DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCHOOL OF STUDIES (ENGINEERING AND TECHNOLOGY)

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G) EVALUATION SCHEME FOR Pre- Ph.D. COURSE WORK

Effective From Session 2023-24

S.No.	Code No.	Subject	Periods			ESE Duration	ESE Marks		Credits
			L	T	P		Max	Min	
1	CSE7100	Research Methodology in Engineering	3	1	0	3 Hrs	100	50	4
2	CSE71XX	Elective-I	3	1	0	3 Hrs	100	50	4
3	CSE71XX	Elective-II	3	1	0	3 Hrs	100	50	4
4	CSE7101	Seminar	-	-	-	-	Qualified/Not Qualified		0
	Total		**9**	**3**	**0**		**300**	**150***	**12**

List Of Electives

1	CSE7102	Network Security
2	CSE7103	Simulation and Modeling
3	CSE7104	Computer Vision
4.	CSE7105	Machine Learning

Duration of Semester will be 6 months

- Candidate has to score minimum 60% of the aggregate marks to qualify in ESE.
- Two core subjects as Electives (4 Credits each) to be decided by the DRC.

ESE: End Semester Examination L: Lecture T: Theory P: Practical

Max: Maximum marks in ESE;

Min: Minimum pass Marks in each subject as 50%

RESEARCH METHODOLOGY IN ENGINEERING

Course Objective

1: Understand the theoretical foundations of research methodology.
2: Gain proficiency in research design and methodology selection.
3: Develop practical skills in data collection and analysis.
4: Enhance critical thinking and problem-solving skills in the research process.
5: Communicate research findings effectively.

Unit 1: PHILOSOPHY AND ETHICS

Introduction to philosophy: nature and scope, concept, branches. Ethics: Definition, moral philosophy, nature of moral judgments and reactions.

Ethics with respect to science and research. Intellectual honesty and research integrity. Scientific misconducts: Falsification, Fabrication, and Plagiarism (FFP).Redundant publication duplicate and overlapping publications, salami slicing. Selective reporting and misrepresentation of data.

Unit 2: ERRORS IN MEASUREMENTS

Types of Errors, Mean Deviation, Standard Deviation and Probable Errors, Propagation of Errors with Summation, Difference, Product and Quotient.

Curve fitting, Method of least square fit, least square fit (straight line) to linear equations and equation reducible to linear equations. Least square fit (parabola) to quadratic equations and equations reducible to quadratic equations.

Unit 3: DATA PROCESSING & ANALYSIS

Literature Survey, Defining the equation and formulating hypothesis/hypotheses. Collection of research data, tabulating and cataloging, Sampling and methods of data analysis. Laboratory Safety Measures, Maintenance of equipment's and proper storage and disposal of materials

Unit 4: SCIENTIFIC PRESENTATION AND WRITING SKILLS

Survey of literature and presentation of data, one seminar paper-preparation in PowerPoint (which include texts, graphs, pictures, tables, references etc.)-Oral in PowerPoint/poster, development of communication skills in presentation of scientific seminars- eye to eye contact, facing the audience, question & answer sessions etc.

Steps to better writing, flow method, organization of material and style, drawing figures, graphs, tables, footnotes, references etc in research paper.

Unit 5: PUBLICATION ETHICS.

1. Publication ethics: definition, introduction and importance.2. Best practice/standards setting initiatives and guidelines: COPE, WAME, etc. 3. Conflicts of interests 4. Publications misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types 5.

Violation of publication ethics, authorship and contributorship ship 6. Identification of publication misconduct complaints and appeals 7. Predatory publishers and journals.

Course Outcomes:

After the successful completion of the course, the students will be able to:

1. Understand the concept of simulation, types of simulation models and discrete event simulation. Develop solutions for application problems using manual simulation and Time Advance algorithm on discrete event simulation.
2. Understand the concepts of Statistical models and queuing models.
3. Apply acceptance rejection technique and inverse transform technique to generate Random Variates and Random numbers using LCM.
4. Understand the useful model of input data, absolute performance and estimation with respect to output analysis.
5. Understand the model building, verification, calibration, validation of models and optimization.

