



SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE

(An Autonomous Institution)

(Approved by AICTE, New Delhi & Affiliated to Pondicherry University)
(Accredited by NBA-AICTE, New Delhi, ISO 9001:2000 Certified Institution &
Accredited by NAAC with "A" Grade)

Madagadipet, Puducherry - 605 107



Department of Artificial Intelligence and Data Science

Minutes of Third BOS Meeting

GD Hall, Training and Placement Cell
Sri Manakula Vinayagar Engineering College

28th August 2021 & 10:00 A.M



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**Department of Artificial Intelligence and Data Science
Minutes of Third Board of Studies**

The Third Board of Studies meeting of Department of Artificial Intelligence and Data Science was held on 28th August 2021 at 10:00 A.M in the GD Hall, Training and Placement Cell, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the BoS meeting

| SI.No | Name of the Member with Designation and official Address | Responsibility in the BoS |
|-------|----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|
| 1 | Dr. J. Madhusudanan, Professor and Head, Department of AI&DS, SMVEC. | Chairman |
| 2 | Dr. M. Thangaraj, Professor & Head, Madurai Kamaraj University, Madurai. | Subject Expert (Academic Council Nominee) |
| 3 | Dr. Chandra Mouli P.V.S.S.R, Associate Professor & Head Central University of Tamil Nadu, Tiruvarur, Tamil Nadu. | Subject Expert (Academic Council Nominee) |
| 4 | Dr. C. Muthu, Professor & Head, Loyola College, Chennai. | Subject Expert (University Nominee) |
| 5 | Dr. Mohanraj Vengadachalam, Machine Learning Lead, Standard Chartered GBS, Chennai. | Representative from Industry |
| 6 | Dr. J. Uthayakumar, Research Head, Genesys Academy, Puducherry. | Postgraduate Alumnus (nominated by the Principal) |
| 7 | Dr. V. Vijayalakshmi Assistant Professor, Department of AI&DS, SMVEC | Internal Member |
| 8 | Dr. K.Kishore Anthuvan Sahayaraj Assistant Professor, Department of AI&DS, SMVEC | Internal Member |

| | | |
|----|--------------------------------------------------------------------------------|-----------------|
| 9 | Prof. M. Ganesan Assistant Professor, Department of CSE, SMVEC | Internal Member |
| 10 | Prof. M. Shanmugam Assistant Professor, Department of CSE, SMVEC | Internal Member |
| 11 | Dr. T. Gayathri Professor, Department of Maths, SMVEC | Internal Member |
| 12 | Dr. R. Sivakumar Associate Professor, Dept. of MBA, SMVEC | Internal Member |
| 13 | Prof. G. Namitha Associate Professor, Dept. of English, SMVEC | Internal Member |
| 14 | Dr. D. Mohan Radheep Associate Professor, Dept. of Physics, SMVEC | Internal Member |

Agenda of the Meeting

1. Discussion and Review of second BoS meeting.
2. To discuss the proctored online End Semester Examination for students admitted in the Academic Year 2020-21. (First Year)
3. To discuss and approve the syllabi for V to VI Semesters under R2020 Regulations for UG Programme B.Tech Artificial Intelligence and Data Science for the students admitted in the year 2020-21.
4. To discuss and approve the syllabi for Professional Electives for V to VI Semesters under R2020 Regulations for UG Programme B.Tech Artificial Intelligence and Data Science for the students admitted in the year 2020-21.
5. Any other item with the permission of chair.

Minutes of the Meeting

Dr. J. Madhusudanan, Chairman, BoS opened the meeting by welcoming and introducing the external members, to the internal and co-opted members and thanked them for accepting to become the member of the Board of Studies and the meeting thereafter deliberated on agenda items that had been approved by the Chairman.

| | |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| BOS/2021/AIDS/UG/3.1 | Discussed and approved the second BoS |
| BOS/2021/AIDS/UG/3.2 | Discussed the proctored online End Semester Examination for the students admitted in the Academic Year 2020-21 (First Semester). |
| BOS/2021/AIDS/UG/3.3 | Syllabi from V to VI semesters for the B.Tech – Artificial Intelligence and Data Science approved with the following suggestions. |

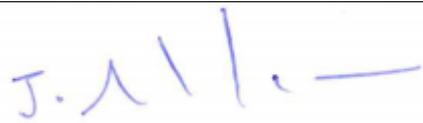
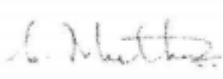
| Sl.No | Regulation | Semester | Subject Name with Code | Unit | Particulars |
|-------|------------|----------|---------------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | R-2020 | V | Deep Learning U20ADT508 | IV&V | Suggested to refine the last two units of “Deep Learning” (U20ADT508) and recommended to add bidirectional RNN, GRU and LSTM |
| 2 | R-2020 | V | Image Processing and Computer Vision U20ADT509 | I,II,III | Suggested to combine image processing and computer vision concepts and keep it as “Image Processing and Computer Vision” (U20ADT509) and replace “Computer Vision” from core paper |

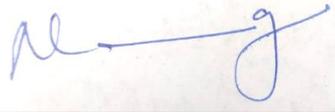
| | | | | | |
|---|--------|----|----------------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | R-2020 | V | Big Data Tools and Techniques U20ADT510 | II | Informed to remove the repetition topics from the “Big Data Tools and Techniques” (U20ADT510) in 2nd unit and also suggested to add spark ML. |
| 4 | R-2020 | V | Deep Learning lab” (U20ADP508 | Lab | Suggested to specify each lab experiment to include deep learning network and dataset |
| 5 | R-2020 | V | Image Processing and Computer Vision lab U20ADP509 | Lab | Suggested to specify each lab experiment to include deep learning network and dataset |
| 6 | R-2020 | V | Big Data Tools and Techniques lab U20ADP510 | Lab | Suggested to add object detection models (YOLO, VGG, VGG16), activity recognition |
| 7 | R-2020 | VI | NLP and Chatbot U20ADT611 | I | Suggested to refine unit I with NLP pre-processing, feature engineering concepts, and Sequence to Sequence |
| 8 | R-2020 | VI | AI and Automation U20ADT612 | IV | Suggested to remove repeated content |
| 9 | R-2020 | VI | Web Technology U20ADT614 | III,IV | Suggested to add Django and PHP |

| | | | | | |
|----|--------|----|----------------------------------|-----|------------------------------------------------------------|
| 10 | R-2020 | VI | NLP and Chatbot Lab U20ADP611 | Lab | Suggested to add Tesseract tool (given in Annexure - I) |
|----|--------|----|----------------------------------|-----|------------------------------------------------------------|

| | |
|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| BOS/2021/AIDS/UG/3.4 | Discussed about the Professional electives of V to VI semester and gave the following suggestions. i. Suggested to redefine the Professional electives subjects as per the industry trends for V and VI Semester and informed to get approval in the next BoS meeting. |
| BOS/2021/AIDS/UG/3.5 | Suggested to give simple mini projects in concerned laboratories for placement purpose. |

The meeting was concluded at 12:30 PM with vote of thanks by **Dr. J. Madhusudan**, Head of Department, Artificial Intelligence and Data Science.

| SI.No | Name of the Member with Designation and official Address | Responsibility in the BoS | Signature |
|-------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------------------------------------------------------------------|
| 1 | Dr. J. Madhusudan , Professor and Head, Department of AI&DS, SMVEC. | Chairman |  |
| 2 | Dr. M. Thangaraj , Professor & Head, Madurai Kamaraj University, Madurai. | Subject Expert |  |
| 3 | Dr. Chandra Mouli P.V.S.S.R. , Associate Professor & Head Central University of Tamil Nadu, Tiruvarur, Tamil Nadu. | Subject Expert |  |
| 4 | Dr. C. Muthu , Professor & Head, Loyola College, Chennai. | Subject Expert |  |
| 5 | Dr. Mohanraj Vengadachalam , Machine Learning Lead, Standard Chartered GBS, Chennai. | Industrial Expert |  |
| 6 | Dr. J. Uthayakumar , Research Head, Genesys Academy, Puducherry. | Member |  |
| 7 | Dr. V. Vijayalakshmi Assistant Professor, Department of AI&DS, SMVEC | Internal Member |  |

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|----|--------------------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------------------|
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| 13 | Prof. G. Namitha, Associate Professor, Dept. of English, SMVEC | Internal Member |  |
| 14 | Dr. D. Mohan Radheep Associate Professor, Dept. of Physics, SMVEC | Internal Member |  |

