Autonomous Program Structure
Final Year B. Tech. Seventh Semester
Computer Engineering
Academic Year: 2023-2024 Onwards

Course Code	Course Title	Teaching Scheme Hours /Week			Examination Scheme				Marks	Credit
		Lecture	Tutorial	Practical	In Semester	End Semester	Practical	Oral		
20CE701	Internship / Project	0	0	30	200	0	0	100	300	15
20HS701	Economics and Personal Finance	2	0	0	50	50	0	0	100	2
	Total	2	0	30	250	50	100	0	400	17
	Grand Total	**32**			**250**	**50**	**100**	**0**	**400**	**17**

Duration of Internship / Project :

1. Internship of 6 Months,
2. Project of 6 Months,
3. Combination: Internship of 2 to 6 Months duration + Project from 1 to 6 Months Duration.

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Secretary Governing Body
MKSSS's Cummins College of Engineering
For Women, Pune-411052

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Chairman Governing Body
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MKSSS's Cummins College of Engineering For Women, Karve Nagar, Pune-411052

20CE 801 Information Security

Teaching Scheme
Lecture: 3 Hours. /week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Prerequisite(s): Computer Networks (20CE 501)

Course Objectives:
To facilitate the learners to-
1. Understand the fundamental concepts of security.
2. Know the basics of cryptography
3. Identify the role of security protocols at various layers.
4. Understand network security threats, security services and countermeasures.

Course Outcomes:
By taking this course, the learner will be able to–
1. Make use of principles of Cryptosystem for Data Protection
2. Identify various techniques to provide Data security and Integrity over the network
3. Choose appropriate security mechanisms to mitigate various security challenges
4. Identify security mechanisms for Network Perimeter and specific Applications

Unit 1: Introduction to Security (06)
Need and significance of Security, Architectures, Introduction to common attacks (e. DOS, Phishing, SQL injection, Cross site scripting etc), Active Vs Passive Attacks, A model for Network and Internetwork Security, TCP/IP security Architecture (services and Mechanism),Introduction to cryptography- Classical Cryptography.

Unit 2: Introduction to Cryptography (07)
Introduction to secrete key cryptography, Cipher Basics, Introduction to DES, DES Analysis, DES variants, Introduction to AES and IDEA, Block cipher modes of operations.

Unit 3: Public Key Cryptography and Key Management (08)
Introduction to Public Key cryptography, The RSA algorithm, Analysis of RSA, Key Management Basics, Diffie- Hellman Key exchange, Key distribution of Private and Public Keys.

Unit 4: Message Integrity and Authentication (08)
Need and Significance of Message Digest, One way hash functions and properties of hash functions, MD5, SHA, Message authentication, Introduction and overview of Digital Signatures: Implementation, Algorithms standards(DSS),Digital Certificates and X.509, Certificate structure, Certificate revocation.

Unit 5: Network Security **(07)**

Introduction to Network Layer Security- Overview of Firewall, Design principles of Firewalls, Various types of firewalls and their working principles, Concept of VPN,Tunnelling protocols, working of IPSEC. Introduction to transport Layer security – SSL/ TLS protocol.

Unit6: Application Security and Authentication Mechanisms **(06)**

Overview of Application Security, Overview of Wireless Security. User Authentication Mechanisms, Kerberos v4 and v5.Overview of Cloud security, Overview of IOT security,

Text Books:

1. William Stalling **'Cryptography and Network Security, principles and practices'**, 7th *Edition. Pearson* ISBN 978-93-325-8522-5

2 William Stalling, Lawrie Brown **'Computer Security: Principles and Practice,** 4th Edition, Pearson ISBN 978-9353438869

Reference Books:

1. Atul Kahate, **'Cryptography and Network Security'**, 4*rd edition McGraw Hill Publication.2019* ISBN 9789353163310

2. Bernard Menezes, **'Network Security and Cryptography'**, *Cengage Learning*. ISBN 978-8131513491

3. *Bruce Schneier:* **'Applied Cryptography –Protocols, Algorithm and Source Code in C'**, *Second Edition, John Wiley & Sons, New York,* ISBN 978-1-119-09672-6.

4. Charlie Kaufman, Radia Perlman and Mike Speciner, **'Network security, private Communication In a Public World'** ISBN978-0130460196

20PECE 801A Introduction to Natural Language Processing

Teaching Scheme

Lectures: 3 Hours / Week

Examination Scheme

In Semester: 50 Marks

End Semester: 50 Marks

Credits: 3

Course Objectives:

To facilitate the learner to

1. Understand various aspects of Natural Language Processing.
2. Learn Phonological, Morphological, Syntactic and Semantic processing
3. Understand issues related to ambiguity of Natural Language.
4. Understand the advanced applications of Natural Language Processing.

Course Outcomes:

After completion of the course, students will be able to

1 Identify importance of Natural Language Processing.
2 Apply the fundamental concepts and techniques of Natural Language.
3 Identify ambiguous structure of Language.
4 Analyze the advanced applications of Natural Language Processing.

Unit I: Introduction to Natural Language Processing (6)

The Study of Language, Applications of Natural Language Understanding, Evaluating language Understanding Systems, Different levels of Language Analysis.

Unit II: Fundamentals of Phonics (7)

Speech Sounds and Phonetic Transcription, Articulatory Phonetics, The Vocal Organs, Place of Articulation of Consonants, Manner of Articulation of Consonants, Vowels, Syllables, Phonological Categories and Pronunciation Variation, Phonetic Features, Predicting Phonetic Variation, Factors Influencing Phonetic Variation.

Unit III: Fundamentals of Morphology (7)

Concept of Morphology, Survey of English Morphology, Inflectional Morphology, Derivational Morphology, Cliticization, Non-Concatenative Morphology, Agreement, Finite-State Morphological Parsing, Construction of Finite-State Lexicon, Finite-State Transducers(FST), Sequential Transducers and Determinism, Finite-State Transducers for Morphological Parsing, Transducers and Orthographic Rules, Word and Sentence Tokenization.

