Guru Nanak Dev Engineering College, Ludhiana

Department of Computer Science & Engineering

Scheme and Syllabus

B. Tech. Computer Science & Engineering (2018 Batch Onwards)

Sixth Semester

S. No.	Course Category	Course Code	Course Title	Theory/ Practical	Hours per week			Internal Marks	External Marks	Total Marks	Credits
					L	T	P				
1.	Professional Core Courses	PCCS-112	Compiler Design	Theory	3	1	0	40	60	100	4
2.	Professional Core Courses	PCCS-113	Computer Graphics	Theory	3	1	0	40	60	100	4
3.	Professional Core Courses	PCCS-114	Machine Learning	Theory	3	0	0	40	60	100	3
4.	Professional Core Courses	PCCS-115	Cyber Security	Theory	3	0	0	40	60	100	3
5.	Professional Elective Courses	PECS-XXX	Elective-II	Theory	3	0	0	40	60	100	3
6.	Open Elective Courses	OECS-XXX	Open Elective-I	Theory	3	0	0	40	60	100	3
7.	Professional Core Courses	LPCCS-109	Computer Graphics Laboratory	Practical	0	0	2	30	20	50	1
8.	Professional Core Courses	LPCCS-110	Machine Learning Laboratory	Practical	0	0	2	30	20	50	1
9.	Professional Elective Courses	PECS-XXX	Elective-II Laboratory	Practical	0	0	2	30	20	50	1
10.	Project	PRCS-102	Minor Project	Practical	0	0	2	60	40	100	1
11.	Mentoring#	MPD-103	Mentoring and Professional Development	Practical	0	0	1	100	-	100	1
Total					**18**	**2**	**8+1#**	**490**	**460**	**950**	**25**

#There will be one period per week for Mentoring and Professional Development; final evaluation of this course will be done based on the combined assessment of odd and even semester of respective year of study.

Scheme and syllabus of B.Tech. (2018 batch onwards)

Subject Code: PCCS-112

Subject Name: Compiler Design

Programme: B.Tech. (CSE)	**L:** 3 **T:** 1 **P:** 0
Semester: 6	**Teaching Hours:** 38
Theory/Practical: Theory	**Credits:** 4
Internal Marks: 40	**Percentage of Numerical/Design/Programming Problems:** 40%
External Marks: 60	**Duration of End Semester Exam (ESE):** 3 hours
Total Marks: 100	**Course Status:** Compulsory

Prerequisites: Knowledge of problem solving using different algorithms and basic programming.

Additional Material Allowed in ESE: [NIL]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Apply knowledge of system programming and mathematics to solve problems related to language translation.
2.	Identify, formulate and solve engineering problems in the area of language translation and compiler design.
3.	Formulate machine code by considering the system design components and functionalities involved in compilation.
4.	Inspect runtime structure used to represent constructs of programming language during compilation process.
5.	Use of compiler phases to develop an understanding of their use in building tools used for engineering practice.
6.	Developing an awareness of the functionality and complexity of modern compilers to engage in independent and life-long learning in the broadest context of technological change.

Detailed Contents:

Part A

Introduction to Compiler: Language Processors, The Structure of a Compiler, The Grouping of Phases into Passes, Applications of Compiler Technology, Programming Language Basics. **[3 Hours]**

Lexical Analysis: Role of lexical analyzer, Tokens, Patterns, and Lexemes, Attributes for Tokens, Lexical Errors, Input Buffering, Sentinels, Specification of Tokens, Recognition of Tokens, The Lexical-Analyzer Generator Lex, Finite Automata. **[5 Hours]**

Syntax Analysis: Introduction, Role of the parser, Context-Free Grammars (CFG), Writing a Grammar, Writing a Grammar, Top down parsing –Backtracking, LL(1), Recursive descent parsing, Non-recursive

Predictive Parsing. Bottom-up parsing – Shift reduce parsing, LR parsers, SLR parser. Canonical LR parser, LALR parser, Introduction to The Parser Generator Yacc. **[6 Hours]**

Syntax-Directed Translation: Syntax-Directed Definitions, Evaluation Orders for SDD's, Applications of Syntax-Directed Translation, Syntax-Directed Translation Schemes, Implementing L-Attributed SDD's. **[6 Hours]**

Part-B

Intermediate Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Translation of Expressions, Type Checking, Control Flow, Backpatching, Switch-Statements, Intermediate Code for Procedures. **[6 Hours]**

Code Generation: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code , Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator, Peephole Optimization , Register Allocation and Assignment. **[6 Hours]**

Machine-Independent Optimizations: The Principal Sources of Optimization, Introduction to Data-Flow Analysis, Foundations of Data-Flow Analysis, Constant Propagation, Partial-Redundancy Elimination, Loops in Flow Graphs. **[6 Hours]**

Text Books:

1. Alfred V. Aho, Monica S. Lam, Ravi Seth, Jeffrey D. Ullman, "Compilers, Principles, Techniques, & Tools", Second Edition, Pearson.

Reference Books:

1. Alfred Aho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools, Pearson Education Asia, 2003.
2. C. Fischer and R. LeBlanc., "Crafting a Compiler", Benjamin Cummings, 1991.
3. S. Chattopadhyay, "Compiler Design", PHI, 2011.
4. C. Holub., "Compiler Design in C", Prentice-Hall Inc., 1993.
5. Appel., "Modern Compiler Implementation in C: Basic Design", Cambridge Press,2004.

