MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Scheme of Teaching and Examination 2021-2022(As per NEP-2020)
Outcome Based Education (OBE) and Choice Based Credit System (CBCS)
(Effective from the academic year 2021–2022)

Artificial Intelligence and Machine Learning (AI&ML)

VII-SEMESTER

Sl. No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				
						Theory lectures	Tutorial	Practical/ Drawing	Examination in Hours	CIE Marks	SEE Marks	Total Marks	Credits
						L	T	P					
1	IPCC	21AI71	Deep Learning	AI&ML	AI&ML	2	2	2	03	50	50	100	4
2	PCC	21AI72	Natural Language Processing	AI&ML	AI&ML	2	2	0	03	50	50	100	3
3	PEC	21AI73X	Professional Elective - 3	AI&ML	AI&ML	2	2	0	03	50	50	100	3
4	PEC	21AI73X	Professional Elective - 4	AI&ML	AI&ML	2	2	0	03	50	50	100	3
5	PROJECT	21AIP74	Project work Phase – I	AI&ML	AI&ML	0	0	4	03	100		100	2
6	AEC	21AEC75X	Ability Enhancement Course-III	AI&ML	AI&ML	0	0	2		50		50	1
7	INT	21INT83	Summer Internship-II	Completed during the vacation of VI and VII semesters									
Total						08	08	08	15	350	200	550	16

Note: **PCC**: Professional Core Courses, **IPCC**: Integrated Professional Core Courses, **AI&ML**: Artificial Intelligence and Machine Learning, **PEC**: Professional Elective Course, **AEC:** Ability Enhancement Course, **PROJECT:** Project work phase-I and **INT:** Internship.

Professional Elective - 3 and Professional Elective - 4				Ability Enhancement Course	
Course Code	Course Title	Course Code	Course Title	Course Code	Course Title
21AI731	Algorithms for Cluster Data	21AI735	Generative Artificial Intelligence	21AEC751	Digital Image Processing Applications
21AI732	Blockchain Technology	21AI736	Information Retrieval	21AEC752	Generative AI Applications
21AI733	Digital Image Processing	21AI737	Predictive Analytics	21AEC753	Project Management Using Git
21AI734	Fuzzy Sets Theory	21AI738	Soft Computing	21AEC754	Technical Writing with LATEX

Credit Definition:
1-hour lecture(L) per week per semester = 1 Credit
2-hour tutorial (T) per week per semester = 1 Credit
2-hour Practical/Drawing (P) per week per semester = 1 Credit

Four-credit courses are to be designed for **50** hours of Teaching-Learning process.
Three credit courses are to be designed for **40** hours of Teaching-Learning process.
Two credit courses are to be designed for **25** hours of Teaching-Learning process.
One credit course is to be designed for **15** hours of Teaching-Learning process

Professional Elective Courses (PEC): A professional elective (PEC) course is intended to enhance the depth and breadth of educational experience in the Engineering and Technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Students can select any one of the professional electives offered by any department. **Selection of a professional elective is not allowed provided,**

- The candidate has studied the same course during the previous semesters of the programme.
- The syllabus content of open elective is similar to that of Departmental core courses, Open Electives or Professional electives.
- A similar course, under any category, is prescribed in the higher semesters of the programme.
- Registration to electives shall be documented under the guidance of Programme Coordinator/ Adviser/Mentor.

Project work: Based on the ability/abilities of the student/s and recommendations of the mentor, a single discipline or a multidisciplinary Mini project can be assigned to an individual student or to a group having not more than 4 students.
CIE procedure for Project:
(i) **Single discipline:** The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the Mini-project work, shall be based on the evaluation of project report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.
(ii) **Interdisciplinary:** Continuous Internal Evaluation shall be group wise at the college level with the participation of all the guides of the college. The CIE marks awarded for the Mini-project, shall be based on the evaluation of project report, project presentation skill and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

AICTE Activity Points: *AICTE Activity Points to be earned by students admitted to BE/B.Tech., day college programme*.
In case students fail to earn the prescribed activity Points, an Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