Unit IV: Semantic Analysis (8)

Part-of-Speech Tagging, POS-Tagging Perspective, POS tagging and HMM, POS-Tag Set, Parsing Algorithms,Parsing in case of Ambiguity; Probabilistic Parsing .Parser Comparison, Grammar; Constituency, Dependency , Inside Probability; Parse Tree construction,language modelling

Unit V: Discourse and Pragmatics (7)

Discourse Structure and Reference, Relating Discourse Structure and Inference, Discourse Structure, Tense, and Aspect, Managing the Attentional Stack, Concept of Pragmatics

Unit VI: Applications of Natural Language Processing (7)

Machine Translation, Sentiment Analysis, Question Answering Systems, Cross Lingual Information Retrieval,Natural Language Interface to Database, Extractive and Abstractive Summarization Systems, Indian Language WordNets.

Text Books:

1. Jurafsky, David, James H. Martin, 'Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition', Pearson Education Limited, Dorling Kindersley(India) Pvt. Ltd. (Indian Subcontinent Version)(2014), ISBN: 987-93-325-1814-4.
2. James Allen, 'Natural Language Understanding', Pearson Education Limited, Dorling Kindersley(India) Pvt. Ltd. (Indian Subcontinent Version)(2007), ISBN: 987-81-317.

Reference Books:

1. Manning, Christopher D., Hinrich Schütze, 'Foundations of Statistical Natural Language Processing', Cambridge Publication(1999), ISBN: 0262133601. 2. Steven Bird, ewan Klein, and Edward Loper, 'Natural Language Processing with Python', O'Reilly Media, 2009.
2. Flanagan, J. L. Speech Analysis, Synthesis and Perception. 2nd ed. New York, NY: Springer-Verlag,. ISBN: 9780387055619.

20PECE 801B User Experience Design (UX/UI)

Teaching Scheme

Lectures: 3 Hours / Week

Examination Scheme

In Semester: 50 Marks

End Semester: 50 Marks

Credits: 3

Course Objectives:

To facilitate the learner to

1. Understand the basic concepts of UI/UX Design in order to design with intention.
2. Achieve a deep understanding of the entire life-cycle of design process.
3. Provide a visual understanding of product to make user interaction as easy and efficient as possible.
4. Understand various design technologies for mobile and web to help avoid common mistakes and meet user requirements
5. Understand the advanced techniques of User Experience Design

Course Outcomes:

After completion of the course, students will be able to

1. Apply the concepts areas of study in UX to enhance the user experience
2. Apply the key psychological principles that underlie UX design principles
3. Construct the wireframes and prototypes for interactive products to establish the structure and flow of possible design solutions.
4. Apply the fundamental aspects of designing and evaluating the interfaces for mobile and web.
5. Compare the advanced techniques of User experienec Design

Unit I: Introduction to User Experience **(6)**

What is User Experience, Relationship Between UI and UX, Why is UX Design so Important, What is UX Design and Where is Used, Usability: A part of the User Experience, Understanding User Experience, Psychology of everyday actions, Concept of UX, Trends in UX, What is User Interaction, Mental Model, Cognitive Model in UX, Emerging Technologies in UX, Universal Design, User-centered design, Human Centered Design.

Unit II: Design Thinking **(8)**

Key elements of Design thinking, Design Thinking Skills-What are wicked problems and its solution, Good and poor design, Empathy Users- User research, Personas, Define problem, , Ideation- Identifying Customer Needs, Translate user needs into product specifications, Applied Creativity, Brainstorming, Prototyping, From Prototype to Product Development, Testing Design Solutions, Relation of Design thinking with UX, Design thinking applications, Applying design thinking to mobile and wed.

Unit II: Interaction Styles **(6)**

Design principles and rules, Shneiderman's golden rules, Normans seven principles, Nielsens ten heuristics with example of its use,Heauricstic evaluation. Direct Manipulation – Windows Characteristics, Components, Presentation styles, Icons, Multimedia and colors, Menu selection, Form Fill-in and Dialog Boxes, Icons, Fitts'law and Hick-Hyman's law.

Unit IV: UX Design Process **(7)**

Elements of User Experience Design, Stages of UX design,
Visual Design - Vision and Memory,Visual Design Principles, Data Visualization, Wire framing & Storyboarding, Converting the wireframes into visual design, Prototyping, Various Prototyping Tools, Elements and Widgets. Gestalt Principles and Grids, Layout Expectations, Forms and Data Entry
Screen Design and Layout- Screen planning and purpose, organizing screen elements, ordering of screen data and content , screen navigation and flow, Visually pleasing composition, amount of information, focus and emphasis, presentation information simply and meaningfully
UX Design Tools

Unit V: UX Design for Mobile and Web **(8)**

Mobile Usability Research – The Important Differences from the Desktop. Smartphone vs. Tablet, UI mobile components and patterns, Application frameworks: Types of Mobile Applications: Widgets, Applications, Mobile Design: Elements of Mobile Design
Web user Interface - The Gestalt Principles of Perceptual Organization, The Law of Similarity, Proximity, Familiarity/Meaningfulness, Symmetry, Continuity, The Principle of Closure, 'New' Grouping Laws, The Law of Element Connectedness, The Law of Common Region.
Types of Evaluation research, Usability Testing.

Unit VI: Interaction Technologies **(7)**

Explicit and Implicit Human Computer Interaction – Gesture interfaces, Speech Recognition, Tangible interfaces, Auditory Interfaces, Natural Language Interfaces, User Interfaces and Interaction for Four Widely Used Devices.
Hidden User Interface via Basic smart Devices, Hidden User Interface via Wearable and Implanted Devices, Virtual and Augmented Reality.