Annexure – I

(Revised V and VI semester curriculum)

| SEMESTER – V | | |
|-----------------------------------------|--------------------|-------------------------------------------------|
| Sl. No. | Course Code | Course Title |
| Theory | | |
| 1 | U20BST551 | Operational Research |
| 2 | U20ADT508 | Deep Learning |
| 3 | U20ADT509 | Image Processing and Computer Vision |
| 4 | U20ADT510 | Big Data Tools and Techniques |
| 5 | U20ADE5XX | Professional Elective - II |
| 6 | U20XXO5XX | Open Elective - II |
| Practical | | |
| 7 | U20ADP508 | Deep Learning Laboratory |
| 8 | U20ADP509 | Image Processing and Computer Vision Laboratory |
| 9 | U20ADP510 | Big Data Tools and Techniques Laboratory |
| Employability Enhancement Course | | |
| 10 | U20ADC5XX | Certification Course-V |
| 11 | U20ADS504 | Foreign Language/ IELTS |
| 12 | U20ADS505 | Presentation Skills using ICT |
| Mandatory Course | | |
| 13 | U20ADM505 | Indian Constitution |

| SEMESTER – VI | | |
|-----------------------------------------|--------------------|-------------------------------------------------|
| Sl. No. | Course Code | Course Title |
| Theory | | |
| 1 | U20ADT611 | NLP and Chatbot |
| 2 | U20ADT612 | AI and Automation |
| 3 | U20ADT613 | Robotic Process Automation – UI Path |
| 4 | U20ADT614 | Web Technology |
| 5 | U20ADE6XX | Professional Elective - III |
| 6 | U20XXO6XX | Open Elective - III |
| Practical | | |
| 7 | U20ADP611 | NLP and Chatbot Laboratory |
| 8 | U20ADP612 | AI and Automation Laboratory |
| 9 | U20ADP613 | Robotic Process Automation – UI Path Laboratory |
| Employability Enhancement Course | | |
| 10 | U20ADC6XX | Certification Course - VI |
| 11 | U20ADS606 | Foreign Language/ IELTS |
| 12 | U20ADS607 | Technical Seminar |
| 13 | U20ADS608 | NPTEL / MOOC |
| Mandatory Course | | |
| 14 | U20ADM606 | Essence of Indian Traditional Knowledge |

(Semester V and VI - Curriculum and Syllabi R-2020)

| SEMESTER – V | | |
|-----------------------------------------|--------------------|-------------------------------------------------|
| Sl. No. | Course Code | Course Title |
| Theory | | |
| 1 | U20BST551 | Operational Research |
| 2 | U20ADT508 | Deep Learning |
| 3 | U20ADT509 | Image Processing and Computer Vision |
| 4 | U20ADT510 | Big Data Tools and Techniques |
| 5 | U20ADE5XX | Professional Elective - II |
| 6 | U20XXO5XX | Open Elective - II |
| Practical | | |
| 7 | U20ADP508 | Deep Learning Laboratory |
| 8 | U20ADP509 | Image Processing and Computer Vision Laboratory |
| 9 | U20ADP510 | Big Data Tools and Techniques Laboratory |
| Employability Enhancement Course | | |
| 10 | U20ADC5XX | Certification Course-V |
| 11 | U20ADS504 | Foreign Language/ IELTS |
| 12 | U20ADS505 | Presentation Skills using ICT |
| Mandatory Course | | |
| 13 | U20ADM505 | Indian Constitution |

U20BST551

OPERATIONS RESEARCH

| L | T | P | C | Hrs |
|---|---|---|---|-----|
| 3 | 1 | 0 | 4 | 60 |

Course Objectives

- To understand the role of operation research in decision making.
- To provide knowledge and training in using optimization techniques.
- To impart the various operation research models for effective problem solving.
- To know the basics and the methods of solving game theory and network problems.
- To acquire knowledge in principles of Queuing Theory.

Course Outcomes

After completion of the course, students shall have ability to

CO1 - Understand the characteristics of different types of decision-making environments. **(K2)**

CO2 - Solve Transportation Models and Assignment Models. **(K3 & K4)**

CO3 - Design new simple models by using critical path method. **(K3 & K4)**

CO4 – Understand the applications of game theory. **(K2)**

CO5 – Apply Queuing theory and solve problems related to it. **(K3)**

UNIT I LINEAR PROGRAMMING

(12 Hrs)

Stages of development of Operations Research – Applications of Operations Research – Limitations of Operations – Introduction to Linear Programming – Graphical Method – Simplex Method - Duality.

UNIT II TRANSPORTATION PROBLEMS

(12 Hrs)

Basic feasible solution by different methods - Fixing optimal solutions - Stepping stone method - MODI method - Assignment problem – Formulation – Optimal solution.

UNIT III NETWORKS MODELS

(12 Hrs)

Shortest Path Problem – Floyd’s Algorithm – Minimum Spanning Tree Problem - CPM/PERT – Crashing of a Project network.

UNIT IV THEORY OF GAMES

(12 Hrs)

Rectangular games -- Minimax theorem -- graphical solution of 2 x n or m x 2 games -- game with mixed strategies.

UNIT V INVENTORY MODELS

(12 Hrs)

Basic Waiting Line Models: (M/M/1):(GD/α/α) – (M/M1):(GD/N/α) – (M/M/C):(GD/α/α) – (M/M/C):(GD/N/α).

Text Books

1. Michael W.Carter, Camille C.Price, Ghaith Rabadi, “Operation Research – A Practical Introduction” Chapman and Hall/CRC; 2nd Edition 2018.
2. Jongmin Yong, “Optimization Theory: A concise Introduction”, World scientific publishing company, 2018.
3. John F. Shortle, James M. Thompson, Donald Gross, Carl M. Harris, “Fundamentals of Queuing Theory”, 5th Edition, 2018.

Reference Books

1. A. RaviRavindran, “Operations Research Methodologies”, Taylor and Francis, 2019.
2. Hasting, Kevin J. “Introduction to the Mathematics of Operations Research with Mathematics”, Taylor and Francis, 2019.
3. Michael W.Carter, Camille C. Price, GhaithRabadi, Operations Research: A Practical Introduction” CRC press, 2017.
4. J. K. Sharma, “Operations Research Theory and applications”, Macmillan IndiaLtd, 5th Edition, 2013.
5. Hamdy A. Taha, “Operations Research: An Introduction”, Pearson Publications, 10th Edition, 2020.

Web Resources

1. <https://www.researchgate.net/publication/313880623>
2. <https://nptel.ac.in/courses/117/103/117103017/>
3. <https://nptel.ac.in/courses/111/107/111107128/>
4. <https://youtu.be/MrOwmSYqkiE>
5. <https://youtu.be/4U3B5lr-MqM>

COs/POs/PSOs Mapping

| COs | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes (PSOs) | | |
|-----|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|----------------------------------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 1 | 3 | 3 | 3 | 2 | - | 1 | - | - | - | - | - | - | - | - | - |
| 2 | 3 | 3 | 3 | 2 | - | 1 | - | - | - | - | - | - | - | - | - |
| 3 | 3 | 3 | 3 | 2 | - | 1 | - | - | - | - | 2 | 1 | - | - | - |
| 4 | 3 | 3 | 3 | 2 | - | - | - | - | - | - | 2 | 1 | - | - | - |
| 5 | 2 | 3 | 3 | 2 | - | - | - | - | - | - | 2 | - | - | - | - |

| | | | | | | |
|------------------|----------------------|----------|----------|----------|----------|------------|
| U20ADT508 | DEEP LEARNING | L | T | P | C | Hrs |
| | | 3 | 0 | 0 | 3 | 45 |

Course Objectives

- To understand Neural Network basic Architecture and various Activation functions.
- To understand CNN and different Neural network model
- Able to apply different optimization techniques to fine tune the deep learning models
- Study about various Deep learning models
- Understand the deep reinforcement learning

Course Outcomes

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

CO1 - Understand basic neural network activation function and loss functions. **(K2)**

CO2 - Able to apply different Convolutional Neural Network. **(K2)**

CO3 - Understand different deep learning regularization and optimization methods. **(K2)**

CO4 - Understand different Neural Network Model. **(K2)**

CO5 - Understand Neural Style transfer and autoencoding process. **(K2)**

UNIT I FOUNDATIONS OF NEURAL NETWORKS (9 Hrs)

Neural Networks: The Biological Neuron-The Perceptron - Multilayer Feed - Forward Networks - Training Neural Networks: Backpropagation Learning - Activation Functions: Linear – Sigmoid – Tanh - Hard Tanh – Softmax -Rectified Linear - Loss Functions: Loss Function Notation - Loss Functions for Regression - Loss Functions for Classification - Loss Functions for Reconstruction - Hyperparameters: Learning Rate – Momentum – Sparsity -Understanding Convolutions.

UNIT II CNN (9 Hrs)

CNN Building Blocks: Layer Type - Convolutional Layer - Activation Layer - Pooling Layer - Fully Connected Layer -Batch Normalization – Dropout - Common architecture and Training Pattern - LeNet-5 - AlexNet - VGG16 net - ResNet.

