SIXTH SEMESTER

Sl. No.	Course Category	Subject Code	Subject Title	L	T	P	Contact Hours / Week	Credit	Full Marks
1	Humanities Science-6	HS 601	Entrepreneurship and Start-ups	2	0	0	2	2	100
2	Program Core – 22	PC CS 608	Data and Internet Security	3	0	0	3	3	100
3	Program Core – 23	PC CS 609	Architecture for Management of Large datasets	3	0	0	3	3	100
4	Program Elective – 1	PE CS 603/1	Fuzzy Logic and Neural Network	3	0	0	3	3	100
		PE CS 603/2	Introduction to toolkits for Machine Learning						
		PE CS 603/3	Mathematics for Machine Learning						
5	Program Core – 24	PC CS 610	Image Processing and Computer Vision	3	0	0	3	3	100
6	Program Core – 25	PC CS 607	Digital Image Processing Lab	0	0	2	2	1	100
7	Program Core – 26	PC CS 611	Applied Artificial Intelligence Lab	0	0	2	2	1	100
8	Program Core – 27	PC CS 612	Statistical Analysis and Computing for Large Datasets Lab	0	0	4	4	2	100
9	Employment Enhancement Courses - 2	EEC 613	Mini Project	0	0	6	6	3	100
				14	0	14	28	21	900

Entrepreneurship and Start-ups

Course Code	HS 601
Course Title	Entrepreneurship and Start-ups
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	Nil
Course Category	Humanities Science (HS)
Number of classes	26 Hours

Course Outcome:

After completing this course, the student should be able to-

CO Number	CO Description	K-level
CO-1	Understanding the basic idea and related terminologies associated with Management, Innovation and Entrepreneurship	K2
CO-2	Understanding and learning elaborately about the differentconcepts of entrepreneurship theories and allied practices.	K2
CO-3	Apply the learned concepts for becoming future entrepreneurs andalso for solving theoretical as well as practical case study which will again indirectly help the learner to become entrepreneurs intheir liked fields.	K3
CO-4	Analyzing theoretical and practical case studies as well as finding out entrepreneurial possibilities so that learner can apply his/ heranalyzing skills.	K3

Course Content:

Module 1: Introduction (6 Hours)

Introduction to Entrepreneurship: Evolution of entrepreneurship from economic theory, managerial and entrepreneurial competencies. Entrepreneurial growth and development.

Module 2: Creativity and Innovation - Concepts (7 Hours)

Creativity and Innovation - Concepts, Shifting composition of the Economy, Purposeful Innovation & the seven sources of innovative opportunity; Innovation Processes. Innovative Strategies - strategies that aim at introducing an innovation. Relationship between innovation & entrepreneurship. Role of planning in innovation & entrepreneurship

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Module 3: Entrepreneurial Motivation (7 Hours)

Entrepreneurial Motivation - Need for continuous learning & relearning; acquiring technologicalinnovation entrepreneurial motivation, Achievement motivation in real life; case study. InternationalEntrepreneurship - Concepts and nature of international entrepreneurship. Role of ethics in internationalentrepreneurship.

Module 4: Problem Identification and Problem Solving (6 Hours)

Problem Identification and Problem Solving: Problem Identification. Problem solving. Innovation and diversification.

References

1. S.N. Shivanandam, Principle of soft computing, WileyISBN13: 9788126527410 (2011). Martin, M.J., Managing Innovation and Entrepreneurship in Technology based Firm, John Wiley.
2. Ettlie, J.E., Managing Technology Innovation, John Wiley & Sons.
3. Drucker, P. F., The Discipline of Innovation, Harvard Business Review.
4. Christensen, C. M. and Raynor, M. E., The Innovator's Solution: Creating and Sustaining Successful Growth, Boston, MA: Harvard Business School Press.
5. Drucker, P. F., Innovation and Entrepreneurship, Harper, New York.
6. Harvard Business Review on Innovation (Collection of articles), Harvard Business School Press.
6. Harvard Business Review on Entrepreneurship (Collection of articles), Harvard Business School Press.
8. Rogers, E.M., Diffusion of Innovations, Simon and Schuster, New York

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Data and Internet Security

Course Code	PC CS 608
Course Title	Data and Internet Security
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Compute network
Course Category	Program Core
Number of classes	36 Hours

Course Outcome:
After completion of this course the students will be able to:

CO Number	CO Description	K-level
CO-1	Describe networking architecture and protocols.	K2
CO-2	Design application specific modifications to protocols and routing.	K3
CO-3	Explain the fundamentals of security and cryptography.	K3
CO-4	Demonstrate protection of each layer with an example protocol	K4
CO-5	Develop intrusion detection and prevention systems, firewalls.	K-4

Course Content:

Module 1: (10 Hours)
Introduction: History of Cryptography. Mathematical background: Probability theory -Information theory – Complexity theory, Number theory. Symmetric (Private) Key Cryptographic Systems: Caesar – Affine – Monoalphabetic Substitution – Transposition – Homophonic substitution – Vignere – Beauford and DES Family – Product ciphers – Lucifer and DES.

Module 2: **(9 Hours)**

Asymmetric (Public) Key Cryptographic Systems: Concept of PKCS, RSA Cryptosystem- Variants of RSA – Primality testing – Security of RSA – Merkle – Hellamn – Security of Merkle – Hellaman, ElGamal. Elliptical Curve Cryptography. Stream ciphers and block ciphers: The one-time pad – Synchronous stream ciphers – Self-synchronizing stream ciphers – Feedback shift registers – Linear Complexity – Non-linear feedback shift registers – Stream ciphers based LFSRs. Non-linear Combination generators – Non-linear filter generators – Clock controlled generators – The alternating step generators – The shrinking generators.

Module 3: **(9 Hours)**

Digital Signatures: Properties, Generic signature schemes – Rabin Lamport – Matyasmeyer, RSA – Multiple RSA and ElGamal Signatures – Digital signature standard – Blind Signatures- RSA Blind. Secret Sharing Algorithms: Threshold secret sharing – Shamir scheme, Blakley scheme and modular Scheme. Pseudo random number generators: Definition of randomness and pseudo-randomness – Statistical tests of randomness – Linear congruential generator – Modern PRNGs (a brief description).

Module 4: **(8 Hours)**

Fraud detection, IoT/Infrastructure security, Mobile/Wireless security, Machine Learning for Security: Challenges in applying machine learning (ML) to security, guidelines for applying ML to security, Current and future trends in security.

References / Suggested learning Resource:

1. Daniel Barbara and SushilJajodia, "Applications of Data Mining in Computer Security", Vol. 6. Springer Science & Business Media, 2002
2. Marcus A. Maloof, "Machine Learning and Data Mining for Computer Security", Springer Science & Business Media, 2006
3. V RaoVemuri, "Enhancing Computer Security with Smart Technology", Auerbach Publications, 2005
4. S. Stolfo, S. Bellovin, S. Hershkop, A. Keromytis, S. Sinclair, S. Smith, "Insider Attack and Cyber Security: Beyond the Hacker", Vol. 39. Springer Science & Business Media, 2008
5. Dhruba K. Bhattacharyya, Jugal K. Kalita, "Network Anomaly Detection: A Machine Learning Perspective", Crc Press, 2013
6 .AnoopSinghal, "Data Warehousing and Data Mining Techniques for Cyber Security", Vol. 31. Springer Science & Business Media, 2007
7. Markus Jakobsson and ZulfikarRamzan, "Crimeware, Understanding New Attacks and Defenses", Addison-Wesley Professional, 2008.

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Architecture for Management of Large Datasets

Course Code	PC CS 609
Course Title	Architecture for Management of Large datasets
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Database Management Systems
Course Category	Program Core
Number of classes	36 Hours

Course Outcome:
After completion of this course the students will be able to:

CO Number	CO Description	K-level
CO-1	Understand the pros and cons of the traditional relational databases and need for distributed architecture for data processing of large datasets.	K2
CO-2	Understand distributed software architectures, runtime and storage strategies used by ApacheHadoop.	K2
CO-3	Explain the need and use cases for emerging architectures such as Spark, Storm, Giraph, Hive etc. and how they differ from Apache Hadoop.	K2
CO-4	Implement map reduce programs to solve data analysis tasks.	K3

Course Content:

Module 1: (10 Hours)
Introduction to relational databases, Ddatabase normalizations, Limitations of relational databases, Sstructured Data, Unstructured data, Dependency preservation, Transaction Processing.

Module 2: (10 Hours)
Design of distributed program models, abstractions, MapReduce, Dataflow and Vertex-centric models, Pprocessing volume and velocity, Linked datasets, NoSQL datasets, storing and querying over NoSQL Dataset.