Text Books:

1. Interaction Design: Beyond Human-Computer Interaction: Book by Helen Sharp Jenny Preece, and Yvonne Rogers
2. Wilbert O. Galitz'Wiley The Essential Guide to User Interface Design' 3rd Edition Apr 2007

Reference Books:

1. Don Norman, 'The Design of Everyday Things', Basic Books, A member of the Perseus Books Group, (2013)
2. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, 'Designing the User Interface: Strategies for Effective Human-Computer Interaction', Pearson Education Limited (India),(2010)

Online/Web/Other References:

1. https://www.interaction-design.org/courses/user-experience-the-beginner-s-guide
2. https://www.coursera.org/learn/user-experience-design#syllabus

20PECE 801D Artificial Intelligence

Teaching Scheme

Lectures: 3 Hours / Week

Examination Scheme

In Semester: 50 Marks

End Semester: 50 Marks

Credits: 3

Course Objectives:

To facilitate the learner to

1. Learn overview and basics of classic Artificial Intelligence.
2. Understand various intelligent searches and knowledge representation.
3. Understand types of learning used in artificial intelligence.
4. Study applications in Artificial Intelligence.

Course Outcomes:

After completion of the course, students will be able to

1. Build fundamental knowledge of AI, its applications and solve classical AI problems using different AI Techniques
2. Apply intelligent search algorithms on AI problems.
3. Make use of Knowledge Management techniques of AI for reasoning.
4. Make use of various learning techniques to solve the given problem.
5. Examine different topics with various methods of expert system, pattern recognition, natural language processing, nature inspired computing.

Unit I: Introduction to AI **(6)**

Definitions of Artificial Intelligence, History of Artificial Intelligence, Artificial Intelligence Problems, Present state of AI, Intelligent agents, Topics of Artificial Intelligence: Learning Systems, Knowledge Representation and Reasoning, Planning, Knowledge Acquisition, Intelligent Search, Logic Programming, Soft Computing, Management of Imprecision and Uncertainty, Branches and applications of Artificial Intelligence.

Unit II: Uninformed search and modelling a search problem **(7)**

Generate-and-Test, Search Techniques: Depth First Search, Breadth First Search, Production Systems: Traveling Salesman Problem, Water-Jug Problem, State Space Representation, State Space Search, Tic-Tac-Toe as a State Space.

Unit III: Heuristic Search Techniques (8)

Best First Search Algorithm, Hill Climbing, Simulated Annealing, A* Algorithm, Problem Reduction, AND–OR Graphs, The AO* Algorithm, Towers of Hanoi Problem, Constraints Satisfaction: crypt-arithmetic problem, mini-max algorithm.

Unit IV: Knowledge Management (7)

Knowledge Management, Types of Knowledge: Declarative Knowledge, Procedural Knowledge, Knowledge Representation, Approaches to Knowledge Representation, Issues in Knowledge Representation, First-order Logic: Basic Predicate Representations, Conversion of WFF to Clause Form, Resolution, Unification, Resolution Examples, Reasoning, monotonic and non-monotonic reasoning.

Unit V: Learning (7)

Types of Learning: Rote Learning, Learning by General Problem Solving, Concept Learning, Learning by Analogy, learning problems and designing the learning systems, Reinforcement learning.

Unit VI: Applications in Artificial Intelligence (7)

Game Playing, Expert Systems, Natural Language Processing, Pattern Recognition, Recommendation system, Nature Inspired Computing.

Text Books:

1. Vinod Chandra S. S., Anand Harendra S., 'Artificial Intelligence and machine learning', PHI, (2014), ISBN 978-81-203-4934-6.
2. Kulkarni P., Joshi P., 'Artificial Intelligence: Building Intelligent Systems', PHI Learning, (2015), ISBN 978-81-203-5046-5.

Reference Books:

1. Peter, Norvig, 'Artificial Intelligence: A Modern Approach', Pearson, (3rd edition), (2014), ISBN-0-13-103805-2.
2. Elaine Rich, Kevin Knight and Nair, 'Artificial Intelligence', Tata McGraw – Hill, (3rd edition), (2012), ISBN-978-0-07-008770-5.
3. Bratko I., 'Prolog Programming for Artificial Intelligence', Pearson Education, (3rd edition), (2004).
4. Tom M. Michell, 'Machine Learning', McGraw Hill Education, Indian edition (2013), ISBN-13: 978-1-25-909695-2.

5. Ethem Alpaydin, 'Introduction to Machine Learning', PHI, (2006), ISBN-81-203-2791-8.

Online/Web/Other References:

1. https://nptel.ac.in/courses/106/105/106105077/

2. https://nptel.ac.in/courses/106/106/106106126/

3. https://onlinecourses.nptel.ac.in/noc19_me71/preview

4. https://onlinecourses.nptel.ac.in/noc20_cs42/preview

20PECE 802C Information Retrieval

Teaching Scheme

Lectures: 3 Hours / Week

Examination Scheme

In Semester: 50 Marks

End Semester: 50 Marks

Credits: 3

Course Objectives:

To facilitate the learner with

1. Concepts of information retrieval
2. Indexing techniques and information retrieval system
3. Text classification and vector space classification
4. The latest trends in information retrieval

Course Outcomes:

After completion of the course, students will be able to

1. Model the working of information retrieval search system
2. Analyze search strategies used in Information retrieval system
3. Design techniques for information retrieval system
4. Understand the latest trends in information retrieval

Unit I: Introduction to Information Retrieval (7)

Information retrieval process, Indexing, Processing Boolean queries, Term vocabulary and postings lists, document delineation and character sequence decoding, determining vocabulary of terms.

Unit II: Scoring, term weighting and vector space model (7)

Parametric and zone indexes, Term frequency and weighting, Vector space model for scoring, variant tf-idf functions, Components of an Information retrieval system.