E-Books and online learning material:

1. https://nptel.ac.in/courses/106/104/106104123/
2. http://index-of.es/Varios-2/Compilers.pdf
3. http://hjemmesider.diku.dk/~torbenm/Basics/basics_lulu2.pdf

Online Courses and Video Lectures:

1. https://nptel.ac.in/courses/106/108/106108113/
2. https://nptel.ac.in/courses/106/104/106104072/
3. https://www.youtube.com/playlist?list=PLrjkTql3jnm-wW5XdvumCa1u9LjczipjA
4. https://www.youtube.com/watch?v=h1LSoF_kUzc
5. https://freevideolectures.com/course/3051/compiler-design

Subject Code: PCCS-113

Subject Name: Computer Graphics

Programme: B.Tech. (CSE)	**L:** 3 **T:** 1 **P:** 0
Semester: 6	**Teaching Hours:** 36
Theory/Practical: Theory	**Credits:** 4
Internal Marks: 40	**Percentage of Numerical/Design/Programming Problems:** 25%
External Marks: 60	**Duration of End Semester Exam (ESE):** 3hrs
Total Marks: 100	**Elective Status:** Compulsory

Prerequisites: NIL

Additional Material Allowed in ESE: [Scientific Calculator]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1.	Apply the concepts of mathematical foundations and programming to solve diverse problems related to computer graphics.
2.	Compare and contrast various computer graphic algorithms and their suitability to real world problems.
3.	Utilize models for transformation of 2D and 3D objects.
4.	Identify the areas of computer graphics to apply advance algorithmic techniques for changing the formations of geometrical objects.
5.	Apply mathematics and physics in the design and development of graphics applications.
6.	Justify the application of computer graphics concepts in the development of computer games, information visualization, and business applications.

Detailed Contents:

Part A

Introduction: Overview of computer graphics, Computer graphics applications, Different I/O devices with specialized graphics features, Elements of graphics. Graphic systems – Video display devices, Raster scan systems, Random scan systems. Video basics – Video controller, Raster-scan display processor. **[6 Hours]**

2D Primitives: Scan conversion basics, Algorithm for scan converting a point, Scan converting a line – Digital differential analyser algorithm, Bresenham's line algorithm. Scan converting circle – Bresenham's circle drawing algorithm, Midpoint circle drawing algorithm. Scan converting ellipse– Midpoint ellipse algorithm. Filling Techniques – Scan line polygon fill algorithm, Boundary-fill, Flood-fill. Anti-aliasing. **[6 Hours]**

2-D Transformations: Geometric and coordinate transformations. Geometric transformations – Scaling, Rotation, Translation, Reflection, Shear. Matrix representations, Homogeneous coordinates, Composite

transformations. **[6 Hours]**

Part B

2D Viewing and Clipping: The viewing pipeline, Window-to-viewport transformation, Point clipping, Line clipping algorithms – Cohen-Sutherland, Liang-Barsky, Nicholl-Lee-Nicholl. Polygon clipping algorithms –Sutherland-Hodgeman, Weiler-Atherton. Curve and text clipping. **[5 Hours]**

3D Transformations and Viewing: 3D geometric transformations – Scaling, Rotation, Translation, Reflection, Shear. Composite transformations, 3D viewing, Viewing pipeline, Parallel projections, perspective projections, classifications of projections. **[5 Hours]**

Visible-Surface Detection: Classification of visible-surface detection algorithms. Techniques for efficient visible-surface algorithms–Back face detection, Depth-buffer method, A-buffer method, Scan-line method, Depth sorting method, BSP tree Method, Area-subdivision method, Octree Methods, Ray-casting method. **[4 Hours]**

Surface Rendering: Light sources, Surface lighting effects, Illumination models, Polygon rendering methods – Constant-intensity shading, Gouraud shading, Phong shading, Fast Phong shading. **[4 Hours]**

Text Books:

1. D. Hearn and M.P. Baker, "Computer Graphics", Second Edition, PHI/Pearson Education.
2. Zhigang Xiang, Roy Plastock, "Theory and Problems of Computer Graphics", Second Edition, Tata McGraw-Hill.
3. C. Foley, Van Dam, Feiner and Hughes, "Computer Graphics Principles & Practice", Second Edition, Pearson Education.
4. Amarendra N. Sinha, Arun D. Udai, "Computer Graphics", First Edition, Tata McGraw-Hill.
5. N. Krishnamurthy, "Introduction to Computer Graphics", First Edition, Tata McGraw-Hill.

Reference Books

1. Malay K. Pakhira, "Computer Graphics, Multimedia and Animation", Second Edition, PHI.
2. Rogers, Adams, "Mathematics Elements for Computer Graphics", Second Edition, Tata Mc-Graw Hill.

E-Books and online learning material

1. Notes for a Computer Graphics Programming Course by Steve Cunningham
   https://www.cs.csustan.edu/~rsc/NSF/Notes.pdf
2. https://www.tutorialspoint.com/computer_graphics/index.htm
3. https://www.javatpoint.com/computer-graphics-tutorial
4. https://www.geeksforgeeks.org/computer-graphics-2/
5. http://www.svecw.edu.in/Docs%5CCSECGLNotes2013.

Online Courses and Video Lectures

1. https://www.youtube.com/watch?v=fwzYuhduME4 Accessed on Feb 02, 2021
2. https://www.coursera.org/learn/interactive-computer-graphics Accessed on Feb 02, 2021

3. https://www.tutorialspoint.com/computer_graphics Accessed on Feb 02, 2021
4. https://nptel.ac.in/courses/106/106/106106090 Accessed on Feb 02, 2021

Scheme and syllabus of B.Tech. (2018 batch onwards)

Subject Code: PCCS-114

Subject Name: Machine Learning

Programme: B.Tech. (CSE)	**L:**3 **T:**0 **P:**0
Semester: 6	**Teaching Hours:** 36
Theory/Practical: Theory	**Credits:** 03
Internal Marks:40	**Percentage of Numerical/Design/Programming Problems:** 30%
External Marks:60	**Duration of End Semester Exam(ESE):** 3 Hours
Total Marks:100	**Course Status:** Compulsory

Prerequisites: Data Mining Techniques

On Completion of the course the student should be able to:

CO#	COURSE OUTCOMES
1.	Implement probability concepts in learning problems with hypothesis and version spaces.
2.	Illustrate the features and algorithms of machine learning with real world problems.
3.	Characterize the machine learning algorithms as supervised learning and unsupervised learning and apply and analyze the various algorithms of supervised and unsupervised learning.
4.	Analyze the concept of neural networks for learning linear and non-linear activation functions.
5.	Apply the concepts of Bayesian analysis from probability models and methods.
6.	Explain and design genetic algorithms for engineering problems with their analysis using evaluation measures.

