveer Internet of Things in Automotive Industries and Road Safety. River Publishers, 2018.
4. Rajesh Singh, Anita Gehlot, Bhupendra Singh, Sushabhan Choudhury, Internet of Things Enabled Automation in Agriculture, New India Publishing Agency (NIPA)

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Programme Name	**Pre-Ph.D. Course Work**	Programme Code	23-
Course Code	**CS-104 (1)**	Credit	3
Year/Sem	1/1	L-T-P	3-0-0
Course Name	**ADVANCED INFORMATION SECURITY SYSTEMS**		

Objectives of the Course: After the completion of the course, the students will be able to-:
1. To develop basic understanding of security, cryptography, system attacks and defenses against them.
2. Will gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath

UNIT 1	**Cryptography**	**Total Topics- 10 and Hours**: **8 L**

Basic Concepts, Cryptosystems, Crypto-Analysis, Ciphers & Cipher Modes, DES, AES, RSA algorithm, Key Management Protocols, Diffie Hellmann Algorithm, Digital Signatures, Message Digest, Secure Hash Algorithms, Public Key Infrastructure.

UNIT II	**Information Theory**	**Total Topics- 10 and Hours**: **8 L**

Basic of Probability & Statistics, Shannon Characteristics, Perfect Secrecy, Confusion and Diffusion, Information Theoretic Tests, Unicity Distance, Entropy, Floating Frequency, Histogram, Autocorrelation, Periodicity, Random Analysis Tests, Zero Knowledge Technique.

UNIT- III	**Mathematical Security**	**Total Topics- 10 and Hours**: **8 L**

Basic Number Theory, Congruence, Chinese Remainder Theorem. Finite Fields, Discrete Logarithm, Bit Commitment, Random Number Generation, Inverses, Primes, Greatest Common Divisor, Euclidean Algorithm, Modular Arithmetic, Properties of Modular Arithmetic, Computing the inverse, Fermat's Theorem, Algorithm for Computing Inverses, NP-Complete Problems, Characteristics of NP- Complete Problems, Meaning of NP-Completeness, NP-Completeness and Cryptography.

UNIT-IV	**Network Security**	**Total Topics- 10 and Hours**: **8 L**

Network Threats, Authentication & Access Control Mechanism, Secured Communication Mechanisms, Biometric, Secured Design for LAN, Firewall, Intrusion Detection System, Virtual Private Network, Email and Web Security. WEP, Access Controls, Secure Socket Layer, IPSEC, WAP Security, Security Issues, Challenges &Defense Mechanisms for Bluetooth, GSM, CDMA, GPRS, Wi-Fi, Wi- Max & IEEE Standards.

- **CS-104 (1).CO1**: To understand the crypto system and concept of crypto analysis.

- CS-104(1).CO2: To implement the use of probability &statistics in Information Systems

- CS-104(1).CO3: To understand the number theory.

- CS-104(1).CO4: To be familiar with prevalent network and distributed system attacks, defences

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against them and forensics to investigate.

Reference Books:

1. Security in Computing, Charles P. Pfleeger, Prentice- Hall International, Inc.,

2. Applied Cryptography Protocols, Algorithms, and Source Code in C, Bruce Schneier,
John Wiley & Sons, Inc., 1995.

3. Digital Certificates Applied Internet Security", Jalal Feghhi, JalliFeghhi and PeterWilliams,
Addison Wesley Longman.

4. Introduction to Cryptography with Coding heory, Wade Trppe, Lawrence C., Washington, Pearson
Education.

5. Network Security, Compete Reference, Tata Mc-Graw Hill.
   Course Outcomes:

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Programme Name	**Pre-Ph.D. Course Work**	Programme Code	23-
Course Code	**CS-104 (2)**	Credit	3
Year/Sem	1/1	L-T-P	3-0-0
Course Name	**DIGITAL IMAGE PROCESSING**		

Objectives of the Course: After the completion of the course, the students will be able to-:
1. Enhance the quality of images using frequency and spatial domain techniques.
2. Represent image using chain codes, linear signature, shape number, Fourier, moments, regional, texture, relational descriptors.

UNIT 1	**Introduction and Fundamentals**	**Total Topics- 10 and Hours**: **8 L**

The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Components of an Image Processing Systems, Image Acquisition, Image Sampling and Quantization, Some basic relationships like Neighbours, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations.

UNIT II	**Image Enhancement in Spatial Domain & Frequency Domian**	**Total Topics- 10 and Hours**: **8 L**

Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Introduction to Fourier Transform and the frequency Domain, Properties of 2-D Fourier Transform, Smoothing and Sharpening Frequency Domain Filters,

UNIT- III	**Image Restoration & Compression**	**Total Topics- 10 and Hours**: **8 L**

A model of The Image Degradation / Restoration Process, Noise Models, Mean Filters, Order-Statistics Filters, Adaptive Filters, Bandreject Filters, Bandpass Filters, Notch Filters, Minimum Mean Square Error (Wiener) Filtering, geometric mean Filter, Inverse Filtering, Coding, Interpixel and Psychovisual Redundancy, Image Compression models, Elements of Information Theory, Error free compression, Lossy compression, Image compression standards.