Unit III: Text classification -Naive Bayes and Vector space classification (7)

Naive Bayes text classification, Bernoulli model, Properties of Naive Bayes, Feature selection, document representation and measures of relatedness in vector spaces, Rocchio classification, KNN, Linear vs Non linear classifiers, Classification with more than two classes, the bias variance tradeoff

Unit IV: Evaluation in Information Retrieval **(7)**

Information retrieval system evaluation, standard test collections, Evaluation of unranked retrieval sets, evaluation of ranked retrieval sets, Assessing relevance, System quality and user
utility, results snippets.

Unit V: Web search basics and Link Analysis **(7)**

Web characteristics, advertising as the economic model, The search user experience, Index size and estimation, Near duplicates and shingling, Web crawling and indexes, distributing indexes, connectivity servers. The web as a graph, Page rank, Hubs and authorities

Unit VI: Trends in Information Retrieval **(7)**

Case study: Google analytics, Search engine optimization, Ranking algorithms,Recommendation systems, Collaborative Filtering

Text Books:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schutze, Introduction to Information Retrieval, Cambridge University Press. 2008.

Reference Books:

1. Grigoris Antoniou and Frank van Harmelen, A semantic Web Primer, Massachusetts

Online/Web/Other References:

1. http://nlp.stanford.edu/IR-book/information-retrieval-book.html

20PECE 802E Introduction to Blockchain

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:
To facilitate the learner to

1. Learn the underlying blockchain technology.
2. Learn and Explore blockchain platforms such as Ethereum, Hyperledger to build blockchain applications.
3. Understand use of cryptocurrency and smart contract.
4. Understand use of blockchain in various domains like supply chain management, healthcare, IoT etc.

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

1. Apply fundamental concepts of blockchain to understand the working of blockchain.
2. Make use of blockchain platforms such as Ethereum, Hyperledger to build blockchain applications.
3. Make use of Cryptocurrency and Smart Contract in real world applications.
4. Explore applications of Blockchain in domains like supply chain management, healthcare, IoT etc.

Unit I: BLOCKCHAIN FUNDAMENTALS (6)

Basics of Blockchain-Architecture, features, Types (Public, Private, Hybrid), working of blockchain, distributed ledger, wallets, Hash, Consensus mechanism and Mining, Smart contract, cryptocurrency.
Blockchain Technology: Applications, opportunity & challenges.

Unit II: CRYPTOGRAPHY and CONSENSUS MECHANISM (7)

Use of Cryptography in Blockchain, symmetric key and asymmetric-key cryptography algorithms, hash functions, SHA-256, digital signature,merkel trees.

Unit V: Machine learning (8)

Supervised, unsupervised learning; Classification, Clustering; Time series analysis, basic data analysis using python: libraries,functions.

Text Analysis: Text Pre-processing, Topic modelling algorithms, Text Similarity measure.

Unit VI: Big Data Trends and applications (7)

Exploratory data analysis, Big data Visualization using python;

IoT and big data, Edge computing, Hybrid cloud.

Applications of Big data, Case study: E-commerce, healthcare.

Text Books:

1 "Data Science and Big Data Analytics", Wiley, 1stEdition (January 2015)
2 "Big Data, Black Book" ,Dreamtech Press (27 May 2015),ISBN-13-978-9351197577

Reference Books:

1 Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game",MC Press(November 2012)
2 J.Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big Data for Dummies", 1st Edition (April 2013)
3 Tom White, "Hadoop: The Definitive Guide", O′Reilly, 3rdedition (June 2012)
4 Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database System concepts",McGraw Hill Education, 6thEdition (December 2013).
5 Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packt Publishing (November 2013)
6 Shiva Achari ,"Hadoop Essentials - Tackling the Challenges of Big Data with Hadoop" ,Packt Publishing(April 2015), ISBN:978-1-78439-668-8

Online/Web/Other References:

1 https://nptel.ac.in/courses/106/104/106104189/
2 https://hadoop.apache.org/docs/stable/
3 https://kafka.apache.org/documentation/
4 https://spark.apache.org/

20CE 801L Information Security Laboratory

Teaching Scheme
Practical: 4 Hours/week

Examination Scheme
In Semester : 25 Marks
Oral : 25 Marks
Credits: 2

Course Objectives:

To Facilitate the Learners to:-

1.Understand Basic CryptographyAlgorithms
2.Learn various techniques for secure data transmission
3.Recognize the need of Network Perimeter Security
4.4.Learn various techniques used for common attacks

Course Outcomes:

By taking this course the learner will be able to:-

1. Implement Standard CryptographyAlgorithms
2. Apply the digital signature for authentication
3. Apply packet filtering concept to configure Firewall
4. Demonstrate common attacks

Sample /Suggested List of Assignments:

1. Implement DES algorithm

2. Implement RSAalgorithms

3. Implement Message Digest Algorithm and demonstrate the collision resistance property

4. Implementation of Diffie Hellman Key exchange for sharing the secret key.

5. 2 users are doing business online. Develop and demonstrate suitable solutions which will take care of user authentication along with Non repudiation.

6. Simulation of packet Filtering concepts.

7. Create a small application to demonstrate attacks (e.g SQL injection ,Cross Site scripting)

8. Develop and demonstrate how the contents of the web site will be made secure against the common attacks.

9. Case Study - Enterprise network Security/ Wireless Security / Security Information and Event Management

20PECE 801LA Introduction to Natural Language Processing Laboratory

Teaching Scheme

Practical: 2 Hours / Week

Examination Scheme

In Semester: 25 Marks
Oral : 25 Marks
Credits: 1

Prerequisite:

Course Objectives:

To facilitate the learner to

1. develop problem solving abilities for natural language processing
2. apply algorithmic strategies while solving problems
3. develop time and space efficient algorithms

Course Outcomes:

After completion of the course, students will be able to

1. Develop programs for natural language processing applications.
2. Design test cases to solve problems for pervasiveness,embedded security and NLP applications.