Detailed Contents

Part A

Introduction: Well defined learning problems, defining a learning system, perspectives and issues in machine learning, the concept learning task, concept learning as search, Find-S: finding a maximally specific hypothesis, version spaces and the candidate elimination algorithm, Inductive bias, probability theory. **[4 Hours]**

Supervised Learning: Basic methods: Distance based methods, Nearest- Neighbors, Decision Trees, Naive Bayes, and Linear models: Linear regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Nonlinearity and kernel Methods. **[5 Hours]**

Unsupervised Learning: Clustering: k-means/ kernel k-means, Dimensionality Reduction: PCA and

kernel PCA, Matrix Factorization and Matrix Completion, Generative models (mixture models and latent factor models). **[5 Hours]**

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, Ensemble methods- Bagging, Gradient Boosting, Random Forest. **[5 Hours]**

Part B

Artificial Neural Networks: Introduction, Neural network representation, appropriate problems for neural network learning, perceptron, gradient descent and the delta rule, Adaline, Multilayer networks, Derivation of Back propagation rule, back propagation algorithm, Initialization, Training & Validation. **[5 Hours]**

Bayesian Learning: Introduction, Bayes theorem and concept learning, Maximum likelihood and least squared error hypothesis for predicting probabilities, minimum description length principle, Bayes optimal classifier, Naive Bayes classifier, Bayesian belief networks. **[6 Hours]**

Genetic Algorithms: Motivation, Genetic algorithms, an illustrative example, hypothesis space search, genetic programming, models of evolution and learning. **[3 Hours]**

Design and Analysis of Algorithms: Study of factors and responses related with experimentation, Hypothesis testing, performance analysis, Evaluation measures-bootstrapping & cross-validation, ROC curve. **[3 Hours]**

Textbooks:

1. Tom M. Mitchell, Machine Learning, McGraw Hill, First Edition.
2. Ethern Alpaydin, Introduction to Machine Learning, MIT Press, 3rd Edition.
3. Aditya Dwivedi, Machine Learning Textbook, Kindle Edition, Dec 2019.

Reference Books:

1. Chris Bishop, Pattern Recognition and Machine Learning, Springer.
2. Kevin Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2nd Edition

E-Books and Online Learning Material

1. Introduction to Machine Learning by Nils J. Nilsson
https://ai.stanford.edu/~nilsson/MLBOOK.pdf
2. Lecture Notes on Machine Learning by Sebastian Raschka
https://sebastianraschka.com/pdf/lecture-notes/stat479fs18/01_ml-overview_notes.pdf
3. https://www.tutorialspoint.com/machine_learning/machine_learning_tutorial.pdf

Online Courses and Video Lectures:

1. https://nptel.ac.in/courses/106106139/ Accessed on February 17, 2021
2. https://nptel.ac.in/courses/106106213/ Accessed on February 17, 2021
3. https://www.coursera.org/lecture/machine-learning/welcome-to-machine-learning-zcAuT

Accessed on February 17, 2021

4. https://www.udacity.com/course/intro-to-machine-learning-with-tensorflow-nanodegree--nd230

Accessed on February 17, 2021

5. https://www.cs.ox.ac.uk/people/nando.defreitas/machinelearning/

Accessed on February 17, 2021

Scheme and syllabus of B.Tech. (2018 batch onwards)

Subject Code: PCCS-115

Subject Name: Cyber Security

Programme: B.Tech. CSE	**L:** 3 **T:** 0 **P:**0
Semester: 6	**Teaching Hours:** 36
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 40	**Percentage of Numerical/Design/Programming Problems:** 0%
External Marks: 60	**Duration of End Semester Exam(ESE):** 3hrs
Total Marks: 100	**Elective Status:** Compulsory

Prerequisites: NIL
Additional Material Allowed in ESE: NIL
On completion of the course, the student will have the ability to:

CO#	Course Outcomes (CO)
1	Analyze and illustrate the security policies, as well as protocols to implement security features.
2	Analyze the network and system attacks, defences against them.
3	Incorporate the approaches for risk management and needful practices.
4	Classify the principles of web security.
5	Determine computer networks and examine secure software practices.
6	Design key terms and concepts in cyber security, protect intellectual property and decrease cyber-crimes.

Detailed Contents:

Part A

Introduction to Cyber Space: History of cyber space, Cyber Crime, Information Security, Computer Ethics and Security for users, Familiarization with secure web browser and guidelines to choose, Role of Antivirus, Guidelines for Secure password, Two-steps authentication, Introduction to Password Manager, Wi-Fi Security. **[7 Hours]**

Secure Social Media usage and security: Best practices for safer Social Networking, Basic Security for Windows, User Account Password Smartphone Security, Android Security, IOS Security. **[6 Hours]**

E-commerce Security: Familiarization: Online Banking Security, Mobile Banking Security, Security

of Debit and Credit Card, UPI Security. **[6 Hours]**

Part B

Micro ATM, e-wallet and POS Security: Security of Micro ATMs, e-wallet Security Guidelines, Security Guidelines for Point of Sales (POS), Cyber Security Exercise, Cyber Security Incident Handling, Cyber Security Assurance. **[5 Hours]**

Social Engineering, Threat Landscape and Techniques: Social Engineering, Types of Social Engineering, How Cyber Criminal Works, How to prevent for being a victim of Cyber Crime, Cyber Security Threat Landscape, Emerging Cyber Security Threats, Cyber Security Techniques, Firewall.