UNIT-IV	**Image Segmentation & Object Recognition**	**Total Topics- 10 and Hours**: **8 L**

Detection of Discontinuities, Edge linking and boundary detection, Thresholding, Region Oriented Segmentation. Patterns and Pattern Classes, Minimum Distance Classifier, matching by Correlation, Bayes Classifier

Course Outcomes:
- CS-104(2):CO1: To understand the origins of Digital Image Processing

- CS-104(2):CO2: To understand and implement the Image Enhancement in Spatial Domain & Frequency Domain

- CS-104(2):CO3: To understand and implement Image Restoration & Compression

- CS-104(2):CO4: To understand and implement Image Segmentation & Object Recognition

Reference Books :

1. Rafael C. Gonzalez & Richard E. Woods, "Digital Image Processing", 2nd edition, Pearson Education, 2004
2. A.K. Jain, "Fundamental of Digital Image Processing", PHI, 2003
3. RosefieldKak, "Digital Picture Processing". 199

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Programme Name	**Pre-Ph.D. Course Work**	Programme Code	23-
Course Code	**CS-104 (3)**	Credit	3
Year/Sem	1/1	L-T-P	3-0-0
Course Name	**NEURAL NETWORK**		

Objectives of the Course: After the completion of the course, the students will be able to-:

1. Grasp the neural networks for pattern classification and association.

2. Acquire the basic concepts of competition-based neural nets.

UNIT 1	**Neuron Model and Network Architectures**	**Total Topics- 10 and Hours**: **8 L**

Objectives, History, Applications, biological inspiration, Neuron Model, Transfer Functions, Network Architectures.

UNIT II	**Learning Rules**	**Total Topics- 10 and Hours**: **8 L**

Perception Learning: Learning Rules, Perceptron Architecture, Perceptron Learning Rule, Training Multiple Neuron Perceptrons. Unsupervised Learning. Supervised Hebbian Learning: The Hebb Rule, Performance Analysis, Application, Variations of Hebbian Learning.

UNIT- III	**Transformations & Optimization**	**Total Topics- 10 and Hours**: **8 L**

Linear Vector Spaces, Spanning a Space, Inner Product, Norm, Orthogonality, Vector Expansions, Linear Transformations, Matrix Representations, Change of Basis, Eigenvalue and Eigenvectors. Performance surfaces and Optimization: Taylor Series, Directional Derivatives, Necessary Condition for Optimality, Quadratic Functions, Optimization Techniques; Steepest Descent, Newton's method, Conjugate Gradient Method.

UNIT-IV	**Back propagation & Competitive Networks**	**Total Topics- 10 and Hours**: **8 L**

The Backpropagation Algorithm; Performance Index, Chain Rule, Example, Drawbacks of Backpropagation, Heuristic Modifications; Momentum, Conjugate Gradient, Levenberg-Marquardt Algorithm. Associative Learning and Competitive Networks: Simple Associative Network, Unsupervised Hebb Rule, Kohonen Rule, Competitive Learning Rule, Self Organizing Feature Maps.

Course Outcomes:

- CS-104(3):CO1:To understand and implement the Neuron Model and Network Architectures
- CS-104(3):CO2:To understand and implement the Learning Rules
- CS-104(3):CO3:To understand and implement the Transformations & Optimization
- CS-104(3):CO4:To design and implement the Back propagation & Competitive Networks

Reference Books

1. M.T.Hagan, H.B.Demuth and M.Beale, "Neural Network Design" Thomson Learning, 2002
2. Simon Haykin, "Neural Networks – A Comprehensive Foundation," 2nd Edition, Pearson Education, 1999.

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Programme Name	**Pre-Ph.D. Course Work**	Programme Code	23-
Course Code	**CSE-104 (4)**	Credit	3
Year/Sem	1/1	L-T-P	3-0-0
Course Name	**ADVANCE TOPICS IN DATABASE SYSTEMS**		

Objectives of the Course: After the completion of the course, the students will be able to-:

1. To provide students with knowledge of database transaction processing, concurrency control and recovery from database failure.

2. To expose students to advance topics and techniques those have promising research directions.

UNIT 1	Indexing	Total Topics- 10 and Hours: 8 L

Types of Single-Level Ordered Indexes, Multilevel Indexes, Dynamic Multilevel Indexes Using B-trees and B+-trees

UNIT II	Concurrency control	Total Topics- 10 and Hours: 8 L

Locking Techniques for Concurrency Control, Concurrency Control Techniques Based on Timestamp Ordering

UNIT- III	Transactions Processing	Total Topics- 10 and Hours: 8 L

Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Schedules and Recoverability, Serializability of Schedules.

UNIT-IV	Parallel & Distributed databases	Total Topics- 10 and Hours: 8 L

I/O parallelism, inter query parallelism, intra-query parallelism, interoperation parallelism, Design of parallel systems, Distributed data storage, Network transparency, Distributed query processing, Distributed transaction model, commit protocols, coordinator selection, concurrency control, deadlock handling.

Reference Books:

1. Database System Concepts by A. Silberschatz, H.F.Korth and S.Sudarshan, 3rd edition, 1997, McGraw-Hill and International Edition.
2. Fundamentals of Database Systems by R.Elmasri and S.B.Navathe, 3rd edition.
3. An Introduction to Database Systems by C.J.Date, 7th edition, Addison-Wesley, Low Priced Edition, 2000
4. Database Management and Design by G.W Hansen, 2nd edition, 1999, Prentice- Hall of India,

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Eastern Economy Edition.

5. Database Management Systems by A,.K.Majumdar and P.Bhattacharyya.5th edition, 1999, Tata McGraw-Hill Publishing.

Course Outcomes:

- CSE-104(4):CO1: To provide the students with knowledge of advanced databases for transaction processing, concurrency control and recovery.

- CSE-104(4):CO2: To expose students to advance topics and techniques those have promising research directions in area of advanced database systems.

- CSE-104(4):CO3: To understand and implement the Concurrency control in database.

- CSE-104(4):CO4:To understand and implement the Transactions Processing in Parallel & Distributed databases