MYSORE UNIVERSITY SCHOOL OF ENGINEERING

Scheme of Teaching and Examination 2021-2022(As per NEP-2020)
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Artificial Intelligence and Machine Learning (AI&ML)

VIII-SEMESTER

Sl. No.	Course & Course Code		Course Title	Teaching Dept.	Paper Setting Board	Teaching Hours/week			Examination				Credits
						Theory lectures	Tutorial	Practical/ Drawing	Examination in Hours	CIE Marks	SEE Marks	Total Marks	
						L	T	P					
1	PROJECT	21AIP81	Project work Phase - II	AI&ML	AI&ML	0	0	12	03	100	100	200	8
2	Seminar	21AIS82	Technical Seminar	AI&ML	AI&ML	Two contact hour /week for interaction between the faculty and students.			03	100		100	3
3	INT	21INT83	Summer Internship-II	Completed during the vacation of VI and VII semesters		Two contact hours /week for interaction between the faculty and students.				100		100	3
Total						0	0	16	06	300	100	400	14

Note: **AI&ML**: Artificial Intelligence and Machine Learning, **PROJECT:** Project work phase-II and **INT:** Internship

Credit Definition:
1-hour lecture(L) per week per semester = 1 Credit
2-hour tutorial (T) per week per semester = 1 Credit
2-hour Practical/Drawing (P) per week per semester = 1 Credit

Four-credit courses are to be designed for **50** hours of Teaching-Learning process.
Three credit courses are to be designed for **40** hours of Teaching-Learning process.
Two credit courses are to be designed for **25** hours of Teaching-Learning process.
One credit course is to be designed for **15** hours of Teaching-Learning process

Technical Seminar: The objective of the seminar is to inculcate self-learning, present the seminar topic confidently, enhance communication skills, and involve participants in group discussions for the exchange of ideas. Each student, under the guidance of a faculty, shall choose, preferably, a recent topic of his or her interest relevant to the program of specialization.

- Carry out a literature survey and systematically organize the content.
- Prepare the report with your own sentences, avoiding a cut-and-paste act.
- Type the matter to become familiar with the use of Microsoft Excel, drawing tools, or any such facilities.
- Present the seminar topic orally and/or through PowerPoint slides.
- Answer the queries and involve yourself in debate or discussion.
- Submit a typed report with a list of references.

The participants shall take part in the discussion to foster a friendly and stimulating environment in which the students are motivated to reach high standards and become self-confident.

Evaluation Procedure:
The CIE marks for the seminar shall be awarded (based on the relevance of the topic, presentation skill, participation in the question and answer session, and quality of report) by the committee constituted for the purpose by the Head of the Department. The committee shall consist of three teachers from the department with the senior-most acting as the Chairman.
Marks distribution for CIE of the course:
Seminar Report:50 marks
Presentation skill:25 marks
Question and Answer: 25 marks.
No SEE component for Technical Seminar.

CIE procedure for Project Work:

1) **Single discipline:** The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two seniors
faculty members of the Department, one of whom shall be the Guide. The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.
2) **Interdisciplinary:** Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.
3) **SEE procedure for Project Work:** SEE for project work will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the ratio 50:25:25

AICTE Activity Points: AICTE Activity Points to be earned by students admitted to BE/B.Tech., day college programme
(For more details refer to Chapter 6, AICTE Activity Point Programme, Model Internship Guidelines)

- Over and above the academic grades, every Day College regular student admitted to the 4 years Degree programme and every student entering 4 years Degree programme through lateral entry, shall earn 100 and 75 Activity Points respectively for the award of degree through AICTE Activity Point Programme.
- Students transferred from other Universities to the fifth semester are required to earn 50 Activity Points from the year of entry to UoM. The Activity Points earned shall be reflected on the student's eighth semester Grade Card.
- The activities can be spread over the years, anytime during the semester weekends and holidays, as per the liking and convenience of the student from the year of entry to the programme. However, the minimum hours' requirement should be fulfilled.
- Activity Points (non-credit) do not affect SGPA/CGPA and shall not be considered for vertical progression**.**

In case students fail to earn the prescribed activity Points, an Eighth semester Grade Card shall be issued only after earning the required activity Points. Students shall be admitted for the award of the degree only after the release of the Eighth semester Grade Card.