[6 Hours]

Information Recovery Tools: Recovering from Information Loss, Destroying Sensitive Information, CCleaner for Windows, Various Case Studies. **[6 Hours]**

Text Books

1. William Easttom II, Computer Security Fundamentals, 4th edition, Pearson.
2. Sunit Belapure Nina Godbole, Cyber Security, 1st edition, Wiley.
3. Christopher Hadnagy, Social Engineering, The Science of Human Hacking, 2nd edition, John Wiley & Sons.
4. Thomas A. Johnson, Cyber Security, 1st edition, CNC Press.
5. Sanjib Sinha, Beginning Ethical Hacking, 1st edition, Apress.

Reference Books

1. Nina Godbole, Information Systems Security: Security Management, Metrics, Frameworks and Best Practices, Wile, 1st edition.
2. Jon Erickson, The art of Exploitation, Starch Press, 2nd edition.

E-Books and online learning material:

1. Cyber Attacks and Counter Measures: http://uou.ac.in/progdetail?pid=CEGCS-17Meilir Page-Jones: Fundamentals.
2. Introduction to Cyber Security available at http://uou.ac.in/foundation-course.
3. Fundamentals of Information Security http://uou.ac.in/progdetail?pid=CEGCS-17.
4. Cyber Security Techniques http://uou.ac.in/progdetail?pid=CEGCS-17.
5. https://www.cybersecurity.ox.ac.uk/resources/videos

Online Courses and Video Lectures

1. https://nptel.ac.in/courses/106/106/106106129/ Accessed on February 12, 2021
2. https://www.utep.edu/information-resources/iso/security-awareness/videos/security-awareness-videos.html Accessed on February 12, 2021
3. https://www.utep.edu/technologysupport/ServiceCatalog/SEC_EmailEncryption.html Accessed on February 12, 2021
4. https://nptel.ac.in/courses/106/105/106105031/ Accessed on February 12, 2021

Scheme and syllabus of B.Tech. (2018 batch onwards)

Subject Code: LPCCS-109

Subject Name: Computer Graphics Laboratory

Programme: B.Tech. (CSE)	**L:** 0 **T:** 0 **P:** 2
Semester: 6	**Teaching Hours:** 24
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design/Programming Problems:** 100%
External Marks: 20	**Duration of End Semester Exam (ESE):** 2 hrs
Total Marks: 50	**Elective Status:** Compulsory

Prerequisites: Fundamentals of computers and knowledge of any programming language like C/C++.

On Completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Apply mathematics and logic to develop computer programs for elementary graphic operations.
2	Implement scan conversion problems using a programming language.
3	Outline the concepts of different type of geometric transformation of objects in 2D and 3D.
4	Implement clipping and filling techniques for modifying an object.
5	Gain experience in creating interactive graphics applications using one or more graphics application programming interfaces.
6	Develop scientific and strategic approach to solve complex problems in the domain of computer graphics.

Special Instruction related to resources requirement: Any programming language like C/C++ could be used for the programs.

List of Practicals:

1. Write a program for creating a simple two-dimensional shape of any object using lines, circle, etc.
2. Write a program to Draw a color cube and spin it using transformation matrices.
3. Implement the DDA algorithm for drawing line (programmer is expected to shift the origin to the center of the screen and divide the screen into required quadrants).
4. Write a program to input the line coordinates from the user to generate a line using Bresenham's Algorithm.
5. Write a program to generate a complete moving wheel using Midpoint circle drawing algorithm and DDA line drawing algorithm.

6. Write a program to draw an ellipse using the Midpoint ellipse generation algorithm for both the regions.
7. Write a program to draw any 2-D object and perform the transformations on it according to the input parameters from the user, namely: Translation, Rotation and Scaling.
8. Write a program to rotate a triangle about any one of its end coordinates.
9. Write program to draw a house like figure and perform the following operations.

a) Scaling about the origin followed by translation.

b) Scaling with reference to an arbitrary point.

10. Write a program to draw a 4×4 chessboard rotated 45° with the horizontal axis. Use Bresenham's algorithm to draw all the lines. Use seed fill algorithm to fill black squares of the rotated chessboard.
11. Write a program to perform clipping on a line against the clip window using any line clipping algorithm. The output must be twofold showing the before clipping and after clipping images.
12. Write a program to implement the Sutherland-Hodgeman Polygon Clipping algorithm for clipping any polygon.

Reference Material

Manuals available in Lab.

Scheme and syllabus of B.Tech. (2018 batch onwards)

Subject Code: LPCCS-110

Subject Name: Machine Learning Laboratory

Programme: B.Tech. (CSE)	**L:** 0 **T:** 0 **P:** 2
Semester: 6	**Teaching Hours:** 24
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design/Programming Problems:** 100%
External Marks: 20	**Duration of End Semester Exam (ESE):** 2 hrs
Total Marks: 50	**Elective Status:** Compulsory

Prerequisites: Knowledge of Python

On Completion of the laboratory course student should be able to:

CO#	COURSE OUTCOMES
1.	Develop, analyze and visualize the implementation of machine learning algorithms
2.	Design and develop various algorithms for specific problems with appropriate datasets
3.	Analyze and identify the need for machine learning techniques for specific domain
4.	Develop solutions of real time problems with the prediction and visualization
5.	Apply and analyze Genetic Algorithms for optimization of engineering solutions
6.	Develop and analyze Genetic Algorithms for optimization of engineering solutions

List of Practicals:

1. Write a program to demonstrate **FIND-S algorithm** for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.
2. Write a program for **Candidate Elimination algorithm** for finding the consistent version space based on a given set of training data samples. The training data is read from a .CSV file.
3. Build an Artificial Neural Network by implementing the **Back propagation algorithm** and test the same using appropriate data sets.
4. Write a program to implement the **naïve Bayesian classifier** for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.
5. Assuming a set of documents that need to be classified, use the **naïve Bayesian Classifier** model to perform this task. Calculate the accuracy, precision, and recall for your data set.
6. Write a program to construct a **Bayesian network** considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

7. Apply **EM algorithm** to cluster a set of data stored in a .CSV file. Use the same data set for clustering using ***k*-Means algorithm**. Compare the results of these two algorithms and comment on the quality of clustering.
8. Write a program to implement ***k*-Nearest Neighbour algorithm** to classify the iris data set. Print both correct and wrong predictions.
9. Implement the non-parametric **Locally Weighted Regression algorithm** in order to fit data points. Select appropriate data set for your experiment and draw graphs.
10. Write a program to predict high risk patients based on variables (e.g. blood pressure, age etc.) and discriminate them from low risk patients.
11. Develop a genetic algorithm for optimization of hyper parameters in machine learning.

Resource Material:

Manuals available in Lab.

Scheme and syllabus of B.Tech. (2018 batch onwards)

Subject Code: PECS-108

Subject Name: Network Security and Cryptography

Programme: B.Tech. (CSE)	**L:** 3 **T:** 0 **P:** 0
Semester: 6	**Teaching Hours:** 36
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 40	**Percentage of Numerical/Design/Programming Problems:** 40%
External Marks: 60	**Duration of End Semester Exam(ESE):** 3 hours
Total Marks: 100	**Course Status:** Elective

Prerequisites: Computer Networks

Additional Material Allowed in ESE: Scientific Calculator

On completion of the course the student will have the ability to:

CO #	Course Outcomes
1.	Apply the knowledge of existing authentication protocols and key management techniques to provide security solutions.
2.	Identify and analyze network security attacks and counter measures to prevent those attacks.
3.	Evaluate network security models using available solutions such as PGP, SSL, IPSec to provide robust framework for security threats.
4.	Assess impact of system and web security threats to ensure secure transmission of data.
5.	Analyze the security requirements and solutions for maintaining Data integrity using modern techniques for data transmission.
6.	Testing and verification of cryptography aspects by integrating people, processes and technologies.

Detailed Contents:

Part-A

Introduction to Security: Essentials of network security, Architecture, Security goals, cryptographic attacks: cryptanalytic, non-cryptanalytic attacks, active attack and passive attack, security Services and security mechanism, Fundamental Security design principles, Network security model, standards. **[5 Hours]**

Number Theory: Integer Arithmetic, Euclidean Algorithm, Extended Euclidean Algorithm, Modular Arithmetic, Matrices, Linear Congruence, Prime numbers, Fermat's and Eular's Theorem, Factorization, Chinese Remainder Theorem. **[6 Hours]**

Classical Encryption Techniques: Encryption, Decryption, Plaintext, Cipher text, Key range and Size, Symmetric cipher model, Substitution techniques: Mono-alphabetic ciphers (additive, Caesar,

Multiplicative, affine), polyalphabetic cipher (autokey, playfair, Hill Cipher) Transposition techniques (keyless, keyed, combined approaches) **[6 Hours]**

Part-B

Modern Symmetric-key Ciphers: Modern Block cipher, components of block cipher, two classes of product cipher, Feistal structure, Data Encryption Standard (DES). Modern stream ciphers, Advanced Encryption Standard (AES), Stream ciphers – RC4. **[5 Hours]**

Public Key Cryptography and RSA: Symmetric – Key vs Asymmetric-key cryptosystems, Principles of public key cryptosystems, RSA algorithm and its attacks, Diffie Hellman Key Exchange. **[4 Hours]**

Data Integrity and Authentication: Message: Hash function (SHA-I), Message Authentication (MD5), Digital Signature: services, attacks on digital signature, RSA Digital signature scheme. **[4 Hours]**

Internet Security Protocols: General structure of Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Electronic Transaction (SET), Email Security: Pretty Good Privacy (PGP), IP Security – Overview, IP security architecture modes, security protocols: Authentication header(AH) and Encapsulation security payload (ESP). **[6 Hours]**

Text Books:

1. William Stallings, "Cryptography and Network Security Principles and Practice", Pearson Education, 6th Edition.
2. Behrouz A. Forouzan, "Cryptography & Network Security", McGraw-Hill Education, 3rd Edition.
3. Atul Kahate, "Cryptography & Network Security", Tata Mc Graw Hill, 3rd Edition.

Reference Books:

1. Wenbo Mao, "Modern Cryptography: Theory and Practice", Hewlett-Packard Company.
2. William Stallings, "Network Security Essentials, Applications and Standards ", Pearson Education.
3. Alfred J. Menezes, Paul C. van Oorschot and Scott A. Vanstone, "Handbook of Applied Cryptography", CRC Press.
4. Trappe & Washington, "Introduction to Cryptography with Coding Theory", Prentice-Hall.