References:

1. D B Resnik, The Ethics of Science: An Introduction, Routledge Publisher, USA (1998).
2. Callahand D & Bok S. Ethics Teaching in Higher Education, Plenum Press, New York, USA (1996).
3. 3. Kanpur J N. Ethical values for excellence in Education and Science, Vishwa Prakashan, New Delhi (1996).5.
4. A. N Tripathi Human Valves. New A pc International Publication, New Delhi (2008).
5. A Wilson: Handbook of Science Communication, Institute of Physics publishing, Bristol Philadelphia (1998).
6. Science Communication: Theory and practice; Stocklmayer, Gore MM, Bryant C (Eds), Springer (2002).
7. Laszios P.. Communicating Science: A Practical Guide, Springer (2006).
8. C R Kothari. Research Methodology: Methods and Technology, 2nd revised edition, New Age International Publication 2004.
9. K. N. Krishnaswamy,A | Sivakumar, M Mathiranjan, Management ResearchMethodology: Integration Principles, Methods and Techniques, Pearson Education, New Delhi 2006.
10. C K Sharma, M K Jain; Research Methodology, Shree Publications, New Delhi.

NETWORK SECURITY

COURSE OBJECTIVE:

The course is designed to train the post graduates in:

1. In depth understanding of network security.
2. In depth understanding of the Cryptographic Techniques.
3. To apply cryptographic techniques in computer systems.
4. To design new or modify existing cryptographic techniques.

To work in research institutions / Industry in the field of Security

UNIT - 1 : INTRODUCTION

OSI Security Architecture - Classical Encryption techniques- Cipher Principles – Data Encryption Standard Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES - AES Cipher - Triple DES - Placement of Encryption Function – Traffic Confidentiality

UNIT - 2: PUBLIC KEY CRYPTOGRAPHY

Key Management Dime Hellman key Exchange Elliptic Curve Architecture and Cryptography Public. Key Cryptography and RSA kes management, Distribution of public keys, public-key distribution of Secret keys, Diffie- Hellman key Exchange.

UNIT - 3: AUTHENTICATION AND HASH FUNCTION

Authentication requirements - Authentication functions - Message Authentication Codes - Hash Functions Security of Hash Functions and MACs – MD5 message Digest algorithm - Secure Hash Algorithm RIPEMD - HMAC Digital Signatures - Authentication Protocols -Digital Signature Standard

UNIT-4 -NETWORK SECURITY

Authentication Applications: Kerberos X.509 Authentication Service - Electronic Mail Security - PGP S/MIME - IP Security - web Security.

UNIT -5: SYSTEM LEVEL SECURITY

Intrusion detection - password management - Viruses and related Threats - Virus Counter measures Firewall Design Principles - Trusted Systems.

COURSE OUTCOMES: Students after completing the course shall gain:

1. Ability to understand concepts of network security and cryptographic techniques.
2. Ability to design and analyze cryp tographic techniques.
3. Apply different digital signature algorithms to achieve authentication and create secure applications
4. Ability to solve network security issues in real time applications.
5. Ability to take up doctoral level research work in security.

TEXT BOOKS

1. William Stallings, "Cryptography and Network Security -Principles and Practices".Prentice Hall of India, Third Edition, 2003.

REFERENCES

1. Atul Kahate, "Cryptography and Network Security'. Tata McGraw-Hill, 2003.

2. Bruce Schneier, "Applied Cryptography"*. John Wiley & Sons Inc, 2001

3. Charles B. Pfleeger, Shari Lawrence Pfleeger,"Security in Computing". Third Edition Pearson Education, 2003.

SIMULATIONS & MODELING

Course Objective:

1. Define the basics of simulation modeling and replicating the practical situations in organizations
2. Generate random numbers and random variates using different techniques.
3. Develop simulation model using heuristic methods.
4. Analysis of Simulation models using input analyzer, and output analyzer.
5. Explain Verification and Validation of simulation model.

UNIT- 1

Introduction to Simulation: Discrete and Continuous Systems, Model of a System, Types of Models, Discrete-Event System Simulation, Steps in a Simulation Study.

System Studies: Subsystems. A Corporate Model. Environment Segment, Production Segment, Management Segment, The Full Corporate Model, Types of System Study, System Analysis, System Desigo, System Postulation,

UNIT- 2

System Simulation: The Technique of Simulation, The Monte Carlo Method, Comparison of Simulation and Analytical Methods, Experimental Nature of Simulation, Types of System Simulation, Numerical Computation Technique for Continuous Models, Distributed Lag Models, Cobweb Models.

System Dynamics: Exponential Growth Models, Exponential Decay Models, Modified Exponential Growth Models, Logistic Curves, System Dynamics Diagrams, Simple System Dynamics Diagrams, Multi-Segment Models, Representation of Time Delays.