Module 3: (8 Hours)
Concepts of distributed data processing, approaches and design patterns of data-intensive algorithms, Aanalytics of distributed programming abstractions.

Module 4: (8 Hours)
Distributed software architectures, Runtime and storage strategies used by Big Data , Apache Hadoop, Spark, Storm, Giraph and Hive, Clusters and Clouds manner Data storage.

Text Books:

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. V.K. Jain, Big Data and Hadoop, Khanna Book Publishing Company 2020.
3. V.K. Jain, Data Science and Analytics (with Python, R and SPSS Programming), Khanna Book Publishing Company.
4. P. J. Sadalage, M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
5. Tom White, "Hadoop: The Definitive Guide", 3/e, O'Reilly, 2012.

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Fuzzy Logic and Neural Network

Course Title:	Fuzzy Logic and Neural Network
Course Code	PE CS 603/1
Number of credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Artificial Intelligence
Course Category	Program Elective
Number of classes	36

Course Outcome: -

On completion of the syllabus, the students will be able to: -

CO Number	CO Description	K-level
CO-1	To Expose the students to the concepts of feed forward neural networks	K2
CO-2	To provide adequate knowledge about feedback networks	K2
CO-3	To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using Genetic algorithm.	K2
CO-4	To provide comprehensive knowledge of fuzzy logic control and adaptive fuzzy logic and to design the fuzzy control using Genetic algorithm.	K2
CO-5	To teach about the concept of fuzziness involved in various	K3

Course Content:

Module- 1: **(8 Hours)**

Introduction –Biological neuron-Artificial neuron-Neuron modelling Learning rules-Single layer-Multi layer feed forward network-Back propagation-Learning factors

Module- 2: **(10 Hours)**

Feedback networks-Discrete time hop field networks-Schemes of neuro –control, identification and control of dynamical systems-case studies (Inverted Pendulum, Articulation Control).

Module- 3: **(10 Hours)**

Classical sets-Fuzzy sets-Fuzzy relations-Fuzzification –Defuzzification- Fuzzy rules.

Fuzzy Logic Control: Membership function – Knowledge base-Decision –making logic – Optimizations of membership function using neural networks-Adaptive fuzzy systems-Introduction to generate to genetic algorithm.

Module- 4: **(8 Hours)**

Fuzzy logic control-Inverted pendulum-Image processing-Home Heating system-Blood pressure during anesthesia-Introduction to neuro fuzzy controller.

Text Books:

1.Kosko, B, "Neural Networks and Fuzzy Systems: A Dynamical Approach to Machine Intelligence", PrenticeHall, NewDelhi, 2004.

2.Timothy J Ross, "Fuzzy Logic with Engineering Applications", John Willey and Sons, West Sussex, England,2005.

References / Suggested Learning Resources:-

1.Jack M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Co., Boston, 2002.

2.Klir G.J. &Folger T.A., "Fuzzy sets, Uncertainty and Information", Prentice –Hall of India Pvt. Ltd., New Delhi, 2008.

3.Zimmerman H.J., "Fuzzy set theory and its Applications", Kluwer Academic Publishers Dordrecht, 2001.

4. Driankov, Hellendroonb, "Introduction to fuzzy control", Narosa Publishers, 2001.

4.Laurance Fausett, Englewood cliffs, N.J., "Fundamentals of Neural Networks", Pearson Education, New Delhi, 2008.

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Introduction to Toolkits for Machine Learning

Course Title:	Introduction to Toolkits for Machine Learning
Course Code	PE CS 603/2
Number of credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Nil
Course Category	PE
Number of classes	36

Course Outcome: -

On completion of the syllabus, the students will be able to: -

CO Number	CO Description	K-level
CO-1	Understand the basics of important and useful software libraries for machine learning	K2
CO-2	Learn to build their own neural networks in PyTorch and Tensor flow	K2
CO-3	Practice building models for object recognition, style transfer, image classification	K2
CO-4	Improve accuracy of their models by using transfer learning from pre-trained models	K2
CO-5	Learn how to debug models, visualize information etc.	K3

Course Content:

Module 1: **(8 Hours)**

Software for machine learning: Scikit-learn, Tensorflow, Pytorch, Basics of TensorFlow, Neural networks.