Suggestive List of Assignments

Group A

1. Write a program using Scala/ Python/ C++ using Eclipse to correct the spelling of English paragraphs.

Group B (Any two)

Using Programming language Python and Natural Language Tool Kit (NLTK) perform following

1. Apply Simple language processing for 10 phonetics Indian languages (Marathi or mother-tongue)
2. Lab on sentiment analysis
3. Lab on Cross Lingual information retrieval
4. Lab on document summarization

Group C

1. Study and implementation of research paper in Multidisciplinary NLP using open source tool.

20PECE 801LB User Experience Design Laboratory

Teaching Scheme

Practical: 2 Hours / Week

Examination Scheme

In Semester: 25 Marks
Oral : 25 Marks
Credits: 1

Prerequisite:

Course Objectives:

To facilitate the learner to

1. Understand users' needs, experiences, behaviours and goals.
2. Learn how visual perception affects the viewing experience
3. Explain Why you made design decisions, through presentations of assignments

Course Outcomes:

After completion of the course, students will be able to

1. Discover the techniques used for understanding of users, what they need, what they value, their abilities, and also their limitations
2. Design innovative and user friendly interfaces for mobile and web applications.
3. Criticize existing interface designs, identify areas of improvement and then create better services and products to make user experience better.
4. Discover the industry-standard tools and specific project deliverables in UI/UX

Suggestive List of Assignments

1. Design user persona for the users of selected product / system and Conduct a contextual inquiry for selected product / system.
2. Heuristic evaluation on a computer prototype developed by your classmates.
3. Design of User interface for the system using various interaction styles.
4. Design appropriate icons pertaining to a given domain. (Eg. Greeting cards)
5. Design a Mobile App/Website that can help people to sell their handmade products in metro cities

6. Improve Instagram with a new, innovative feature, which stands out from other image apps.
7. Redesign a page from the job portal you like (preferably a complex screen). Justify your selection and the changes/design you made. Document your design process on Notion.
8. ATM machine/KIOSK screen design for rural people
9. Tool exploration Adobe XD, Figma

20PECE 801LD Artificial Intelligence Laboratory

Teaching Scheme

Practical: 2 Hours / Week

Examination Scheme

In Semester: 25 Marks

Oral: 25 Marks

Credits: 1

Prerequisite:

Course Objectives:

To facilitate the learner to

1. Experiment Artificial Intelligence concepts from syllabus.
2. Experiment AI searches like A*, Min-max algorithm.
3. Understand monotonic and non-monotonic knowledge representation.
4. Experiment classification and clustering algorithms.

Course Outcomes:

After completion of the course, students will be able to

1. Implement various uninformed searching techniques.
2. Implement various Heuristic searching techniques.
3. Apply Knowledge Management techniques to implement Expert system.
4. Implement unification for the given expression.

Suggestive List of Assignments

Group A : (Mandatory)

1. Implement DFS/BFS for graph problem.
2. Implement simple water jug problem using DFS or BFS.
3. Implement Best first search algorithm
4. Implement A* algorithm for graph problem

Group B: (Any Two)

1. Implement A* algorithm for 8 puzzle problem
2. Write a program to implement Min-max algorithm for game playing
3. Implement Unification algorithm

Group C

1. Represent knowledge using AIML/Prolog by implementing small expert system

20HDM801 Deep Learning and Applications

Teaching Scheme
Lectures: 3 Hours / Week

Examination Scheme
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Prerequisite: 20CE404 Machine Learning

Course Objectives:

1. To be familiar with Deep learning algorithms and applications.
2. To get exposure to Convolutional Neural Networks
3. To gain advanced knowledge of Recurrent Neural Networks and LSTM for given data.
4. To get exposure to Deep learning algorithms in NLP Applications .
5. To gain advanced knowledge of Pretrained networks and advanced deep neural networks.

Course Outcomes:

At the end of this course, students will be able to:-

1. Make use of deep learning concepts and Popular open source libraries
2. Apply Convolutional Neural Networks algorithm for given problem
3. Experiment with concepts of Recurrent Neural Networks and LSTM for given data.
4. Experiment with Deep learning algorithms in NLP Applications .
5. Experiment with Pretrained networks and advanced deep neural networks

Course Contents:

Section 1: Basics of Deep learning and Convolutional Neural Networks

Linear Algebra, Artificial intelligence, machine learning, and deep learning, mathematical building blocks of neural networks, binary classification, a multiclass classification, Confusion Matrix for multi class classifiers. Understanding convolutional neural networks (convnets), Using a pre trained convnet, Visualizing what convnets learn

Section 2: Deep learning for sequential data and Recurrent Neural Networks

Working with text data, One-hot encoding of words and characters, Using word embeddings, Understanding recurrent neural networks, Understanding the LSTM and GRU layers, Deep Learning in Question Answering over Knowledge Base, Deep Learning in Machine Comprehension, Deep Learning in Sentiment Analysis

Section 3: Deep Learning for Complex Problems and Aututoencoders

Text generation with Long short term memory (LSTM) , Generative Adversarial Networks Generative recurrent networks, Text processing with LSTM, Generating images with autoencoders, Deep Learning for Board Games

Text Books:

1. "Deep Learning: A Practical Approach Using Python", François Chollet, ISBN : 13-9781617294433, MANNING publishing, Ist edition, 2021

2. "Python Deep Learning, Next generation techniques to revolutionize computer vision, AI, speech and data analysis", Valentino Zocca, Gianmario Spacagna, Daniel Slater, Peter Roelants, , Packt Publishing, Ist edition, 2017, ISBN: 13- 978-1786464453

3. "Deep Learning for Natural Language Processing", Jason Brownlee, 2017 Jason Brownlee. All Rights Reserved. Edition: v1.1 (eBook), ISBN : 9789352136094

4. "Deep Learning in Natural Language Processing", Li Deng , Yang Liu, Springer Nature, 2018, ISBN 978-981-10-5208-8 (eBook)

Reference Books:

1. "Deep Learning Using Python", S Lovelyn Rose, L Ashok Kumar, D Karthika Renuka, Wiley Publisher, 2019, ISBN: 13- 978-812657991
2. "Deep Learning", Ian Goodfellow and Yoshua Bengio and Aaron Courville, MIT Press Ltd., 2017, ISBN: 9780262035613
3. "Deep Learning – A Practitioner's approach", Josh Patterson and Adam Gibson, O'Reilly Publication, 1st edition , 2017 ISBN : 9789352136049

Web resources:

https://d2l.ai/d2l-en.pdf: Dive into Deep Learning Release 0.16.5, Aston Zhang, Zachary C. Lipton, Mu Li, and Alexander J. Smola Jun,

http://ling.snu.ac.kr/class/AI_Agent/deep_learning_for_nlp.pdf: Deep Learning for Natural Language Processing, Jason Brownlee.