E-Books and online learning material

1. Modern Cryptography by P. Rogaway
   https://web.cs.ucdavis.edu/~rogaway/classes/227/winter00/
2. A Graduate Course in Applied Cryptography by Dan Boneh
3. Lecture Notes on Cryptography by S. Goldwasser and M. Bellare
   http://cseweb.ucsd.edu/~mihir/papers/gb.pdf

Online Courses and Video Lectures

1. https://crypto.stanford.edu/~dabo/courses/OnlineCrypto/ Accessed on Feb. 16, 2021
2. https://nptel.ac.in/courses/106/105/106105031/ Accessed on Feb. 16, 2021
3. https://nptel.ac.in/courses/106/105/106105162/ Accessed on Feb. 16, 2021
4. https://www.slideshare.net/ayyakathir/cryptography-and-network-security-52030354 Accessed on Feb. 16, 2021
5. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/lecture-videos/lecture-21-cryptography-hash-functions/ Accessed on Feb. 16, 2021
6. https://freevideolectures.com/course/3027/cryptography-and-network-security Accessed on Feb. 16, 2021
7. https://saweis.net/crypto.html Accessed on Feb. 16, 2021

Scheme and syllabus of B.Tech. (2018 batch onwards)

Subject Code: LPECS-104

Subject Name: Network Security and Cryptography Laboratory

Programme: B.Tech.(CSE)	**L:** 0 **T:** 0 **P:** 2
Semester: 6	**Teaching Hours:** 24
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design/Programming Problems:** 100%
External Marks: 20	**Duration of End Semester Exam(ESE):** 2 hours
Total Marks: 50	**Course Status:** Elective

Prerequisites: Computer Networks

On completion of the course the student will have the ability to:

CO #	Course Outcomes
1.	Implement encryption and decryption techniques for providing security solutions.
2.	Analyze the impact of public key cryptosystems for secure exchange of information.
3.	Analyze and design Network Security protocols for information exchange over unsecure network.
4.	Apply security principles for implementing authentication applications.
5.	Analyze the security requirements and solutions for maintaining Data integrity using modern techniques for data transmission.
6.	Testing and verification of cryptography aspects by integrating people, processes and technologies.

Special Instruction related to resources requirement: Any programming language like C, C++, can be used for the programs.

List of Practicals:

1. Implement the following Symmetric key cipher techniques :
   a. Caesar Cipher
   b. Multiplicative Cipher
   c. Affine Cipher
   d. Playfair Cipher
   e. Hill Cipher
   f. Rail fence – Row & Column Transformation etc.
2. Implement Diffie-Hellman Key exchange algorithm.
3. Implement RSA Public Key algorithm.
4. Implement Stream cipher algorithm – RC4.
5. Mini Project related to cryptography and network security with the team of 2-4 members

Reference Material

Manuals available in Lab.

Scheme and syllabus of B.Tech. (2018 batch onwards)

Subject Code: PECS-114

Subject Name: Advanced Database Management Systems

Programme: B.Tech.(CSE)	**L:** 3 **T:** 0 **P:** 0
Semester: 6	**Teaching Hours:** 36
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 40	**Percentage of Numerical/Design/Programming Problems:** 20%
External Marks: 60	**Duration of End Semester Exam (ESE):** 3hrs
Total Marks: 100	**Elective Status:** Elective

Prerequisites: Basic Knowledge of Computer Fundamentals and Database Management Systems.
Additional Material Allowed in ESE: Nil
On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Implement PL/SQL programming using concept of Cursor Management, Error Handling, Package and Triggers. (Change from Level-2 to Level 3 or above)
2	Apply and Relate the concept of transaction, concurrency control and recovery in database.
3	Recognize the purpose of query processing and optimization and also demonstrate the basic of query evaluation.
4	Illustrate the concept of object oriented database and have experience with object oriented modeling, design and implementation. (Change from Level-2 to Level 3 or above)
5	List the principles of distributed systems and describe the problems and challenges associated with these principles.
6	Evaluate the association rules for mining the data.

Detailed Contents:

Part - A

Introduction to SQL Programming Techniques: Database Programming: Issues and Techniques, Embedded SQL, Dynamic SQL, Database Programming: Data Types, Variables, Constraints, Operators, Conditions, Loops, Strings, Arrays, Procedures, Functions, Cursors, Records, Exceptions, Triggers, Packages, Database Stored Procedures. **[5 Hours]**

Transaction Processing and Optimization: Transaction Processing Concepts, Concurrency Control Techniques, Timestamp ordering, Multiversion Concurrency Control Techniques, Validation (Optimistic) Concurrency Control Techniques, Granularity of Data Items and Multiple Granularity Locking. **[4 Hours]**

Query Processing and Optimization: Query Processing, Syntax Analyzer, Query decomposition, Query Optimization, Heuristic Query Optimization, Algorithms for SELECT and JOIN Operations,

Algorithms for PROJECT and Set Operations, Implementing Aggregate Operations and OUTER JOINS. Using Selectivity and Cost Estimation in Query Optimization. Semantic Query Optimization. **[5 Hours]**

Object-Oriented DBMS: Introduction Advanced Database Applications, Weakness of RDBMS, Storing Objects in Relational Database. Next- Generation Database Systems, OODBMS Perspectives, Persistence, Issues in OODBMS, Advantages and Disadvantages of OODBMS, Object- Oriented Database Design, Comparison of ORDBMS and OODBMS. **[4 Hours]**

Part - B

Distributed Databases and Client-Server Architectures: Distributed Database Concepts, Data Fragmentation, Replication, and Allocation techniques for Distributed Database Design. Types of Distributed Database Systems, Query Processing in Distributed Databases, Overview of Concurrency Control and Recovery in Distributed Databases. **[6 Hours]**

Overview of Data Warehousing and OLAP: Introduction, Characteristics of Data Warehouses, Data Modeling for Data Warehouses, Building a Data Warehouse, Typical Functionality of a Data Warehouse, Data Warehouse versus Views, Problems and Open Issues in Data Warehouses. **[5 Hours]**

Data Mining Concepts: Overview of Data Mining Technology, Association rules, Classification, Clustering, Approaches to Other Data Mining Problems, Application of Data Mining, Commercial Data Mining Tools. **[4 Hours]**

Emerging Database Technologies and Applications: Mobile Databases, Multimedia Databases, Geographical Information Systems (GIS), Genome Data Management. **[3 Hours]**

Text Books:

1. SQL,PL/SQL ,The programming language of oracle, Ivan Bayross, BPB Publication
2. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", McGraw Hill Education.
3. Connolly, "Specifications of Database Systems: A Practical Approach to Design, Implementation and Management", Pearson India.
4. Alexis Leon, Mathews Leon, "Database Management Systems", Leon Press.
5. Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", Tata McGraw.