UNIT-3

Probability Concepts in Simulation: Stochastic Variables, Discrete Probability Functions, Continuous Probability Functions, Measures of Probability Functions, Numerical Evaluation of Continuous Probability Functions, Continuous Uniformly Distributed Random Numbers, Computer Generation of Random Numbers, A Uniform Random Number Generator, Generating Discrete Distributions, Non-Uniform Continuously Distributed Random Numbers, The Rejection Method.

UNIT-4

Arrival Patterns and Service Times: Congestion in Systems, Arrival Patterns, Poisson Arrival Patterns, The Exponential Distribution, The Coefficient of Variation. The Erlang Distribution, The Hyper-Exponential Distribution, Service Times, The Normal Distribution, Queuing Disciplines, Queuing notation, Measures of Queues, Mathematical Solutions of Queuing Problems.

UNIT- 5

Discrete System Simulation: Discrete Events, Representation of Time, Generation of Arrival Patterns, Simulation of a Telephone System. Delayed Calls, Simulation Programming Tasks, Gathering Statistics, Counters and Summary Statistics, Measuring

Course Outcomes:

After the successful completion of the course, the students will be able to:

1. Understand the concept of simulation, types of simulation models and discrete event simulation. Develop solutions for application problems using manual simulation and Time Advance algorithm on discrete event simulation.
2. Understand the concepts of Statistical models and queuing models.
3. Apply acceptance rejection technique and inverse transform technique to generate Random Variates and Random numbers using LCM.
4. Understand the useful model of input data, absolute performance and estimation with respect to output analysis.
5. Understand the model building, verification, calibration, validation of models and optimization.

COMPUTER VISION

Course Objectives:

1. To provide a solid foundation in digital image processing techniques and equip learners with the necessary tools to analyze, transform, enhance, and restore digital images for various applications in fields such as computer vision, medical imaging, remote sensing, and more
2. The learners can gain a deeper understanding of advanced image processing techniques, including edge detection, feature extraction, and multi-scale analysis. These techniques are fundamental for various computer vision applications, such as object recognition, image understanding, and scene analysis
3. The learners can gain knowledge and skills in image segmentation and object detection
4. The learners can gain a deeper understanding of various machine learning and data analysis techniques
5. learners can gain a deeper understanding of methods for 3D vision, including techniques for 3D reconstruction, shape estimation, surface representation, object recognition, and motion analysis

UNIT-1

Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, etc.; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

UNIT- II

Edges. Canny, LOG, DOG; Line detectors (Hough Transform), Corners, Harris and Hessian Affine. Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale, Space Analysis, Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.

UNIT -III

Region Growing, Edge Based approaches to segmentation, Graph ,Cut, Mean, Shift, Texture Segmentation; Object detection.

UNIT- IV

Clustering: K,Means, K,Medoids, Mixture of Gaussians, Classification: Discriminate Function, Supervised, Un, supervised, Semi,supervised; Classifiers: Bayes, KNN, ANN models;

Dimensionality Reduction: PCA, LDA, ICA; Non, parametric methods.

UNIT- V

Methods for 3D vision - projection schemes, shape from shading, photometric stereo ,shape from texture, shape from focus, active range finding, surface representations, point, based representation, volumetric representations, 3D object recognition, 3D reconstruction introduction to motion, triangulation, bundle adjustment , translational alignment, parametric motion - spline, based motion optical flow, layered motion.

Course Outcomes:

After completing the course you will be able to:

1. Provide you with a strong foundation in image processing principles, algorithms, and techniques
2. Recognize fundamental ideas, terms, theories, models, and procedures in the field of computer vision after finishing the course.
3. Gain knowledge and skills in object detection, allowing them to identify and locate objects within images accurately
4. Explain fundamental techniques for computer vision, such as multi-scale representation, edge detection and the detection of other primitives, stereo, motion, and object recognition; propose a design for a computer vision system that addresses a particular issue.
5. How to evaluate and analyze the performance of computer vision algorithms.

REFERENCES:

1. Richard Szeliski, Computer Vision: Algorithms and Application, Springer, Verlag London Limited 2011.

2. Computer Vision: A Modern Approach, D.A. Forsyth, J. Ponce, Pearson education, 2003.

3. Richard Hartley and Andrew Zisserman, Multiple View Geometry in Computer Vision, Second Edition, Cambridge University Press, March 2004.