20HDM801L Deep Learning and Applications Laboratory

Teaching Scheme
Practical: 2 Hours / Week

Examination Scheme
In Semester: 25 Marks
Oral: 25 Marks
Credit: 1

The laboratory work for the Deep Learning and Applications (DLA) course includes implementation of deep neural network models for various applications. Students will work on image data and sequential data in the assignment. Students are encouraged to do variation in data for the assignments. Students will experiment with values of parameters/ hyper parameters and parameters in models for better accuracy. DLA aspirants will select a deep neural network model and data of their interest implemented in earlier assignments to write one paper as a part of the last assignment. In this assignment they are expected to do literature study from similar domains and compare their results with already existing research done by other researchers.

Suggestive List of Assignments

Benchmark Datasets for Research:
https://www.kaggle.com/sudalairajkumar/novel-corona-virus-2019-dataset
- **https://www.kaggle.com/imdevskp/corona-virus-report**
- **https://data.humdata.org/dataset**
- **https://ieee-dataport.org/open-access/corona-virus-covid-19-tweets-dataset**
- **https://data.world/datasets/covid-19Datasets**
- **https://github.com/datasets/covid-19**
- **https://www.dimensions.ai/news/dimensions-is-facilitating-access-to-covid-19-research/**
- **https://www.sirm.org/category/senza-categoria/covid-19/**
- **https://dev.to/anujgupta/google-s-25-million-datasets-a-perfect-gift-for-aspiring-datascientists-3ekh**
- **https://github.com/CSSEGISandData/COVID-19**
- **https://www.kaggle.com/manoj9april/imbd-sentiment-classification-dataset**
- **https://www.kaggle.com/c/digit-recognizer/data**

--Experiment with Data representations for neural networks:Manipulating tensors, tensor operations
--Training a convnet from scratch on a small dataset
--Experiment with pre trained convnet to visualizing what convnets learn: Implement CNN for given data : Classification of characters
–Implement model for word embeddings using IMDB data, train and evaluate
--Implement RNN for given data: Speech recognition or similar application
--Experiment with Pretrained networks/ autoencoders
--Prepare paper for: work with online/ real time data and any DL technique

20OE801 Open Elective-III

20OE801 Open Elective-III			**Eligible Departments**				
Sr. No.	**Course Code**	**Course Title**	**EnTC**	**Comp**	**IT**	**Mech**	**Instru**
1	20OE801A	Big Data and Analytics	Y	Y	Y	Y	Y
2	20OE801B	Cyber Physical Systems	Y	Y	Y	N	Y
3	20OE801C	Digital Control	Y	N	N	Y	Y
4	20OE801D	Industrial Engineering and Management	Y	Y	Y	Y	Y
5	20OE801E	Introduction to Cyber-crime and Forensics	Y	Y	Y	Y	Y
6	20OE801F	Instrumentation in Food and Agriculture	Y	Y	Y	Y	Y
7	20OE801G	Medical IoT	Y	Y	Y	N	Y
8	20OE801H	Quantum Computing	Y	Y	Y	N	Y
9	20OE801I	Renewable Energy Sources	Y	Y	Y	Y	Y
10	20OE801J	Soft Computing	Y	Y	Y	Y	Y
11	20OE801K	Software Testing and Quality Assurance	Y	Y	Y	Y	Y

20OE802 Open Elective-IV

20OE802 Open Elective-IV			**Eligible Departments**				
Sr. No.	**Course Code**	**Course Title**	**EnTC**	**Comp**	**IT**	**Mech**	**Instru**
1	20OE802A	Applied statistics with R Programming	Y	N	N	Y	Y
2	20OE802B	Automobile Engineering	Y	Y	Y	N	Y
3	20OE802C	Autonomous Robots	N	Y	Y	Y	N
4	20OE802D	Building Automation and Energy Audit	Y	Y	Y	Y	N
5	20OE802E	Data Analysis and Visualization	Y	N	N	Y	Y
6	20OE802F	Data Science using Python	Y	N	N	Y	Y
7	20OE802G	Industrial Drives and Control	Y	Y	Y	Y	N
8	20OE802H	Smart Sensors and Structures	Y	Y	Y	Y	N
9	20OE802I	Wireless Networks	N	Y	Y	N	Y

20OE 801A Big Data And Analytics

Teaching Scheme
Lectures**:** 3 Hours / Week

Examination scheme:
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:
To facilitate the learner to
1 Understand the concepts, challenges and techniques of Big data and Big data analytics
2 Understand the concepts of Hadoop, Map Reduce framework , Spark for Big data analytics
3 Apply skills and tools to manage and analyze the big data
4 Understand latest big data trends and applications.

Course Outcomes:
After completion of the course, students will be able to
1 Apply basic concepts of big data for the various applications.
2 Apply data analytics life cycle to real-world big data applications
3 Choose Hadoop ecosystem components based on requirement of application
4 Compare Spark and Hadoop architecture
5 Compare various methods used in data Analytics and big data trends.