Deep Learning (21AI71)

VII Semester DEEP LEARNING			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	50	**Exam Hours**	03
L: T: P	2:2:2	**Credits**	04

Modules	Course Content	Teaching Hours
Module 1	**Deep Feed forward Networks**: Gradient-Based Learning, Hidden Units, Architecture Design, Back Propagation. **Regularization:** Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi Supervised Learning, Multi-Task Learning.	**10 Hours** **L(3):T(3):P(4)**
Module 2	**Optimization for Training Deep Models**: How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms. Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates. **Convolutional Networks**: The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Efficient Convolution Algorithms, Random or Unsupervised Features.	**10 Hours** **L(3):T(3):P(4)**
Module 3	**Sequence Modelling**: Recurrent and Recursive Nets, Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks. Long Short-Term Memory (LSTM).	**10 Hours** **L(3):T(3):P(4)**
Module 4	**Introduction to Reinforcement Learning:** State of the art applications in Atari, Alpha Go, relation to other problems in artificial intelligence, **Markov Decision Processes (model based):** Formulation, Value Iteration (VI), Policy Iteration (PI), Linear Programming, Approximate	**10 Hours** **L(3):T(3):P(4)**
Module 5	**Dynamic Programming (approximate model based):** curse-of-dimensionality, representations, Approximate value iteration, approximate policy iteration, approximate linear program, approximation and convergence guarantees. Stochastic. **Value function learning (approximate model-free):** Temporal difference (TD learning, TD (0), TD (lambda), Q-learning, State-Action-Reward-State Algorithm (SARSA),	**10 Hours** **L(3):T(3):P(4)**

Course outcomes:

At the end of the course the students will be able to:

- **CO1**: Understand the basic concepts of Neural Network.
- **CO2**: Apply the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
- **CO3**: Develop Generative models using Convolutional neural Network.
- **CO4**: Study on recent trends and applications of deep learning.
- **CO5**: Identify the model based from the model free methods. Identify stability/convergence and approximation properties of RL algorithms. Use deep learning methods to RL problems in practice.

Textbooks:

1. Deep Learning, Lan Good fellow and Yoshua Bengio and Aaron Courville, MIT Presshttps://www.deeplearn ingbook.org/, 2016.
2. Richard S. Sutton and Andrew G. Barto, Introduction to Reinforcement Learning, 2nd Edition, MIT Press. 2017. ISBN-13 978-0262039246.
3. Dimitri Bertsekas and John G. Tsitsiklis, Neuro Dynamic Programming, Athena Scientific. 1996. ISBN-13: 978-1886529106.

Reference Books:

1. Neural Networks, A systematic Introduction, Raúl Rojas, 1996.
2. Pattern Recognition and machine Learning, Chirstopher Bishop, Springer, 2007.
3. V. S. Borkar, Stochastic Approximation: A Dynamical Systems Viewpoint, Hindustan Book Agency, 2009. ISBN-13: 978-0521515924.
4. Deep Learning. Ian Goodfellow and Yoshua Bengio and Aaron Courville. MIT Press. 2016.ISBN-13: 978-0262035613.