Module 2: **(8 Hours)**

Basics of CNN, Object recognition using CNN, Pre-trained models, State-of-the-art classifiers, saving and Loading models.

Module 3: **(10 Hours)**

RNNs, NLP, Word embeddings, LSTMs, Time series forecasting, Univariate Time Series Forecasting, Multi-step Forecasting, Time Series Classification

Module 4:

(10 Hours)

Introduction to Tensor Flow Lite. Basics of PyTorch, Perform style transfer of one image to another, Perform text generation, Sentiment analysis with PyTorch.

Text Books:

1. Natural Language Processing with PyTorch, Delip Rao, Brian McMahan, O'Reilly Press 2019.
2. Introduction to Machine Learning, by Jeeva Jose, Khanna Book Publishing, 2020.
3. Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, Aurelien Geron, O'Reilly 2019.

References:

• List of software and tools provided by the instructor.

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Mathematics for Machine Learning

Course Title:	Mathematics for Machine Learning
Course Code	PE CS 603/3
Number of credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Nill
Course Category	Program Elective
Number of classes	36

Course Outcome: -

On completion of the syllabus, the students will be able to: -

CO Number	CO Description	K-level
CO-1	Understand the mathematics behind core machine learning algorithms	K2
CO-3	Understand the mathematics behind linear algebra solvers used for machine learning	K2
CO-5	Understand the importance of regularization for machine learningmodels and various methods to perform it	K2
CO-2	Solve practical data analysis problems using the techniques taught in the course	K3
CO-4	Perform vibrational inference on a dataset	K3

Course Content:

Module 1: (8 Hours)

Convex functions and sets, Convex Optimization, Optimization Formulations of Data Analysis Problems, Regularization, Lasso, Gradient and Sub-gradient descent for non-smooth functions e.g.: SVM, Online Gradient Descent e.g.: Stochastic Gradient Descent and its applications (NN), Duality and its examples, Accelerating Gradient Descent,

Module 2: (8 Hours)

Maximum likelihood estimation (MLE) in Binomial, Multinomial, Gaussian, models in exponential family.
Expectation Maximization (EM) based learning in Mixture models, Hidden Markov Model, Dirichlet processes (Clustering).

Module 3: (10 Hours)

Weak learner, efficient Implementation of ERM for decision stumps, AdaBoost algorithm, linear combinations of hypotheses, Vapnik–Chervonenkis dimension , application of boosting algorithm, Convex learning problems, Lipschitz functions, smoothness, learnability of convex learning problems, surrogate loss functions, overview about regularization and stability estimating decisions using posterior distributions, Model selection: Variational Inference.

Module 4 : (10 Hours)

Soft margin SVM, SVM optimality conditions, implementing soft margin SVM with SGD, Kernel method, kernel trick, representer theorem, implementing soft margin SVM with kernels, decision trees algorithm, nearest neighbor (NN) algorithmsk, NN algorithm for binary classification, Artificial neural networks (ANNs), learning neural networks, expressive power of NNs, sample complexity of NNs

Text Books:

1. Introduction to Machine Learning, by Jeeva Jose, Khanna Book Publishing, 2020.
2. Linear Algebra and Learning from Data (2019), Gilbert Strang, Wellesley Cambridge Press
3. “Machine Learning: A Probabilistic Perspective” By Kevin P. Murphy (MIT Press), 2021 edition

References:

• List of papers prescribed by the instructor

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Image Processing and Computer Vision

Course Title:	Image Processing and Computer Vision
Course Code	PC CS 610
Number of credits	3 (L: 3, T: 0, P: 0)
Prerequisites	Basic knowledge of mathematics and signals
Course Category	Program Core
Number of classes	36

Course Outcome: -

On completion of the syllabus, the students will be able to: -

CO Number	CO Description	K-level
CO-1	Understand the fundamentals of image processing	K2
CO-2	Understand the fundamentals of computer vision	K2
CO-3	Perform key image processing tasks such as transformations, restoration, segment and compression	K3
CO-4	Implement the algorithms and techniques used in computer vision.	K3
CO-5	Learn the advanced techniques used in image processing	K3

Module 1: (8 Hours)

Digital Image Fundamentals-Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels – neighborhood, adjacency, connectivity, distance measures. Simple Operations- Arithmetic, Logical, Geometric Operations. Mathematical Preliminaries - 2D, Linear Space Invariant Systems - Convolution - Correlation - Spectrum

Module 2: (10 Hours)

Image Transforms: 2D Orthogonal and Unitary Transforms-Properties and Examples. 2D DFT- FFT – DCT - Hadamard Transform - Haar Transform - Slant Transform - KL Transform – Properties And Examples.
Image Enhancement:- Histogram Equalization Technique- Point Processing-Spatial Filtering-In Space And Frequency - Nonlinear Filtering-Use Of Different Masks.