Unit I: Introduction (6)
Database Management Systems, Structured Data, SQL. Unstructured data, NOSQL, Advantages of NOSQL, Comparative study of SQL and NOSQL. Big data overview, characteristics of Big Data, Case study- SAP HANA.

Unit II: Data Analytic Life Cycle (6)
Data Analytical Architecture, drivers of Big Data, Emerging Big Data Ecosystem and new approach. Data Analytic Life Cycle: Discovery, Data preparation, Model Planning, Model Building, Communicate Results, Opearationalize. Case Study: GINA

Unit III: Big Data Architectures, Hadoop (8)
Introduction to Big Data and Hadoop, Building blocks of hadoop: Ecosystem, HDFS, HBASE, YARN, Map Reduce working.

Unit IV: Introduction to Spark (7)
Spark Framework, Architecture of Spark, Resilient Distributed Datasets, Data Sharing using Spark RDD, Operations in Spark;
Introduction to Kafka: need, use cases, components.

Unit V: Machine learning (8)

Supervised, unsupervised learning; Classification, Clustering; Time series analysis, basic data analysis using python: libraries,functions.

Text Analysis: Text Pre-processing, Topic modelling algorithms, Text Similarity measure.

Unit VI: Big Data Trends and applications (7)

Exploratory data analysis, Big data Visualization using python;

IoT and big data, Edge computing, Hybrid cloud.

Applications of Big data, Case study: E-commerce, healthcare.

Text Books:

1 "Data Science and Big Data Analytics", Wiley, 1stEdition (January 2015)
2 "Big Data, Black Book" ,Dreamtech Press (27 May 2015),ISBN-13-978-9351197577

Reference Books:

1 Arvind Sathi, "Big Data Analytics: Disruptive Technologies for Changing the Game",MC Press(November 2012)
2 J.Hurwitz, Alan Nugent, Fern Halper, Marcia Kaufman, "Big Data for Dummies", 1st Edition (April 2013)
3 Tom White, "Hadoop: The Definitive Guide", O′Reilly, 3rdedition (June 2012)
4 Abraham Silberschatz, Henry Korth, S. Sudarshan, "Database System concepts",McGraw Hill Education, 6thEdition (December 2013).
5 Vignesh Prajapati, "Big Data Analytics with R and Hadoop", Packt Publishing (November 2013)
6 Shiva Achari ,"Hadoop Essentials - Tackling the Challenges of Big Data with Hadoop" ,Packt Publishing(April 2015), ISBN:978-1-78439-668-8

Online/Web/Other References:

1 https://nptel.ac.in/courses/106/104/106104189/
2 https://hadoop.apache.org/docs/stable/
3 https://kafka.apache.org/documentation/
4 https://spark.apache.org/

MKSSS"s Cummins College of Engineering for Women, Pune
(An Autonomous Institute Affiliated to SavitribaiPhule Pune University)

Page 49

20OE 801E Introduction to Cyber Crime and Forensics

Teaching Scheme Examination scheme:
Lectures: 3 Hours / Week In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Course Objectives:

To facilitate the learners to-
1 Learn fundamental concepts of cyber security

2 Understand Security challenges presented by mobile devices and information system access in cybercrime world
3 Learn tools used in Computer forensics and Cyber Applications
4 Understand risks associated with social media networking
Course Outcomes:

By taking this course the learner will be able to-

1 Classify Cyber Crimes
2 Identify threats and risks within context of Cyber Security
3 Outline Relevant laws and Acts in Cyber Security
4 Appraise various roles and tools used in Cyber Security/ Digital forensics

Unit I: Introduction to Cybercrime: (7)
Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, Ethical dimensions of cybercrime,Ethics and Morality,Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective
on Cybercrimes

Unit II: Cyber Offenses: (7)
How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Typical Cyber Crimes like Social Engineering, Cyber stalking, Cyber Defamation, Intellectual property Infringement Botnets: The Fuel for Cybercrime, Dark net

Unit III: Cybercrime:Mobile and Wireless Devices : (8)
Introduction, Trends in Mobility, Financial Frauds in Mobile and Wireless Computing, Security Challenges Posed by Mobile Devices, structure of Sim card, Sim card forensics, Sim card cloning,
Organizational Measures for Handling Mobile,Mobile Apps and cybercrime, Whats app forward frauds, End point detection systems, End point detection systems in devices in organization

Unit IV: Methods Used in Cybercrime: (8)
Introduction, Proxy Servers and Anonymizers,Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow

Unit V: Digital Forensics- (6)
Introduction to Digital Forensics, Forensics Software and Hardware, Evaluating computer forensic
tools , Software tools and Hardware Tools, New Trends, Mobile forensics for android, Sample Case studies.

Unit VI: Cyber Security Tools- (6)
wireshark, Nmap, Nessus, Ncat, Burp Suite, Snort, Nikto Career Opportunities and trends in Cyber
Security.
Text Books:
1 Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA. ISBN 978-81-265-2179-1
2 Information Security & Cyber Laws By Sarika Gupta, Gaurav Gupta,Khanna Publication ISBN: 978-93-810-6824-3 2019
3 Computer Forensics and Investigations Bill Nelson, Amelia Phillips and Christopher Stuart Cengage learning. ISBN 978-81-315-1946-2

Reference Books:
1 Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group
2 Eoghan Casey,”Digital evidence and computer crime Forensic Science,Computers and the Internet , ELSVIER,2011 ISBN 978-0-12-374268-1

20OE 802E Data Analysis and Visualization

Teaching Scheme
Lectures**:** 3 Hours / Week

Examination scheme:
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Prerequisites:

1 Basic Mathematics
2 Basics of Python Programming

Course Objectives:
To facilitate the learners
1 To understand the data analytics and visualization as well as the statistics behind it.
2 To understand and analyze the machine learning methods used in data analysis
3 To understand the modern tools used for data analytics and visualization.