DEEP LEARNING LABORATORY

PART	Course Content	Teaching Hours
PART A	1. Design a single unit perceptron for classification of a linearly separable binary dataset without using pre-defined models. Use the Perceptron() from sklearn. 2. Identify the problem with single unit Perceptron. Classify using Or-, And- and Xor-ed data and analyze the result. 3. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets. Vary the activation functions used and compare the results. 4. Build a Deep Feed Forward ANN by implementing the Backpropagation algorithm and test the same using appropriate data sets. Use the number of hidden layers >=4. 5. Design and implement an Image classification model to classify a dataset of images using Deep Feed Forward NN. Record the accuracy corresponding to the number of epochs. Use the MNIST, CIFAR-10 datasets. 6. Design and implement a CNN model (with 2 and with 4+ layers of convolutions) to classify multi category image datasets. Use the MNIST, Fashion MNIST, CIFAR-10 datasets. Set the No. of Epoch as 5, 10 and 20. Make the necessary changes whenever required. Record the accuracy corresponding to the number of epochs. Record the time required to run the program, using CPU as well as using GPU in Colab. and Test accuracy corresponding to the following architectures: a. Base Model b. Model with L1 Regularization c. Model with L2 Regularization d. Model with Dropout e. Model with both L2 (or L1) and Dropout.	**10 Hours**
PART B	7. Use the concept of Data Augmentation to increase the data size from a single image. 8. Design and implement a CNN model to classify CIFAR10 image dataset. Use the concept of Data Augmentation while designing the CNN model. Record the accuracy corresponding to the number of epochs. 9. Implement the standard LeNet-5 CNN architecture model to classify multicategory image dataset (MNIST, Fashion MNIST) and check the accuracy. 10. Implement the standard VGG-16 & 19 CNN architecture model to classify multi category image dataset and check the accuracy. 11. Implement RNN for sentiment analysis on movie reviews. 12. Implement Bidirectional LSTM for sentiment analysis on movie reviews.	**10 Hours**

Laboratory Outcomes:

The student should be able to illustrate the following operations:

- Understand and Implement Basic Deep Learning Models and Understand and Implement Backpropagation Algorithm.
- Explore Convolutional Neural Networks (CNNs) and Work with Advanced CNN Architectures
- Implement Deep Feed Forward Networks, explore Recurrent Neural Networks (RNNs) and LSTMs and Leverage GPUs for Training.

Web References:

1. Deep Learning with Python.
2. TensorFlow Tutorials.
3. PyTorch Tutorials and Understanding CNNs.

Descriptions (if any):

The programs can be implemented in Python and Data sets can be taken from standard repositor.

Natural Language Processing (21AI72)

VII Semester NATURAL LANGUAGE PROCESSING			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T: P	2:2:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Need for processing of natural languages, Language processing levels, Applications of NLP, Ambiguity and uncertainty in language, Regular Expressions, NLP tasks in syntax, semantics and pragmatics, Machine Translation.	**08 Hours L(4):T(4)**
Module 2	**Morphological Processing:** Introduction to Corpus, Tokenization, Stemming, Lemmatization Inflectional and Derivational morphology, Morphological parsing, Finite state transducers, N- gram language models, practical illustrations with NLTK, **Python3**: Textual sources, APIs, social media and Web Scraping, practical illustrations with NLTK, Python3, Textual sources, APIs, social media and Web Scraping.	**08 Hours L(4):T(4)**
Module 3	**Information Retrieval**: Design features of Information Retrieval Systems, Classical, non-classical, Alternative Models of Information Retrieval, valuation Lexical Resources: World Net-Frame Net-Stemmers. **Part-of-Speech Tagging**: POS Tagger- Research Corpora.	**08 Hours L(4):T(4)**
Module 4	**Large Language Models**: History and evolution of LLMs, Neural Network Architecture Building Blocks for LLMs, LLM models, Transformer Architecture, Training and Fine-tuning LLMs-Data collection, data Preprocessing, and fine-tuning strategies., Transformer variants: BERT, GPT Architecture, XLNet.	**08 Hours L(4):T(4)**
Module 5	**Applications on Large Language Models**: Language translation, summarization, and paraphrasing. Exploring GPT-based applications-chatbots, content generation, and sentiment analysis, Advantages and Challenges of LLM, Ethical and Societal Implications	**08 Hours L(4):T(4)**

Course outcomes:

At the end of the course the students will be able to:
CO1: Understand the basic terminology and theory behind underlying natural language processing.
CO2: Understand approaches inflectional and derivational morphology and finite state transducers
CO3: Understand approaches to part of speech tagging, parsing syntax and semantics in NLP.
CO4: Understand basics of large language models and fine tuning LLM
CO5: Understand the applications of BERT, GPT.