UNIT III REGULARIZATION AND OPTIMIZATION (9 Hrs)

Regularization - Dropout Regularization - Normalizing Inputs- Vanishing / Exploding Gradients - Weight Initialization - Numerical Approximation of Gradients - Gradient Checking. Mini-batch Gradient Descent - Exponentially Weighted Averages - Bias Correction in Exponentially Weighted Averages - Gradient Descent with Momentum - Adam Optimization Algorithm - Learning Rate Decay - The Problem of Local Optima - Transfer learning and Fine tuning.

UNIT IV RNN (9 Hrs)

Building and improving Feed Forward Language Model - RNN - Bidirectional RNN – LSTM – GRU - Seq2Seq paradigm - multilength Seq2Seq.

UNIT V DEEP REINFORCEMENT LEARNING (9 Hrs)

Value iteration - Q Learning - Basic deep Q Learning - Policy gradient method - actor critic method - Experience replay - Basic autoencoding - convolutional autoencoding - variational autoencoding - Generative Adversarial Network (GAN).

Text Books

1. Eugene Charniak, "Introduction to Deep Learning", MIT Press, 2019.
2. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 1st Edition, 2016
3. Charu C. Aggarwal, "Neural Networks and Deep Learning", Springer, 2018

Reference Books

1. Cosma Rohilla Shalizi, "Advanced Data Analysis from an Elementary Point of View", Cambridge University Press, 2015.
2. Deng & Yu, "Deep Learning: Methods and Applications", Now Publishers, 2014
3. Michael Nielsen, "Neural Networks and Deep Learning", Determination Press, 2015.
4. Josh Patterson, Adam Gibson, "Deep Learning A Practitioner's Approach", O'Reilly Media, 2017.
5. Nikhil Buduma, "Fundamentals of Deep Learning", O'Reilly, 2017.

Web Resources

1. <https://nptel.ac.in/courses/106/106/106106184/>
2. <http://deeplearning.net/Dj>
3. <https://www.guru99.com/deep-learning-tutorial.html>
4. <https://www.coursera.org/specializations/deep-learning>
5. <http://neuralnetworksanddeeplearning.com/>

COs/POs/PSOs Mapping

| Cos | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes (PSOs) | | |
|----------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|----------------------------------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 1 | 2 | 2 | 2 | 3 | 3 | 2 | - | 1 | - | - | - | - | 2 | 2 | 2 |
| 2 | 2 | 3 | 3 | 3 | 2 | 1 | 1 | - | - | 1 | - | 1 | 2 | 2 | 1 |
| 3 | 2 | 3 | 3 | 2 | 1 | - | 1 | 1 | - | - | - | - | 2 | 2 | 1 |
| 4 | 2 | 2 | 3 | 2 | 3 | 2 | - | - | 1 | - | - | 1 | 2 | 3 | 1 |
| 5 | 3 | 2 | 2 | 3 | 3 | 1 | - | - | - | - | 1 | - | 2 | 2 | 2 |

| | | | | | | |
|------------------|-------------------------------------------------|----------|----------|----------|----------|------------|
| U20ADT509 | IMAGE PROCESSING AND COMPUTER VISION | L | T | P | C | Hrs |
| | | 3 | 0 | 0 | 3 | 45 |

Course Objectives

- To understand basic image processing concepts.
- To study different object segmentation methods.
- To understand different shape invariant in images and videos.
- Able to understand various object recognition methods.
- Study about Texture and object motion analysis.

Course Outcomes

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

- CO1** - Recognize and describe both the theoretical and practical aspects of computing with images. **(K2)**
CO2 - Understand object segmentation methods. **(K2)**
CO3 - Understand shape representation methods. **(K2)**
CO4 - Apply object recognition and optimization techniques. **(K3)**
CO5 - Understand motion analysis in video. **(K2)**

UNIT I INTRODUCTION TO DIGITIZED IMAGE **(9 Hrs)**

Basic Concepts - Image Digitization – Sampling – Quantization - colour images - digital image properties - Image data representation - Traditional data structure - Hierarchical data structure - Image Pre-processing - Pixel brightness transformation - geometric transformation - Image smoothing - Edge Detectors – Scaling - Canny Edge Detector - edges in multispectral images - image restoration - Inverse filtration - wiener filtration.

UNIT II OBJECT SEGMENTATION **(9 Hrs)**

Thresholding - Edge based segmentation - edge image thresholding - edge relaxation - border tracing - Hough transforms - border detection - region construction from borders - region growing segmentation - region merging -region splitting - splitting and merging - matching.

UNIT III SHAPE REPRESENTATION **(9 Hrs)**

Region identification - contour based shape representation - simple geometric border representation - Fourier transform of boundaries - Shape invariants - region based shape representation - simple scalar region descriptors –moments - convex hull - region decomposition - region neighbourhood graphs.

UNIT IV OBJECT RECOGNITION **(9 Hrs)**

Knowledge representation - statistical pattern recognition - Syntactic pattern recognition - optimization techniques in recognition - Mathematical Morphology - Morphological transformation – dilation – erosion - opening and closing -homotopic transformation – skeleton - thinning and thickening.

UNIT V TEXTURE AND MOTION ANALYSIS **(9 Hrs)**

Statistical texture description - Syntactic texture description - hybrid texture description - texture recognition - Motion Analysis - Optical flow method - detection of interest points.

Text Books

1. Milan Sonka, Vaclav Hlavac, Roger Boyle "Image Processing, Analysis and Machine Vision", Springer US,2013
2. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison Wesley Longman, Inc., 1992
3. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012

Reference Books

1. D. Forsyth and J. Ponce, "Computer Vision - A modern approach" McGraw-Hill, 2012
2. E. R. Davies, "Computer and Machine Vision: Theory, Algorithms, Practicalities" Fourth Edition, 2005
3. Richard Szeliski, "Computer Vision: Algorithms and Applications", 2nd ed. 2020.
4. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012
5. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, Englewood Cliffs, 1982.

Web Resources

1. https://www.youtube.com/watch?v=iXNsAYOTzgM&ab_channel=freeCodeCamp.org
2. https://www.youtube.com/watch?v=2FYm3GOonhk&ab_channel=Murtaza%27sWorkshopRoboticsandAI
3. https://onlinecourses.nptel.ac.in/noc21_ee23/preview
4. https://onlinecourses.nptel.ac.in/noc21_cs93/preview
5. <https://www.udacity.com/course/computer-vision-nanodegree--nd891>

COs/POs/PSOs Mapping

| COs | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes (PSOs) | | |
|----------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|----------------------------------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 1 | 2 | 2 | 2 | 3 | 3 | 2 | | 1 | - | - | - | - | 2 | 2 | 2 |
| 2 | 2 | 3 | 3 | 3 | 2 | 1 | 1 | - | - | 1 | - | 1 | 2 | 2 | 1 |
| 3 | 2 | 3 | 3 | 2 | 1 | - | 1 | 1 | - | - | - | - | 2 | 2 | 1 |
| 4 | 2 | 2 | 3 | 2 | 3 | 2 | - | - | 1 | - | - | 1 | 2 | 3 | 1 |
| 5 | 3 | 2 | 2 | 3 | 3 | 1 | - | - | - | - | 1 | - | 2 | 2 | 2 |

| | L | T | P | C | Hrs |
|--------------------------------------|----------|----------|----------|----------|-----------|
| U20ADT510 | | | | | |
| BIG DATA TOOLS AND TECHNIQUES | 3 | 0 | 0 | 3 | 45 |

Course Objectives

- Understand big data for business intelligence.
- Learn business case studies for big data analytics.
- Understand nosql big data management.
- Perform map-reduce analytics using Hadoop and related tools.
- Understand big data for business intelligence.

Course Outcomes

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

CO1 - Describe big data and use cases from selected business domains. **(K2)**

CO2 - Explain NoSQL big data management. **(K3)**

CO3 - Install, configure, and run Hadoop and HDFS. **(K3)**

CO4 - Perform map-reduce analytics using Hadoop. **(K2)**

CO5 - Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics. **(K2)**

UNIT I UNDERSTANDING BIG DATA (9 Hrs)

What is big data – why big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.

UNIT II NOSQL DATA MANAGEMENT (9 Hrs)

Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – sharding – master-slave replication – peer-peer replication – sharding and replication – consistency – relaxing consistency – version stamps – map-reduce – partitioning and combining – composing map-reduce calculations.

UNIT III BASICS OF HADOOP (9 Hrs)

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures.

UNIT IV MAPREDUCE APPLICATIONS (9 Hrs)

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats.