4. R.C. Gonzalez and R.E. Woods, Digital Image Processing. Addison, Wesley, 1992.

Machine Learning

Course Objective:

1. Understanding the basic foundations and fundamental concepts, theories and techniques that form the basis of machine learning. This includes Supervised learning, Unsupervised learning, reinforcement learning.
2. To develop practical skills in applying machine learning algorithms and techniques to real world

UNIT - I

Introduction - Well-posed learning problems, Designing a learning system, Perspectives and issues in machine learning Concept learning and the general to specific ordering–Introduction, A concept learning task, Concept learning as search, Find-S: finding a maximally specific hypothesis, Version spaces and the candidate elimination algorithm, Remarks on version spaces and candidate elimination, Inductive bias.

UNIT - II

Decision Tree learning – Introduction, Decision tree representation, Appropriate problems for decision tree learning, The basic decision tree learning algorithm, Hypothesis space search in decision tree learning, Inductive bias in decision tree learning, Issues in decision tree learning **Artificial Neural Networks** – Introduction, Neural network representation, Appropriate problems for neural network learning, Perceptions, Multilayer networks and the back propagation algorithm, Remarks on the back propagation algorithm, An illustrative example face recognition Advanced topics in artificial neural networks.

Evaluation Hypotheses – Motivation, Estimation hypothesis accuracy, Basics of sampling theory, A general approach for deriving confidence intervals, Difference in error of two hypotheses, Comparing learning algorithms

UNIT - III

Bayesian learning – Introduction, Bayes theorem, Bayes theorem and concept learning, Maximum likelihood and least squared error hypotheses, Maximum likelihood hypotheses for predicting probabilities, Minimum description length principle, Bayes optimal classifier, Gibs algorithm, Naïve Bayes classifier, An example learning to classify text, Bayesian belief networks The EM algorithm **Computational learning theory** – Introduction, Probability learning an approximately correct hypothesis, Sample complexity for Finite Hypothesis Space, Sample Complexity for infinite Hypothesis Spaces, The mistake bound model of learning - **Instance-Based Learning**- Introduction, k -Nearest Neighbour Learning, Locally Weighted Regression, Radial Basis Functions, Case-Based Reasoning, Remarks on Lazy and Eager Learning

Genetic Algorithms – Motivation, Genetic Algorithms, An illustrative Example, Hypothesis Space Search, Genetic Programming, Models of Evolution and Learning, Parallelizing Genetic Algorithms

UNIT - IV

Learning Sets of Rules – Introduction, Sequential Covering Algorithms, Learning Rule Sets: Summary, Learning First Order Rules, Learning Sets of First Order Rules :FOIL, Induction as Inverted Deduction, Inverting Resolution

Analytical Learning- Introduction ,Learning with Perfect Domain Theories: Prolog-EBG Remarks on Explanation-Based Learning, Explanation-Based Learning of Search Control Knowledge.

UNIT - V

Combining Inductive and Analytical Learning – Motivation, Inductive-Analytical Approaches to Learning, Using Prior Knowledge to Initialize the Hypothesis, Using Prior Knowledge to Alter the Search Objective, Using Prior Knowledge to Augment Search Operators,

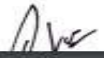
Reinforcement Learning – Introduction, The Learning Task, Q Learning, Non-Deterministic, Rewards and Actions, Temporal Difference Learning, Generalizing from Examples, Relationship to Dynamic Programming

TEXT BOOKS:

1. Machine Learning – Tom M. Mitchell, - MGH
2. Machine Learning: An Algorithmic Perspective, Stephen Marsland, Taylor & Francis(CRC)

REFERENCE BOOKS:

1. Machine Learning Methods in the Environmental Sciences, Neural Networks, William W Hsieh, Cambridge Univ Press.
2. Richard o. Duda, Peter E. Hart and David G. Stork, pattern classification, John Wiley & Sons Inc., 2001
3. Chris Bishop, Neural Networks for Pattern Recognition, Oxford University Press, 1995.
4. Machine Learning by Peter Flach ,Cambridge.



Course Outcome:

1. Students should understand the fundamental concepts and techniques used in machine learning. This includes knowledge oof basic algorithms, optimization techniques and model evaluation methods.
2. Ability to implement machine learning algorithms.
3. Student will be exposed to a variety of machine learning algorithms, such as Linear Regression, Logistic Regression, Decision Trees, Random Forest, Support Vector Machine, Naïve Bayes, Clustering Algorithms and Neural Networks.
4. Students will gain Hands-On experience with real world datasets.
5. Students will learn to evaluate and validate machine learning models effectively.