Module 3: (10 Hours)

Color Image Processing-Color models–RGB, YUV, HSI; Color transformations– formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation. Image Observation And Degradation Model, Circulant And Block Circulant Matrices and Its Application In Degradation Model - Algebraic Approach to Restoration- Inverse By Wiener Filtering - Generalized Inverse- SVD and Interactive Methods.

Module 4: (8 Hours)

Redundancy and Compression Models -Lossless and Lossy compression - Variable-Length coding, Huffman coding, Image Segmentation: Edge Detection - Line Detection - Curve Detection - Edge Linking and Boundary Extraction, Boundary Representation, Morphology-Dilation, Erosion, Opening and Closing. Hit and Miss Algorithms Feature Analysis. Vision: Cameras and projection models, clustering, shape reconstruction, object

recognition, scene recognition, face detection and human motion categorization.

Text Books:

1. Gonzales R. C. and Woods R. E., Digital Image Processing, Prentice-Hall, 4 ed, 2018
2. Computer Vision: Algorithms and Applications, by Richard Szeliski, Springer, 2010. 3. Learning OpenCV, by Gary Bradski & Adrian Kaehler, O'Reilly Media, 2008.

References:

1. Multiple View Geometry in Computer Vision, 2nd Edition, by R. Hartley, and A. Zisserman, Cambridge University Press, 2004.
2. Computer Vision: A Modern Approach, by D.A. Forsyth and J. Ponce, Prentice Hall, 2002.
3. Pattern Classification (2nd Edition), by R.O. Duda, P.E. Hart, and D.G. Stork, Wiley-Interscience, 2000.
4. Pratt W. K., Digital Image Processing, 4 ed, Wiley, 2007
5. Bovik, A. C., The essential guide to image processing, Academic Press, 2009
6. Forsyth D. A. and Ponce J., Computer Vision - A Modern Approach, 2 ed, 2012.
7. M Sonka, V Hlavac, and R Boyle: Image Processing, Analysis, and Machine Vision, Thomson,Toronto, 4 ed, 2015.

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Digital Image Processing Lab

Course Title:	Digital Image Processing Lab
Course Code	PC CS 607
Number of credits	1(L: 0, T: 0, P: 2)
Prerequisites	Theoretical knowledge of Digital Image Processing
Course Category	Program Core
Number of classes	24

Course Outcome: -

On completion of the syllabus, the students will be able to: -

CO Number	CO Description	K-level
CO-1	Explain discrete transform works including concepts of basic images.	K2
CO-2	Execute basic commands in working environment/tool.	K3
CO-3	Apply de-noising and restoration techniques.	K3
CO-4	Apply binary image processing operations	K3

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List of Experiments (Minimum 6 experiments are to be performed. Use of virtual laboratory to perform few experiments may be explored, if available):

1. Familiarize the working environment/tool.
2. Digital Signal Processing Basics
3. Image Enhancement
4. Image Segmentation
5. Image Restoration and Denoising
6. Binary Image Processing

Laboratory softwares / programming languages which may be used

MATLAB/ GNU Octave 3.8 or higher/ Scilab 5.5 or higher/ Choice of any open-source tool with the prior permission obtained from the department./ Python

Text Books:

1. Rafeal C. Gonzalez, "Digital Image Processing Using MATLAB ", 2nd Edition, published by Tata McGraw hill.

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Applied Artificial Intelligence Lab

Course Title:	Applied Artificial Intelligence Lab
Course Code	PC CS 611
Number of credits	1(L: 0, T: 0, P: 2)
Prerequisites	Theoretical Knowledge of Artificial Intelligence
Course Category	Program Core
Number of classes	24

Course Outcome: -

On completion of the syllabus, the students will be able to: -

CO Number	CO Description	K-level
CO-1	Describe the various applications of AI in several fields	K2
CO-2	Executing various AI methods for problem solving	K3
CO-3	Design AI methodologies for real life problem solving	K4
CO-4	Analyse problems in specific fields of interest such as Speech analytics, graph analytics, Image Analytics, Video Analytics, Natural Language Processing etc.	K4