UNIT V HADOOP RELATED TOOLS (9 Hrs)

Hbase – data model and implementations – Hbase clients – Hbase examples – praxis.Cassandra – cassandra data model – cassandra examples – cassandra clients – Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries – Apache Spark ML.

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. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.
3. Tom White, "Hadoop: The Definitive Guide", Third Edition, O'Reilley, 2012.

Reference Books

1. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.
2. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
3. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
4. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
5. Alan Gates, "Programming Pig", O'Reilley, 2011.

Web Resources

1. <https://www.ibm.com/in-en/analytics/hadoop/big-data-analytics>
2. <https://www.simplilearn.com/what-is-big-data-analytics-article>
3. <https://www.guru99.com/big-data-analytics-tools.html>
4. <https://www.upgrad.com/blog/big-data-tools/>
5. <https://towardsdatascience.com/big-data-analytics-its-technologies-and-tools-e77f9bd0d37c>

COs/POs/PSOs Mapping

| COs | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes (PSOs) | | |
|----------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|----------------------------------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 1 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 2 | 2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 3 | 2 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 4 | 3 | 2 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 5 | 2 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |

| | | | | | | |
|------------------|---------------------------------|----------|----------|----------|----------|------------|
| U20ADP508 | DEEP LEARNING LABORATORY | L | T | P | C | Hrs |
| | | 0 | 0 | 2 | 1 | 30 |

Course Objectives

- To understand Neural Network basic Architecture and various Activation functions.
- To understand gradient descent for deep learning.
- Able to apply different optimization techniques to fine tune the deep learning models.
- Study about various Deep learning models.
- Understand the working of model in different applications.

Course Outcomes

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

CO1 – Understand the role of neural networks in engineering & artificial intelligence. **(K2)**

CO2 – Understand regularization methods for gradient problem. **(K2)**

CO3 – Apply various optimization techniques and fine-tuning process. **(K3)**

CO4 – Understand various Neural Network models. **(K2)**

CO5 – Apply deep learning Network in various applications. **(K3)**

List of Exercises

1. Build a simple Neural Network.
2. Build a deep learning model to Classify cat and dog using CNN
3. Build a deep learning model to predict Stock Prices using Recurrent Neural Network
4. Build a deep learning model to Forecast Sales using LSTM
5. Build a deep learning model to predict Movie box office using GRU model
6. Build a deep learning model to predict Sports result Prediction using RNN and LSTM
7. Build a deep learning model to predict Cardiovascular Disease using ANN
8. Build a deep learning model to create an art using Style Transfer technique
9. Build a deep learning model to identify traffic signs from the image
10. Build a deep learning model for Fashion Recommendation System

Reference Books

1. Cosma Rohilla Shalizi, “Advanced Data Analysis from an Elementary Point of View”, Cambridge University Press, 2015.
2. Deng & Yu, “Deep Learning: Methods and Applications”, Now Publishers, 2014.
3. Michael Nielsen, “Neural Networks and Deep Learning”, Determination Press, 2015.
4. Josh Patterson, Adam Gibson, “Deep Learning A Practitioner's Approach”, O'Reilly Media, 2017.
5. Nikhil Buduma, “Fundamentals of Deep Learning”, O'Reilly, 2017.

Web Resources

1. <https://nptel.ac.in/courses/106/106/106106184/>
2. <http://deeplearning.net/>
3. <https://www.guru99.com/deep-learning-tutorial.html>
4. <https://www.coursera.org/specializations/deep-learning>
5. <http://neuralnetworksanddeeplearning.com/>

COs/POs/PSOs Mapping

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|----------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|----------------------------------|------|------|
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| 1 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 2 | 2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 3 | 2 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 4 | 3 | 2 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 5 | 2 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |

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|------------------|------------------------------------------------------------|----------|----------|----------|----------|------------|
| U20ADP509 | IMAGE PROCESSING AND COMPUTER VISION LABORATORY | L | T | P | C | Hrs |
| | | 0 | 0 | 2 | 1 | 30 |

Course Objectives

- To understand basic image processing concepts.
- To study different object segmentation methods.
- To understand different shape invariant in images and videos.
- Able to understand various object recognition methods.
- Study about object motion analysis.

Course Outcomes

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

CO1 - Setup and study computer vision libraries. **(K2)**

CO2 - Implement object detection mechanism. **(K2)**

CO3 - Apply object tracking methods. **(K3)**

CO4 - Implement deep learning models in computer vision. **(K2)**

CO5 - Apply deep learning model to reconstruct a 3D scene. **(K3)**

List of Exercises

1. Write a program to read and write an image and a video file.
2. Write a program to detect a line, circle and ellipse.
3. Write a program to detect edges and apply median and Gaussian filters in an image.
4. Write a program to detect contour in an image.
5. Write a program to detect foreground and background in video.
6. Write a program to recognize traffic sign using machine learning algorithm.
7. Write a program to track Objects in a video.
8. Write a program to reconstruct a scene in 3D by inferring the geometrical features of the scene from camera motion.
9. Build a deep learning model to classify digits in MNIST dataset.
10. Build a deep learning model to detect smiles in SMILES Dataset.

Reference Books

1. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison Wesley Longman, Inc., 1992
2. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012
3. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.
4. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012
5. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, Englewood Cliffs, 1982.

Web Resources

1. https://www.youtube.com/watch?v=iXNsAYOTzgM&ab_channel=freeCodeCamp.org
2. https://www.youtube.com/watch?v=2FYm3GOonhk&ab_channel=Murtaza%27sWorkshop-RoboticsandAI
3. https://onlinecourses.nptel.ac.in/noc21_ee23/preview
4. https://onlinecourses.nptel.ac.in/noc21_cs93/preview
5. <https://www.udacity.com/course/computer-vision-nanodegree--nd891>

COs/POs/PSOs Mapping

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| 2 | 2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 3 | 2 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 4 | 3 | 2 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 5 | 2 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |

| U20ADP510 | BIG DATA TOOLS AND TECHNIQUES LABORATORY | L | T | P | C | Hrs |
|-----------|-----------------------------------------------------|---|---|---|---|-----|
| | | 0 | 0 | 2 | 1 | 30 |

Course Objectives

- To understand setting up of Hadoop Cluster.
- To solve problems using Map Reduce Technique.
- To solve Big Data problems.
- To implement the concepts in R Programming.
- To solve operations using NoSQ.

Course Outcomes

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

CO1 – Set up multi-node Hadoop Clusters. **(K2)**

CO2 – Apply Map Reduce algorithms for various algorithms. **(K3)**

CO3 – Implementation of clustering, regression and classification techniques. **(K2)**

CO4 – Data processing using R programming. **(K3)**

CO5 – Unstructured data processing using NoSQL. **(K3)**

List of Experiments

1. Installation, Configuration, and Running of Hadoop and HDFS
2. Implementation of Word Count / Frequency Programs using MapReduce
3. Implementation of Page Rank Computation
4. Implementation of Linear and Logistic Regression
5. Implementation of SVM and Decision Tree Classification Technique
6. Implementation of following Clustering Techniques:
 - Hierarchical Clustering
 - Partitioning Clustering
 - Fuzzy Clustering
 - Density Based Clustering
 - Model Based Clustering
7. Application to adjust the Number of Bins in the Histogram using R Language
8. Build supervised learning models using Apache Spark ML.
9. Application to analyze Stock Market Data using R Language
10. Unstructured data into NoSQL data and do all operations such as NoSQL query with API.
11. Application of Recommendation systems using Hadoop/mahout libraries.

Reference Books

1. EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.
2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
4. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers" CRC Press, 2015.
5. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010.

Web Resources

1. <https://www.ibm.com/in-en/analytics/hadoop/big-data-analytics>
2. <https://www.simplilearn.com/what-is-big-data-analytics-article>
3. <https://www.guru99.com/big-data-analytics-tools.html>
4. <https://www.upgrad.com/blog/big-data-tools/>
5. <https://towardsdatascience.com/big-data-analytics-its-technologies-and-tools-e77f9bd0d37c>

COs/POs/PSOs Mapping

| COs | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes (PSOs) | | |
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| 2 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 3 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 2 | 3 |
| 4 | 3 | 2 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 5 | 2 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |

| | L | T | P | C | Hrs |
|------------------|----------|----------|----------|----------|------------|
| U20ADC5XX | 0 | 0 | 4 | - | 50 |

CERTIFICATION COURSE-V

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

| | | | | | | |
|------------------|---------------------------------------------------------------------|----------|----------|----------|----------|------------|
| U20ADS504 | SKILL DEVELOPMENT COURSE 4 (Foreign Language / IELTS – I) | L | T | P | C | Hrs |
| | | 0 | 0 | 2 | - | 30 |

Student should choose the Foreign Language/IELTS course like Japanese/French/ Germany/IELTS, etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and language Experts. The courses are to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. Students have to complete the courses successfully. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course. The marks attained for this course is not considered for CGPA calculation.

| U20ADS505 | SKILL DEVELOPMENT COURSE 5 (Presentation Skills using ICT) | L | T | P | C | Hrs |
|------------------|----------------------------------------------------------------------|----------|----------|----------|----------|------------|
| | | 0 | 0 | 2 | - | 30 |

The methodology used is “learning by doing”, a hands-on approach, enabling the students to follow their own pace. The teacher, after explaining the project, became a tutor, answering questions and helping students on their learning experience.