Reference Books

1. SQL,PL/SQL ,The programming language of oracle, Ivan Bayross BPB Publication
2. An introduction to database system by C.J.Date (Addison Welsey, Publishing house).
3. An introduction to Database Systems by Bipin C. Desai, Galgotia publications.
4. Prateek Bhatia, Database Management system, Kalayani Publishers
5. S.K. Singh, "Database Systems Concepts, Design and Applications", Pearson Education.

E-Books and online learning material

1. Database Management system. 2nd Ed. http://fdjpkc.fudan.edu.cn/_upload/article/files/38/18/68cfc4494aa8a05490d9c94b84e8/37986de0-6e42-4a65-ad14-91d6d49e20cf.pdf
2. Fundamentals of Database Management Systems eBook. https://www.circuitmix.com/free-download-fundamentals-of-database-management-systems-ebook/

Online Courses and Video Lectures

1. https://nptel.ac.in/courses/106/106/106106093/ Accessed on Feb. 10, 2021
2. https://www.youtube.com/watch?v=075XblZxQts&list=PLV8vIYTIdSnadoY3-LdIJ8pzxgpdBVbHI Accessed on Feb. 10, 2021
3. https://www.youtube.com/watch?v=SdW5RKUboKc&list=PLSE8ODhjZXjasmrEd2_Yi1deeE360zv5O Accessed on Feb. 10, 2021
4. https://www.youtube.com/watch?v=hKljaVcCMgg&list=PLLANTs44t4TVFZ6i8fIu0wOBv3FVUMc89 Accessed on Feb. 10, 2021
5. https://www.youtube.com/watch?v=5qTtecS682A&list=PLir19lgiavA2XaNFoBIYdLtZWXfneVYW6 Accessed on Feb. 10, 2021

Scheme and syllabus of B.Tech. (2018 batch onwards)

Subject Code: LPECS-107

Subject Name: Advanced Database Management Systems Laboratory

Programme: B.Tech.(CSE)	**L:** 0 **T: 0 P:** 2
Semester: 6	**Teaching Hours:** 24
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design/Programming Problems:** 100%
External Marks: 20	**Duration of End Semester Exam(ESE):** 2 hrs
Total Marks: 50	**Elective Status:** Elective

On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1	Implement PL/SQL programming using concept of Cursor Management, Error Handling, Package and Triggers. (Change from Level-2 to Level 3 or above)
2	Apply and Relate the concept of transaction, concurrency control and recovery in database.
3	Recognize the purpose of query processing and optimization and also demonstrate the basic of query evaluation.
4	Illustrate the concept of object oriented database and have experience with object oriented modeling, design and implementation. (Change from Level-2 to Level 3 or above)
5	List the principles of distributed systems and describe the problems and challenges associated with these principles.
6	Evaluate the association rules for mining the data.

List of Practicals:

1. Insert data to a table using character type variable
    a. Which will get the salary of an employee with particular id from emp table and display it on the screen.
    b. Which creates two variables in the outer block and assign their product to the third variable created in the inner block.
2. Write a PL/SQL procedure to calculate the incentive on a target achieved and display the message either the record updated or not.
3. Write PL/SQL code to count the number of employees in a particular department and check whether this department have any vacancies or not by using functions. Assume there are 45 vacancies in this department.

4. Write a PL/SQL procedure to accepts a BOOLEAN parameter and uses a CASE statement to print Unknown if the value of the parameter is NULL, Yes if it is TRUE, and No if it is FALSE.
    a. which use the relational operators to compare character values for equality or inequality.
5. Write a program in PL/SQL to update the salary of a specifc employee by 8% if the salary exceeds the mid range of the salary against this job and update up to mid range if the salary is less than the mid range of the salary, and display a suitable message.
6. Write a program in PL/SQL to print 1st n numbers with a difference of 3 and starting from 1.
    a. which uses FOR loop to insert ten rows into a database table.
    b. to demonstrate the use of 'WHILE loop'
    c. to demonstrate the use of 'Nested loop'
    d. to demonstrate the use of ' Labeling loop'
    e. to demonstrate the use of 'GOTO statement'
7. Write a program in PL/SQL to insert records from one table to another.
    a. Which uses a cursor to select the five highest paid employees from the emp table.
    b. that uses implicit cursor attributes to update the salary of employees in emp table.
    c. to illustrate the use of different types of Explicit cursors
    d. to illustrate the use of Triggers.
    e. to illustrate the use of Packages
    a. to handle exceptions
8. **Minor Project:** By using standard database design rules, a small database has to be designed for a specific assigned problem by a group of two to three students. Design meaningful Pl/SQL queries related to your project and execute them. Each must submit a project report of 8 to 10 pages (approximately) and the team will have to demonstrate as well as to give a presentation of the same.

Reference Material

Manuals available in Lab.