List of Practicals:

1. Acquire, clean and pre-process a speech recognition dataset, compute features and develop models to recognize words.
2. Tune the models in the previous lab to improve its accuracy.
3. Acquire, clean and pre-process a graph dataset, compute features and develop models to identify clusters/communities.
4. Tune the models in the previous lab to improve its accuracy.
5. Acquire, clean and pre-process an image dataset(s), compute features and develop models to identify various classes such as hand-written numerals or characters, objects etc.
6. Tune the models in the previous lab to improve its accuracy.
7. Acquire, clean and pre-process document dataset, compute features and develop models for sentiment analysis
8. Tune the models in the previous lab to improve its accuracy.

Text Books:

1. Bernhard G. Humm, "Applied Artificial Intelligence - An Engineering Approach", Leanpub, Victoria, British Columbia, Canada.
2. Adelyn Zhou, "Applied Artificial Intelligence: A Handbook for Business Leaders", Topbots 2018.
3. M.C. Trivedi, A classical approach to Artificial Intelligence, Khanna Book Publishing Company, 2020.

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Statistical Analysis and Computing for Large Datasets Lab

Course Title:	Statistical Analysis and Computing for Large Datasets Lab
Course Code	PC CS 612
Number of credits	2 (L: 0, T: 0, P: 4)
Prerequisites	Nill
Course Category	PC
Number of classes	48 Hours

Course Outcome: -

On completion of the syllabus, the students will be able to: -

CO Number	CO Description	K-level
CO-1	Process datasets via statistical packages	K2
CO-2	Perform statistical measurements and multivariate analysis	K3
CO-3	Apply various statistical tests to determine the measures of central tendency	K3
CO-4	Formulate hypothesis and perform a suitable hypothesis test	K3
CO-5	Apply resampling to address mixed data distributions, identifyand remove biases from the datasets	K3
CO-6	Determine the important predictor variables in a regression analysis of the dataset	K4

List of Practical:

1. Implement random number generation using R/Python or MATLAB drawn from various distributions such as Uniform, Normal, Exponential etc. Plot the histograms of the generated numbers and compute the mean and standard deviations.
2. Implement the sampling and verify the central limit theorem.
3. Use the generators for certain distribution and compute the various moments and measures of the central tendency and statistical tests of significance.
4. Use census data from the Govt. of India and perform statistical analysis as defined by the instructor (for example multivariate analysis to find correlation between various attributes of data)
5. Perform linear regression to study the dependency of a dependent variable on various input/predictor variables.
6. Study various types of regularizations and determine which predictor variables are significant.
7. Form a hypothesis and using the given dataset perform hypothesis testing (as defined by the instructor)
8. Perform various types of resampling to address mixed distributions, removing bias.

Text Books / References:

1. B. L. S. Prakasa Rao, A First Course in Probability and Statistics, World Scientific/Cambridge University Press India, 2009.
2. R. V. Hogg, J. W. McKean and A. Craig, Introduction to Mathematical Statistics, 6th Ed., Pearson Education India, 2006.
3. Gareth M. James, Introduction to statistical learning: With applications to R, Springer 2013.
4. Manish Sharma, Amit Gupta, the Practice of Business Statistics, Khanna Book Publishing House, 2010.

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Mini Project

Course Code	EEC 613
Course Title	Mini Project
Number of Credits	3 (L: 0, T: 0, P: 6)
Prerequisites	Nil
Course Category	Employment Enhancement Courses
Number of classes	70 Hours

Course Outcome:-

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

CO Number	CO Description	K-level
CO-1	Demonstrate a thorough and systematic understanding of project contents	K2
CO-2	Identify the methodologies and professional way of documentation and communication	K3
CO-3	Develop the skill of working in a Team	K3
CO-4	Apply the idea of mini project for developing systematic work plan in major project	K3

Course Content:-

The mini project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The course should have the following-

1) Perform detailed study about various components of a project.
2) Study about methodologies and professional way of documentation and communication related to project work.
3) Develop idea about problem formulation.
4) Knowledge of how to organize, scope, plan, do and act with in a project thesis.
5) Familiarity with specific tools (i.e. hardware equipment and software) relevant to the project selected.
6) Demonstrate the implementation of a mini project work.

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