ICT skills

- Understand ICT workflow in cloud computing.
- Manage multitasking.
- Deal with main issues using technology in class.
- Record, edit and deliver audio and video.
- Automate assessments and results.

Teaching tools

- Different ways to create audiovisual activities.
- Handle audiovisual editors.
- Collaborative working.
- Individualize learning experience.
- Get instant feedback from students.

Each one of the students will be assigned an ICT Topic and the student has to conduct a detailed study and have to prepare a report, running to 15 or 20 pages for which a demo to be performed followed by a brief question and answer session. The demo will be evaluated by the internal assessment committee for a total of 100 marks. The marks attained for this course is not considered for CGPA calculation.

| | | | | | | |
|------------------|----------------------------|----------|----------|----------|----------|------------|
| U20ADM505 | INDIAN CONSTITUTION | L | T | P | C | Hrs |
| | | 2 | 0 | 0 | 0 | 30 |

Course Objectives

- To Enable the student to understand the importance of constitution
- To understand the structure of executive, legislature and judiciary
- To understand philosophy of fundamental rights and duties

Course Outcomes

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

- CO1** - Understand historical background of the constitutional making and its importance for building a democratic India, the structure of Indian government, the structure of state government, the local Administration.
- CO2** - Understand knowledge on directive principle of state policy, the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

UNIT I INDIAN CONSTITUTION

Salient Features - Preamble - Fundamental Rights – Directive Principles of State Policy - Fundamental Duties.

UNIT II PARLIAMENTARY SYSTEM

Powers and Functions of President and Prime Minister - Council of Ministers - The Legislature Structure and Functions of Lok Sabha and Rajya Sabha – Speaker.

UNIT III THE JUDICIARY

Organization and Composition of Judiciary - Powers and Functions of the Supreme Court - Judicial Review – High Courts.

UNIT IV STATE GOVERNMENTS

Powers and Functions of Governor and Chief Minister – Council of Ministers - State Legislature.

UNIT V LOCAL GOVERNMENTS

73rd and 74th Constitutional Amendments – Federalism - Center – State Relations.

Text Books

1. Basu D.D, "Introduction to Indian Constitution", Prentice Hall of India, New Delhi, 2015.
2. Gupta D.C, "Indian Government and Politics", Vikas Publishing House, New Delhi, 2010.

Reference Books

1. Pylee M.V, "Introduction to the Constitution of India", Vikas Publishing House, New Delhi, 2011.
2. Kashyap S, "Our Constitution", National Book Trust, New Delhi, 2010.

| SEMESTER – VI | | |
|-----------------------------------------|--------------------|-------------------------------------------------|
| Sl. No. | Course Code | Course Title |
| Theory | | |
| 1 | U20ADT611 | NLP and Chatbot |
| 2 | U20ADT612 | AI and Automation |
| 3 | U20ADT613 | Robotic Process Automation – UI Path |
| 4 | U20ADT614 | Web Technology |
| 5 | U20ADE6XX | Professional Elective - III |
| 6 | U20XXO6XX | Open Elective - III |
| Practical | | |
| 7 | U20ADP611 | NLP and Chatbot Laboratory |
| 8 | U20ADP612 | AI and Automation Laboratory |
| 9 | U20ADP613 | Robotic Process Automation – UI Path Laboratory |
| Employability Enhancement Course | | |
| 10 | U20ADC6XX | Certification Course - VI |
| 11 | U20ADS606 | Foreign Language/ IELTS |
| 12 | U20ADS607 | Technical Seminar |
| 13 | U20ADS608 | NPTEL / MOOC |
| Mandatory Course | | |
| 14 | U20ADM606 | Essence of Indian Traditional Knowledge |

U20ADT611**NLP AND CHATBOT**

| L | T | P | C | Hrs |
|---|---|---|---|-----|
| 3 | 0 | 0 | 3 | 45 |

Course Objectives

- To explain and apply fundamental algorithms and techniques in the area of natural language processing (NLP).
- To understand approaches to syntax and semantics in NLP.
- To implementation of machine translation.
- To understand about chatbot.
- To learn conversational interface.

Course Outcomes

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

CO1 - Understand the concept of NLP. **(K2)**

CO2 - Create Language Modelling. **(K3)**

CO3 - Understand the concept of machine translation. **(K3)**

CO4 - Illustrate the chatbot. **(K3)**

CO5 - Understand the concept of conversational interface. **(K2)**

UNIT I INTRODUCTION**(9 Hrs)**

Introduction to NLP – NLP preprocessing steps – NLP Feature Engineering - Words - Structure - spellcheck, morphology using FSTs - Semantics - Lexical Semantics, word count vector, WordNet and WordNet based similarity measures, Distributional measures of similarity, Concept Mining - Word Sense Disambiguation - supervised, unsupervised and semi-supervised approaches - Parts of Speech.

UNIT II LANGUAGE MODELLING**(9 Hrs)**

Sentences - Basic ideas in compositional semantics, Classical Parsing – different types of parsing - Bottom up, top down, Dynamic Programming - Parsing using Probabilistic Context Free Grammars and Expectation - Maximization based approaches for learning PCFG parameters. Language Modelling.

UNIT III MACHINE TRANSLATION**(9 Hrs)**

Machine Translation - rule-based techniques, Statistical Machine Translation, parameter learning using Expectation - Maximization - Information Extraction - Introduction to Named Entity Recognition and Relation Extraction - Natural Language Generation - the potential of using ML - Advanced Language Modelling – Applications - summarization, question answering.

UNIT IV CHATBOT**(9 Hrs)**

Chatbot – Design of a Chatbot - Introduction to Conversational Interface - Preliminaries, developing a speech based Conversational Interface, Conversational Interface and devices - Technology of Conversation: Introduction - Conversation as Action - The structure of Conversation - The language of Conversation.

UNIT V CONVERSATIONAL INTERFACE**(9 Hrs)**

Developing a Speech-Based Conversational Interface - Implementing Text to Speech - Text Analysis - Wave Synthesis - Implementing Speech Recognition - Language Model, Acoustic Model - Decoding - Speech Synthesis Mark-up Language - Advanced voice user interface design – Advanced Chatbots.

Text Books

1. James Allen, "Natural Language Understanding", 2nd Edition, Pearson Education, 2003.

2. Srinu Janarthanam, "Hands-On Chatbots and Conversational UI Development: Build chatbots", Published by Packet Publishing Ltd., First Edition, 2017.
3. Jurafsky, Dan and Martin, James, "Speech and Language Processing", Second Edition, Prentice Hall, 2008.

Reference Books

1. Cathy Pearl, "Designing Voice User Interfaces: Principles of Conversational Experiences", Shroff/O'Reilly, First Edition, 2017.
2. Michael McTear, Zoraida Callejas, David Griol, "The Conversational Interface: Talking to Smart Devices", Springer, First Edition 2016.
3. Daniel M.Bikel and Imed Zitouni, "Multilingual Natural Language Processing Applications: From Theory To Practice", Pearson Publications.
4. Abhishek Singh, Karthik Ramasubramanian, Shrey Shivam, "Building an Enterprise Chatbot: Work with Protected Enterprise Data using Open Source Frameworks", Apress, 2019.
5. Akshar Bharathi, Vineet chaitanya, "Natural Language Processing, A paninian perspective", Prentice – Hall of India.

Web Resources

1. <https://www.udemy.com/course/chatbot/>
2. <https://gtuematerial.in/natural-language-processing-3170723/>
3. <https://chatbotsmagazine.com/understanding-the-need-for-nlp-in-your-chatbot-78ef2651de84?gi=ecca664b642a>
4. <https://www.ultimate.ai/blog/ai-automation/how-nlp-text-based-chatbots-work>

COs/POs/PSOs Mapping

| Cos | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes (PSOs) | | |
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| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 1 | 2 | 2 | 2 | 3 | 3 | 2 | | 1 | - | - | - | - | 2 | 2 | 2 |
| 2 | 2 | 3 | 3 | 3 | 2 | 1 | 1 | - | - | 1 | - | 1 | 2 | 2 | 1 |
| 3 | 2 | 3 | 3 | 2 | 1 | - | 1 | 1 | - | - | - | - | 2 | 2 | 1 |
| 4 | 2 | 2 | 3 | 2 | 3 | 2 | - | - | 1 | - | - | 1 | 2 | 3 | 1 |
| 5 | 3 | 2 | 2 | 3 | 3 | 1 | - | - | - | - | 1 | - | 2 | 2 | 2 |

U20ADT612

AI AND AUTOMATION

| L | T | P | C | Hrs |
|---|---|---|---|-----|
| 3 | 0 | 0 | 3 | 45 |

Course Objectives

- To understand the working of agents and its advantage.
- To study the development and deployment of chatbot using AWS.
- To experiment IoT with AI.
- To create mobile application with TensorFlow.
- To implement the concept of Artificial Intelligence with Cyber Security.