Course Outcomes:
By taking this course, the learner will be able to
1 Develop the knowledge of data analysis and the statistical tools used for analysis
2 Identify the relevant data analysis method for a real time application
3 Select the appropriate data visualization method for the application in hand
4 Understand recent trends in data analysis and visualization

Unit 1: INTRODUCTION TO DATA ANALYTICS (06)
Introduction to Data, Data types and their relationships, Data Analytics workflow, Types of analysis Applications.

Unit 2: BASIC DATA ANALYTICS (08)
Statistical analysis, Attribute correlation, Regression analysis, Dimensionality reduction, Feature extraction and selection, Time series prediction, Hypothesis Analysis
Case study, Python based examples

Unit 3: MACHINE LEARNING FOR DATA ANALYTICS (10)
Data analysis methods used for Clustering, Classification, Regression, Outlier Detection, Time Series Prediction, Anomaly Detection, Association, Recommendation Systems
Case study, Python based examples

Unit 4: DATA VISUALIZATION (10)
Purpose and types of Visualization, Graphical Representation, Multidimensional Visualization, Handling data Cleaning, data reduction for visualization, Sorting and Scaling, Multivariate Glyphs
Case study, Python based examples

Unit 5: RENDS IN DATA ANALYSIS AND VISUALIZATION (08)

Deep Learning for Data Analysis, handling of small and Big Data,
Storytelling and Data Visualization Dashboards
Case study, Python based examples, Demo with tool like Tableau.

Text Books:

1 Dr. Anil Maheshwari, '**Data Analytics'**, McGraw Hill Education (India) Pvt. Ltd. (2017)
2 Dr. Ossama Embarak, **'Data Analysis and Visualization Using Python'**, aPress (2018)

Reference Books:

1 Wes McKenny, **'Python for Data Analysis'**, O'Reilly (2013)
2 Han and Kamber, **'Data Mining: Concepts and Techniques'**, The Morgan Kaufmann Series in Data Management Systems (2011)
3 Christopher Bishop, **'Pattern Recognition and Machine Learning'**, Springer (2010)
4 Edited by Chun-houh Chen, Wolfgang Härdle and Antony Unwin, **'Handbook of Data Visualization'**, Springer (2008)

Web References:

1 Academic use of Tableau - https://www.tableau.com/academic/teaching
2 NPTEL Courses
   a Introduction to Data Analytics https://nptel.ac.in/courses/110/106/110106064/
   b Data Analytics with Python https://nptel.ac.in/courses/106/107/106107220/
   c Python for Data Science https://nptel.ac.in/courses/106/106/106106212/
   d Introduction to Learning Analytics https://nptel.ac.in/courses/127/101/127101012/
   e Data Analytics with Python https://onlinecourses.nptel.ac.in/noc20_cs46/preview

20OE 802F Data Science Using Python

Teaching Scheme
Lectures**:** 3 Hours / Week

Examination scheme:
In Semester: 50 Marks
End Semester: 50 Marks
Credits: 3

Prerequisites:

1 Basic Mathematics
2 Basics of Python Programming

Course Objectives:
To facilitate the learners
1 To understand the data analytics and visualization as well as the statistics behind it.
2 To understand and analyze the machine learning methods used in data analysis
3 To understand the modern tools used for data analytics and visualization.

Course Outcomes:
By taking this course, the learner will be able to
1 Develop the knowledge of data science.
2 Identify the relevant Python method used in data science.
3 Select the appropriate data operation method for the application in hand.
4 Understand recent trends in data science and analysis.

Unit 1: INTRODUCTION TO DATA (06)
Introduction to Data, Data types and their relationships, Handling different types of data using Python, Handling numeric and categorical data using Python

Unit 2: BASIC DATA Processing using NumPy, Pandas (08)
Statistical operations, data cleaning, missing data, indexing, slicing, iterating, attribute selection, dimensionality reduction, Handling tabular data, time series
Case study, Python based examples

Unit 3: MACHINE LEARNING using Sci-Kit, Tensorflow - I (08)
Clustering, Classification, Regression, Outlier Detection
Case study, Python based examples

Unit 4: MACHINE LEARNING using Sci-Kit, Tensorflow- II (08)
Time Series Prediction, Anomaly Detection, Association, Recommendation Systems
Case study, Python based examples

Unit 5: REGRESSION ANALYSIS AND PREDICTIVE ANALYSIS (06)

Introduction to types of analysis - Predictive, descriptive and decision based, Regression analysis, types - linear, logistic, ridge, lasso

Unit 6: DATA VISUALIZATION AND GRAPHICS USING Matplotlib / Seaborn (06)

Basic visualization plots - Area, histogram, bar, Specialized plots - pie, box, scatter, bibble, Waffle, Word clouds, Seaborn, Regression plots
Introduction to Folium, maps with markers, choropleth maps, dashboards

Text Books:

1 Aurélien Géron, '**Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems'**, O'Reilly Media (2017)
2 Samir Madhavan, '**Mastering Python for data science'**, Packt (2015)
3 David Beazley, '**Python CookBook**', O'reilly (2013)
4 Dr. Ossama Embarak, **'Data Analysis and Visualization Using Python'**, aPress (2018)

Reference Books:

1 Wes McKenny, **'Python for Data Analysis'**, O'Reilly (2013)
2 Han and Kamber, **'Data Mining: Concepts and Techniques'**, The Morgan Kaufmann Series in Data Management Systems (2011)
3 Christopher Bishop, **'Pattern Recognition and Machine Learning'**, Springer (2010)
4 Edited by Chun-houh Chen, Wolfgang Härdle and Antony Unwin, **'Handbook of Data Visualization'**, Springer (2008)

Web References:

1 Academic use of Tableau - https://www.tableau.com/academic/teaching
2 NPTEL Courses
  a Python for Data Science https://nptel.ac.in/courses/106/106/106106212/
  b Introduction to Data Analytics https://nptel.ac.in/courses/110/106/110106064/