Scheme and syllabus of B.Tech. (2018 batch onwards)

Subject Code: PECS-120

Subject Name: Natural Language Processing

Programme: B.Tech. CSE	**L:** 3 **T:** 1 **P:** 0
Semester: 6	**Teaching Hours:** 36
Theory/Practical: Theory	**Credits:** 3
Internal Marks: 40	**Percentage of Numerical/Design/Programming Problems:** Nil
External Marks: 60	**Duration of End Semester Exam (ESE):** 3 hrs
Total Marks: 100	**Elective Status:** Elective

Prerequisites: Knowledge of regular languages and parsing

Additional Material Allowed in ESE: [Scientific Calculator]

On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Apply the knowledge of mathematics and engineering to understand the computational properties of natural languages and the commonly used algorithms for processing linguistic information.
2.	Examine natural language processing models and algorithms using both the traditional symbolic and the more recent statistical approaches.
3.	Discuss the key concepts from natural language processing and to describe and analyze language, POS tagging and context free grammar for English language.
4.	Discover the capabilities and limitations of current natural language technologies, and some of the algorithms and techniques that underlie these technologies.
5.	Recognize the significance of models and methods of statistical natural language processing for common NLP tasks.
6.	Illustrate the concepts of morphology, syntactic analysis, semantic interpretation and pragmatics of the language, demonstrating them with different approaches.

Detailed Contents:

Part-A

Introduction: Introduction to natural language and speech processing, Steps for processing natural languages, Issues and challenges for processing of natural languages, Elements of information theory, Brief history of natural language processing. **[5 Hours]**

Morphological Analysis: Inflectional and Derivational morphology, Morphological parsing, Lexicon and Morphotactics, Finite state transducers, N-gram language models, N-gram smoothing, Entropy. **[7 Hours]**

Part-of-Speech Tagging: Word classes, Part-of-speech tagging, Tagsets, POS tagging Techniques – Rule-

based, Stochastic, Transformation-based. **[6 Hours]**

Part-B

Syntactic Analysis: Introduction to parsing, Basic parsing strategies, Top-down parsing, Bottom-up parsing, Dynamic programming – CYK parser, Issues in basic parsing methods, Earley algorithm, Parsing using Probabilistic Context Free Grammars. **[7 Hours]**

Semantic Analysis: Lexical semantics, Lexemes, Relations among lexemes and their senses, WordNet, Word Sense Disambiguation – Supervised and Un-supervised approaches. Information Extraction – Introduction to Named Entity Recognition and Relation Extraction. **[4 Hours]**

Pragmatics: Discourse, Discourse structure. Dialogue – Acts, structure, conversational agents. Language generation, Architecture for generation. **[4 Hours]**

Applications: Different application areas of natural language processing – Machine translation, Machine learning, Text categorisation and summarisation, Speech synthesis, Speech recognition, Optical character recognition, Database access, etc. **[3 Hours]**

Text Books:

1. D. Jurafsky and J. H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition", Pearson Education.
2. J. Allen, "Natural Language Understanding", Second Edition, Addison Wesley.
3. Andrew Radford, Martin Atkinson, David Britain, Harald Clahsen, Andrew Spencer "Linguistics, An Introduction", Second Edition, Cambridge University Press.

Reference Books:

1. T. Siddiqui and U.S. Tiwary, "Natural Languauge Processing and Information Retrieval", First Edition, Oxford University Press.
2. J. Handke, "The Structure of the Lexicon: Human Versus Machine (Natural Language Processing)", First Edition, Mouton de Gruyter.
3. Bharati, V. Chaitanya and R. Sangal, "Natural Language Processing: A Paninian Perspective", Third Edition, Prentice Hall of India.

E-Books and online learning material:

1. https://lecturenotes.in/subject/371/natural-language-processing-nlp
2. http://www.cs.virginia.edu/~kc2wc/teaching/NLP16/slides/01-intro.pdf

Online Courses and Video Lectures:

1. https://nptel.ac.in/courses/106/101/106101007/mod01lec01.mp4
2. https://nptel.ac.in/courses/106/101/106101007/mod01lec02.mp4
3. https://nptel.ac.in/courses/106/101/106101007/mod01lec03.mp4
4. https://nptel.ac.in/courses/106/101/106101007/mod01lec04.mp4
5. https://www.coursera.org/learn/language-processing

Scheme and syllabus of B.Tech. (2018 batch onwards)

Subject Code: LPECS-110

Subject Name: Natural Language Processing Laboratory

Programme: B.Tech. CSE	**L:** 0 **T:** 0 **P:** 2
Semester: 6	**Teaching Hours:** 20
Theory/Practical: Practical	**Credits:** 1
Internal Marks: 30	**Percentage of Numerical/Design/Programming Problems:** 100%
External Marks: 20	**Duration of End Semester Exam (ESE):** 2 hrs
Total Marks: 50	**Elective Status:** Elective

Prerequisites: Experience with programming and machine learning

On completion of the course, the student will have the ability to:

CO#	Course Outcomes
1.	Apply the knowledge of engineering to understand the computational properties of natural languages and to implement the algorithms for processing linguistic information.
2.	Utilize the models and methods of statistical natural language processing for common NLP tasks such as speech recognition, machine translation, text classification, spell checking etc.
3.	Understand the key concepts of morphology, syntactic analysis for implementing POS tagging algorithms and context free grammar for English language.
4.	Identify and apply natural language processing algorithms to solve real world problems
5.	Understanding semantics and pragmatics of English language for processing.
6.	Implement, and apply state-of-the-art techniques to novel problems involving natural language data.

List of Practicals:

1. Use Naïve Bayes method to classify positive or negative sentiment in tweets.
2. Apply the orthographic e-insertion rule for morphological analysis.
3. Implement the auto-complete algorithm using an N-gram model.
4. Implement a simple auto-correct algorithm using minimum edit distance and dynamic programming.
5. Use the auto-correct algorithm to implement a simple spell checker, using unigram frequency to sort options at similar edit distance.
6. Apply the Viterbi algorithm for Part of Speech tagging.
7. Implement the top down and bottom up parsing algorithms.

8. Implement the CYK Parser using Dynamic programming.
9. Implement the Earley Algorithm using suitable example.
10. Implement named entity recognition in information extraction.

Reference Material

Manuals available in Lab.