Course Outcomes

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

CO1 - Understand the working of agents. **(K2)**

CO2 - Develop and deploy of Chatbot using AWS. **(K3)**

CO3 - Experiment IoT with AI. **(K4)**

CO4 - Create and Develop mobile application with TensorFlow. **(K4)**

CO5 - Implement the concept of Artificial Intelligence with Cyber Security. **(K3)**

UNIT I INTELLIGENT AUTONOMOUS AND MULTI-AGENT (9 Hrs)

Introduction – Challenges – Cyber Adversary – Embodied Agents – Required AI coordination. Active Inference in Multi-Agent System: Introduction – Energy based Adaptive agent – Applications – Validation.

UNIT II CHATBOT USING AWS (9 Hrs)

Introduction to AWS and Amazon CLI – Creation of local development environment – Introduction to Alexa – Creating Lambda – Connecting to External APIs – Creation of Amazon Lex Chatbot – Lex responses – Lex Bot to Dynamo DB – Application Chatbot to Facebook – Slack – HTTP.

UNIT III INTERNET OF THINGS AND ARTIFICIAL INTELLIGENCE (9 Hrs)

Web of Smart Entities: Introduction – Smart Things – Vision – Use of Artificial Intelligence – Interacting with Automation – Artificial Intelligence and the Internet of Big Things – Value of Information and Internet of Things.

UNIT IV TENSORFLOW FOR MOBILE APPLICATIONS (9 Hrs)

Introduction to TensorFlow – TensorFlow Lite on Android – application using CNN – Finding Pattern - Features from Image – TensorFlow Core Machine Learning – Conversion – ML Kit Basic – Face Detection – Barcode Scanner – Text Recognition.

UNIT V DETECTION OF CYBER SECURITY THREATS WITH ARTIFICIAL INTELLIGENCE (9 Hrs)

Introduction – Detecting Spam with Perceptions – Spam with SVMs – Phishing – Spam Detection with Naive Bayes – Malware Threat Detection – Different Malware types – Decision Tree Malware Detectors – Metamorphic Malware – Network Anomaly Detection.

Text Books

1. Sam Williams “Hands-on Chatbot Development with Alexa Skills and Amazon Lex”, Packt Publishing, 2018.
2. William Lawless, Ranjeev Mittu, Donald Sofge, Ira S Moskowitz, Stephen Russell, “Artificial Intelligence for the Internet of Everything”, Packt Publishing, 2019.
3. N. G. Karthikeyan, “Machine Learning Project for Mobile Application”, Packt Publishing, 2018.

Reference Books

1. Bear Cahill, "Building Intelligent Chatbots on AWS", linkedin.com, 2019.
2. Amita Kapoor, "Hands-On Artificial Intelligence for IoT Expert Machine Learning and Deep Learning Techniques for Developing Smarter IoT Systems", Packt Publishing, 2019.
3. Fadi Al-Turjman, "Artificial Intelligence in IoT", Springer International Publishing, 2019.
4. Abhishek Kumar, Ashutosh Kumar Dubey, N. Gayathri, Prasenjit Das, S. Rakesh Kumar, "AI and IoT-Based Intelligent Automation in Robotics", United Kingdom, Wiley, 2021.
5. Alessandra Parisi "Hands-on Artificial Intelligence for Cyber Security", Packt Publishing, 2019.

Web Resources

1. <https://aws.amazon.com/chatbot/>
2. <https://aws.amazon.com/lex/>
3. <https://www.tensorflow.org/lite>

COs/POs/PSOs Mapping

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|----------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|----------------------------------|------|------|
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| 3 | 2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | 2 | 2 | 1 |
| 4 | 2 | 2 | 3 | 2 | 3 | 2 | - | - | - | - | - | - | 2 | 3 | 1 |
| 5 | 3 | 2 | 2 | 3 | 3 | 1 | - | - | - | - | - | - | 2 | 2 | 2 |

| | | | | | | |
|------------------|--------------------------------------------------|----------|----------|----------|----------|------------|
| U20ADT613 | ROBOTICS PROCESS AUTOMATION – UI PATH | L | T | P | C | Hrs |
| | | 3 | 0 | 0 | 3 | 45 |

Course Objectives

- To learn the basics of data science
- To enable the students to understand the statistics and probability.
- To understand the tools in developing and visualizing data.
- To gain good knowledge in the application areas of data science.
- To inculcate the perceiving and acting of data science applications.

Course Outcomes

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

- CO1** - Understand basic programming concepts and its operation from RPA perspective. **(K2)**
- CO2** - Understand the basic concepts of Robotic Process Automation and its applications. **(K2)**
- CO3** - Develop familiarity and deep understanding of UI Path tools. **(K3)**
- CO4** - Apply automation to image, text, data tables, citrix, pdf, email, etc., execute exception handling and apply various functionalities of orchestrator. **(K3)**
- CO5** - Analyse opportunities of research in Artificial Intelligence with respect to RPA. **(K4)**

UNIT I PROGRAMMING FUNDAMENTALS (9 Hrs)

Understanding the application - Basic Web Concepts – Protocols - Email Clients - Data Structures - Data Tables – Algorithms - Software Processes - Software Design – SDLC – Scripting - Net Framework - .Net Fundamentals – XML - Control structures and functions – XML – HTML – CSS - Variables and Arguments.

UNIT II RPA CONCEPTS (9 Hrs)

Fundamentals: History of Automation - Introduction to RPA - RPA vs Automation - Processes and Flowcharts - Programming Constructs in RPA - Processes and workloads that can be Automated - Types of Bots. Advanced concepts: Standardization of processes - RPA Development methodologies - Difference from SDLC - Robotic control flow architecture - RPA business case - RPA Team - Process Design Document/Solution Design Document - Industries best suited for RPA - Risks and Challenges with RPA - RPA and emerging ecosystem.

UNIT III UIPATH INTRODUCTION AND EXPLORATION (9 Hrs)

Introduction: Installing UiPath Studio community edition - The User Interface - Keyboard Shortcuts About Updating - About Automation Projects - Introduction to Automation Debugging - Managing Activation Packages - Reusing Automations Library - Installing the Chrome Extension – Variables - Control Flow - Data Manipulation - Recording and Advanced UI Interaction - Selectors.

UNIT IV UIPATH ADVANCED AUTOMATION (9 Hrs)

Image, Text and Advanced Citrix Automation - Excel Data Tables and PDF - Email Automation - Debugging and Exception Handling - Project Organization. Orchestrator: Tenants – Authentication – Users – Roles – Robots – Environments - Queues and Transactions - Schedules.

UNIT V ARTIFICIAL INTELLIGENCE AND RPA (9 Hrs)

Research on application of RPA for Machine Learning, Agent awareness - Natural Language Processing - Computer Vision, etc, Case studies and projects on applying RPA for designing and developing robots for real-world problems.

Text Books

1. A. Tripathi, "Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots with the leading RPA tool – UiPath", Packt Publishing, 2018.
2. K. Wibbenmeyer, "The Simple Implementation Guide to Robotic Process Automation (RPA): How to Best Implement RPA in an Organization", iUniverse.
3. S. Merianda, "Robotic Process Automation Tools, Process Automation and Their Benefits: Understanding RPA and Intelligent Automation", Createspace.

Reference Books

1. M. Lacity, L. Willcocks, "Robotic Process and Cognitive Automation: The Next Phase", Steve Brookes Publishing.
2. Tom Taulli, "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", 2020.
3. Nandan Mullakara, "Robotic Process Automation Projects: Build real-world RPA solutions using UiPath and Automation Anywhere", 2020.
4. Gerardus Blokdyk, "RPA robotic process automation", Second Edition, Paper Back, 2018.
5. S. Mukherjee, "Essentials of Robotics Process Automation", Khanna Publishing, 2019.

Web Resources

1. <https://www.laserfiche.com/ecmblog/what-is-robotic-process-automation-rpa/>
2. <https://piazza.com/class/j641h48teqh6ba>
3. https://developer.mozilla.org/en-US/docs/Plugins/Guide/Plug-in_Basics
4. <https://www.edx.org/>

COs/POs/PSOs Mapping

| COs | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes (PSOs) | | |
|----------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|----------------------------------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 1 | 1 | 2 | 3 | 2 | 1 | 2 | - | - | - | - | - | - | 2 | 3 | 2 |
| 2 | 1 | 2 | 3 | 2 | 3 | 2 | - | - | - | - | - | - | 3 | 3 | 2 |
| 3 | 2 | 2 | 2 | 3 | 3 | 3 | - | - | - | - | - | - | 3 | 2 | 3 |
| 4 | 2 | 2 | 3 | 1 | 3 | 1 | - | - | - | - | - | - | 3 | 3 | 2 |
| 5 | 2 | 2 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | 3 | 3 | 2 |

U20ADT614**WEB TECHNOLOGY**

| L | T | P | C | Hrs |
|---|---|---|---|-----|
| 3 | 0 | 0 | 3 | 45 |

Course Objectives

- To study the fundamentals of web application development.
- To understand the design components and tools using CSS and Javascript.
- To learn the concepts of the PHP programming fundamentals.
- To study about image basics.
- To understand the working procedure of Django for forms.

Course Outcomes

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

CO1 - Develop basic web applications. **(K3)**

CO2 - Design the web applications using CSS and Validate the web pages using JavaScript functions. **(K3)**

CO3 - Demonstrate the PHP application to advance scripts. **(K3)**

CO4 – Learn the basics of Django. **(K2)**

CO5 - Update the knowledge of Django. **(K3)**

UNIT I INTRODUCTION TO WWW AND HTML (9 Hrs)

Protocols - secure connections - application and development tools - the web browser - What is server - dynamic IP. Web Design: Web site design principles - planning the site and navigation. HTML: The development process - Html tags and simple HTML forms - web site structure.

UNIT II CSS AND JAVASCRIPT (9 Hrs)

Need for CSS - introduction to CSS - basic syntax and structure - using CSS - background images - colours and properties - manipulating texts - using fonts - borders and boxes – margins - padding lists - positioning using CSS - CSS2. Client side scripting - What is JavaScript - How to develop JavaScript - simple JavaScript – variables – functions – conditions - loops and repetition.

UNIT III PHP (9 Hrs)

Introduction, Basics, Data types, Operators, Flow control, Arrays, Array functions, Strings and Regular expressions, Generators. OOP in PHP -- Classes, Objects, Constructors and Destructors, Access Modifiers, Methods, Inheritance, Error and Exceptional Handling, File Handling. Web Development Frameworks – Introduction – Yii – Model View Controller – Entry Script – Application – Controller – Model – View – Component – Module.

UNIT IV INTRODUCTION TO DJANGO (9 Hrs)

Introduction to Django - Creating the Project – Running the Development Server – Creating the Application – Designing a Model – Setting up the Database – Setting up the Application – Dynamic Web Sites – Communication – Data Storage – Presentation.

UNIT V DJANGO ARCHITECTURE, FORMS AND APIS (9 Hrs)

Django model layer – View layer – Template Layer – Forms – Automated admin interface – Django Security – Django Web application tools – Core functionalities – Geographic Framework. Templates – Forms - Validation – Authentication - Advanced Forms processing techniques - Django REST framework – Django piston.

Text Books

1. P.J. Deitel AND H.M. Deitel, "Internet and World Wide Web - How to Program", Pearson Education, 2009.

- Kevin Tatroe, Peter MacIntyre, Rasmus Lerdorf, "Programming PHP", Creating Dynamic Web Pages, O'Reilly Media, 3rd Edition, 2013.
- Ayman Hourieh, "Learning Website Development with Django", Packt Publishing, 2008.

Reference Books

- UttamK.Roy, "Web Technologies", Oxford University Press, 2010.
- Rajkamal, "Web Technology", Tata McGraw-Hill, 2009.
- Steven Suehring, Janet Valade, "PHP, MySQL, JavaScript & HTML5 All-in-One", John Wiley & Sons, Inc, 2013.
- Yakov Fain, Victor Rasputnis, Anatole Tartakovsky and Viktor Gamov, "Enterprise Web Development", O'Reilly Media, 2014.
- Django for Beginners: Build websites with Python and Django Paperback, William S Vincent, Independently Published, 2018.

Web Resources

- <https://www.w3schools.com>
- <https://www.geeksforgeeks.org/web-technology/>
- <https://www.guru99.com/akephp-tutorial.html>
- <https://www.ithands.com/blog/cms-or-php-framework-which-technology-is-better-for-my-business>
- <http://Oriell.ly/learning-web-app>

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|-----|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|----------------------------------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 3 | - | 3 | 3 | 3 |
| 2 | 2 | 2 | 2 | 2 | - | 2 | - | 2 | - | 2 | - | 2 | 2 | 2 | - |
| 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | - | - | 3 | - | 3 | 3 | 3 |
| 4 | 2 | 2 | 2 | 2 | - | 2 | - | 2 | - | 2 | - | 2 | 2 | 2 | - |
| 5 | 2 | 2 | 2 | 2 | - | 2 | - | 2 | - | 2 | - | 2 | 2 | 2 | - |

| | | | | | | |
|------------------|-----------------------------------|----------|----------|----------|----------|------------|
| U20ADP611 | NLP AND CHATBOT LABORATORY | L | T | P | C | Hrs |
| | | 0 | 0 | 2 | 1 | 30 |

Course Objectives

- To understand the NLP concepts.
- To implement text classification and summarization.
- To create WhatsApp group chat.
- To understand sentiment analysis.
- To learn spam detection model.

Course Outcomes

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

CO1 – Implementation of concepts with python. **(K3)**

CO2 – Create NLP applications for other languages. **(K2)**

CO3 – Illustrate detection models. **(K3)**

CO4 – Develop applications using sentiment analysis. **(K3)**

CO5 – Implement whatsapp chat analysis. **(K3)**

List of Exercises

1. Implementation of Resume Screening with Python
2. Creation of Named Entity Recognition with Python
3. Development of Sentiment Analysis with Python
4. Create Keyword Extraction with Python
5. Implementation of Spelling Correction Model with Python
6. Creation of Keyboard Autocorrection Model
7. Implementation of Election Results Prediction by analyzing Tweets
8. Development of NLP for Other languages
9. Creation of Text Classification using Deep Learning
10. Summarize Text with Machine Learning
11. Implement a chatbot for Task Management.
12. Implement a chatbot to recommend a gift product.
13. Development of WhatsApp Group Chat Analysis
14. Implementation of Next Word Prediction Model
15. Creation of Fake News detection Model
16. Development of NLP for WhatsApp Chats
17. Implementation of OCR using Tesseract.

Reference Books

1. James Allen, Natural Language Understanding, Second Edition, Benjamin/Cummings Publishing Co. Inc., Subs. Of Addison-Wesley Longman Publ. Co390 Bridge Pkwy. Redwood City, CA United States, 1995.
2. Sridhar Janarthanam, "Hands-On Chatbots and Conversational UI Development: Build chatbots" Published by Packet Publishing Ltd., First Edition, 2017.
3. Jurafsky, Dan and Martin, James, Speech and Language Processing, Second Edition, Prentice Hall, 2008.
4. Cathy Pearl, "Designing Voice User Interfaces: Principles of Conversational Experiences", Shroff/O'Reilly, First Edition, 2017.
5. Michael McTear, Zoraida Callejas, David Griol, "The Conversational Interface: Talking to Smart Devices", Springer, First Edition 2016.

Web Resources

1. <https://www.udemy.com/course/chatbot/>
2. <https://chatbotsmagazine.com/understanding-the-need-for-nlp-in-your-chatbot-78ef2651de84?gi=ecca664b642a>
3. <https://gtuematerial.in/natural-language-processing-3170723/>
4. <https://www.ultimate.ai/blog/ai-automation/how-nlp-text-based-chatbots-work>

COs/POs/PSOs Mapping

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|----------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|----------------------------------|------|------|
| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| 1 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 2 | 2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 3 | 2 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 4 | 3 | 2 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 5 | 2 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |

U20ADP612

**AI AND AUTOMATION
LABORATORY**

| | | | | |
|---|---|---|---|-----|
| L | T | P | C | Hrs |
| 0 | 0 | 2 | 1 | 30 |

Course Objectives

- To understand the AI concepts.
- To learn the automation in shopping cart.
- To learn how to create AI project.
- To implement automation projects.
- To understand the process of automation in AI projects with sample projects.

Course Outcomes

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

CO1 – Implementation of automation in AI projects. **(K3)**

CO2 – Develop capstone projects using automation. **(K3)**

List of Exercises

The following topics are used to create as capstone projects using AI and Automation.

1. Automatic Answer Checker
2. Smart Health Consulting Project
3. College Enquiry Chat Bot
4. Online AI Shopping With M-Wallet System
5. Intelligent Tourist System Project
6. Online Assignment Plagiarism Checker
7. Question paper generator system
8. Aptitude Tests
9. Teachers Automatic Time-Table Software
10. Automatic Attendance System.

Reference Books

1. Sam Williams “Hands-on Chatbot Development with Alexa Skills and Amazon Lex”, Packt Publishing, 2018.
2. William Lawless, Ranjeev Mittu, Donald Sofge, Ira S Moskowitz, Stephen Russell, “Artificial Intelligence for the Internet of Everything”, Packt Publishing, 2019.
3. N.G.Karthikeyan, “Machine Learning Project for Mobile Application”, Packt Publishing, 2018.
4. Bear Cahill, “Building Intelligent Chatbots on AWS”, linkedin.com, 2019.
5. Amita Kapoor, “Hands-On Artificial Intelligence for IoT Expert Machine Learning and Deep Learning Techniques for Developing Smarter IoT Systems”, Packt Publishing, 2019.

Web Resources

1. <https://nevonprojects.com/artificial-intelligence-projects/>
2. <https://www.upgrad.com/blog/top-artificial-intelligence-project-ideas-topics-for-beginners/>
3. <https://www.projectwale.com/final-year-artificial-intelligence-projects/>

COs/POs/PSOs Mapping

| COs | Program Outcomes (POs) | | | | | | | | | | | | Program Specific Outcomes (PSOs) | | |
|-----|------------------------|------|------|------|------|------|------|------|------|-------|-------|-------|----------------------------------|-------|-------|
| | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | PO 7 | PO 8 | PO 9 | PO1 0 | PO1 1 | PO1 2 | PSO 1 | PSO 2 | PSO 3 |
| 1 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 2 | 2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 | 3 |

| | | | | | | |
|------------------|------------------------------------------------------------|----------|----------|----------|----------|------------|
| U20ADP613 | ROBOTIC PROCESS AUTOMATION – UI PATH LABORATORY | L | T | P | C | Hrs |
| | | 0 | 0 | 2 | 1 | 30 |

Course Objectives

- To understand the concept of RPA – UI path.
- To implement web scraping, data mitigation process.
- To learn the email query processing and customer support emails.
- To develop credit card applications.
- To automate the process in excel and pdf.

Course Outcomes

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

CO1 – Implementation of RPA – UI path. **(K3)**

CO2 – Develop web scraping, data mitigation and entry process. **(K2)**

CO3 – Create the query processing in email and customer support emails. **(K3)**

CO4 – Develop credit card applications. **(K3)**

CO5 – Implement the automation process in excel and pdf. **(K3)**

List of Exercises

1. Web Scraping
2. Data Migration & Entry
3. Email Query Processing
4. Invoice Processing
5. Customer Support Emails
6. Scheduling systems
7. Expense management
8. Credit card applications
9. Moving Files from one Source Folder to Destination Folder
10. Excel Automation
11. PDF Automation

Reference Books

1. A. Tripathi, "Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots with the leading RPA tool – UiPath", Packt Publishing, 2018.
2. K. Wibbenmeyer, "The Simple Implementation Guide to Robotic Process Automation (RPA): How to Best Implement RPA in an Organization", iUniverse.
3. S. Merianda, "Robotic Process Automation Tools, Process Automation and Their Benefits: Understanding RPA and Intelligent Automation", Createspace.
4. M. Lacity, L. Willcocks, "Robotic Process and Cognitive Automation: The Next Phase", Steve Brookes Publishing.
5. Tom Taulli, "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", 2020.

Web Resources

1. <https://www.edureka.co/blog/rpa-projects>
2. <https://www.edureka.co/blog/uiopath-automation-examples>
3. <https://mindmajix.com/30-rpa-examples>

COs/POs/PSOs Mapping

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| 2 | 2 | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 3 | 2 | 2 | 3 | 2 | 2 | - | - | - | - | - | - | - | 2 | 3 | 3 |
| 4 | 3 | 2 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |
| 5 | 2 | 3 | 2 | 2 | 3 | - | - | - | - | - | - | - | 3 | 3 | 3 |

| | | | | | | |
|------------------|----------------------------------|----------|----------|----------|----------|------------|
| U20ADC6XX | CERTIFICATION COURSE – VI | L | T | P | C | Hrs |
| | | 0 | 0 | 4 | - | 50 |

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

| | | | | | | |
|------------------|----------------------------------------------------------------------|----------|----------|----------|----------|------------|
| U20ADS606 | SKILL DEVELOPMENT COURSE 6 (Foreign Language / IELTS – II) | L | T | P | C | Hrs |
| | | 0 | 0 | 2 | - | 30 |

Student should choose the Foreign Language/IELTS course like Japanese/French/ Germany/IELTS, etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and language Experts. The courses are to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. Students have to complete the courses successfully. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course. The marks attained for this course is not considered for CGPA calculation.

| | SKILL DEVELOPMENT COURSE 7 | L | T | P | C | Hrs |
|------------------|-----------------------------------|----------|----------|----------|----------|------------|
| U20ADS607 | (Technical Seminar) | 0 | 0 | 2 | - | 30 |

Course Objectives

- To encourage the students to study advanced engineering developments
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as over head projectors, power point presentation and demonstrative models.

Course Outcomes

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

CO1 - Review, prepare and present technological developments.

CO2 - Face the placement interviews.

Method of Evaluation:

- During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for duration of about 20 minutes.
- In a session of three periods per week, 8 to 10 students are expected to present the seminar.
- Each student is expected to present atleast twice during the semester and the student is evaluated based on that.
- At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report.
- A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also.
- Evaluation is 100% internal. The marks attained for this course is not considered for CGPA calculation.

| | | | | | | |
|------------------|-----------------------------------|----------|----------|----------|----------|------------|
| U20ADS608 | SKILL DEVELOPMENT COURSE 8 | L | T | P | C | Hrs |
| | (NPTEL / MOOC - I) | 0 | 0 | 2 | - | 30 |

Student should register online courses like MOOC / SWAYAM / NPTEL etc. approved by the Department committee comprising of HoD, Programme Academic Coordinator, Class advisor and Subject Experts. Students have to complete the relevant online courses successfully. The list of online courses is to be approved by Academic Council on the recommendation of HoD at the beginning of the semester if necessary, subject to ratification in the next Academic council meeting. The Committee will monitor the progress of the student and recommend the grade (100% Continuous Assessment pattern) based on the completion of course / marks secured in online examinations. The marks attained for this course is not considered for CGPA calculation.

| | | | | | |
|------------------|------------------------------------------------|----------|----------|----------|--------------|
| U20ADM606 | ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE | L | T | P | C Hrs |
| | | 2 | 0 | 0 | - 30 |

Course Objectives

The course will introduce the students to

- To get a knowledge in Indian Culture
- To Know Indian Languages and Literature and the fine arts in India
- To explore the Science and Scientists of Medieval and Modern India

Course Outcomes

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

- CO1** – Understand philosophy of Indian culture. **(K2)**
- CO2** – Distinguish the Indian languages and literature. **(K3)**
- CO3** – Learn the philosophy of ancient, medieval and modern India. **(K1)**
- CO4** – Acquire the information about the fine arts in India. **(K3)**
- CO5** – Know the contribution of scientists of different eras. **(K2)**

UNIT I INTRODUCTION TO CULTURE

Culture, Civilization, Culture and Heritage, General Characteristics of Culture, Importance of Culture in Human Literature, Indian Culture, Ancient India, Medieval India, Modern India.

UNIT II INDIAN LANGUAGES, CULTURE AND LITERATURE

Indian Languages and Literature-I: The role of Sanskrit, Significance of Scriptures to Current Society, Indian Philosophies, Other Sanskrit Literature, Literature of South India Indian Languages and Literature-II: Northern Indian languages & Literature.

UNIT III RELIGION AND PHILOSOPHY

Religion and Philosophy in Ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only).

UNIT IV FINE ARTS IN INDIA (ART, TECHNOLOGY & ENGINEERING)

Indian Painting, Indian handicrafts, Music, Divisions of Indian Classic Music, Modern Indian Music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, Development of Science in Ancient, Medieval and Modern India.

UNIT V EDUCATION SYSTEM IN INDIA

Education in Ancient, Medieval and Modern India, Aims of Education, Subjects, Languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India.

Reference Books

1. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, 2014.
2. Science in Samskrit, "Samskrita Bharti Publisher", 2007.
3. NCERT, "Position paper on Arts, Music, Dance and Theatre", 2006.
4. Kapil Kapoor, "Text and Interpretation: The India Tradition", 2005.
5. S. Narain, "Examinations in ancient India", Arya Book Depot, 1993.
6. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989.