Reference Books:

1. D. Jura sky and J. H. Martin. Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition, Pearson Education,2008
2. J. Allen, Natural Language Understanding, Addison Wesley, 2007.
3. Vineet Chaitanya, Rajeev Sangal. Natural Language Processing - A Paninian Perspective by Akshar Bharathi.

Professional Elective -III/IV (21AI731)

VII Semester ALGORITHMS FOR CLUSTER DATA			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T: P	2:2:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**An Introduction to Cluster Analysis:** Introduction, Common Techniques Used in Cluster Analysis, Data Types Studied in Cluster Analysis, Insights Gained from Different Variations of Cluster Analysis.	**08 Hours L(4):T(4)**
Module 2	**Advanced Cluster Analysis**: Feature Selection Methods, Probabilistic Model-Based, Distance-Based Algorithms, Density and Grid Based Methods. Leveraging Dimensionality Reduction Methods. **Clustering High-Dimensional Data:** Problems, Challenges and Major Methodologies, Subspace Clustering Methods, Bi-clustering, Dimensionality Reduction Methods and Spectral Clustering.	**08 Hours L(4):T(4)**
Module 3	**A Survey of Stream Clustering Algorithms:** Introduction**,** Methods Based on Partitioning Representatives**,** Big Data Clustering, Clustering Categorical Data, Clustering Multimedia Data, Time-Series Data Clustering, Clustering Biological Data, Network Clustering.	**08 Hours L(4):T(4)**
Module 4	**Semi supervised Clustering:** Introduction, semi supervised Grap Cuts, A Unified View of Label Propagation, semi supervised Embedding, Comparative Experimental Analysis, **Cluster Ensembles**: Theory and Applications, Clustering Validation Measures, Educational and Software Resources for Data Clustering,	**08 Hours L(4):T(4)**
Module 5	**Applications of Clustering:** Clustering Gene Expression Data, Types of Gene Expression Data Clustering, Similarity Measures for Gene Expression Data. **MATLAB and C++ for Clustering:** Data Clustering in MATLAB, Clustering in C/C++, The kd-tree Data Structure	**08 Hours L(4):T(4)**

Course outcomes:

At the end of the course the student will be able to:

CO1: Identify data mining problems.
CO2: Write association rules for a given data pattern.
CO3: Choose between classification and clustering solution.
CO4: Apply clustering algorithms to analyze and interpret data patterns.
CO5: Evaluate and compare the performance of different clustering algorithms.

Text Books:

1. "Algorithms for Clustering Data" by Anil K. Jain and Richard C. Dubes
2. "Data Clustering: Theory, Algorithms, and Applications" by Guojun Gan, Chaoqun Ma, and Jianhong Wu

References:

1. Handbook of Cluster Analysis" by Christian Hennig, Marina Meila, Fionn Murtagh, and Roberto Rocci.
2. "Stream Data Mining: Algorithms and Their Applications" by Joachim Bähr, Mehmet Gönen, and Michael Goebel.

Professional Elective -III/IV (21AI732)

VII Semester BLOCKCHAIN TECHNOLOGY			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T: P	2:2:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Blockchain:** Distributed systems, History of blockchain, Introduction to blockchain, Types of blockchain, CAP theorem and blockchain, Benefits and limitations of blockchain.	**08 Hours L(4):T(4)**
Module 2	**Decentralization and Cryptography:** Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Decentralized organizations. Cryptography and Technical Found	**08 Hours L(4):T(4)**
Module 3	**Bitcoin and Alternative Coins A:** Bitcoin, Transactions, Blockchain, Bitcoin payments B: Alternative Coins Theoretical foundations, Bitcoin limitations, Name coin, Litecoin, Primecoin, Z cash	**08 Hours L(4):T(4)**
Module 4	**Smart Contracts and Ethereum 101:** Smart Contracts: Definition, Ricardian contracts. Ethereum 101: Introduction, Ethereum blockchain, Elements of the Ethereum blockchain, Precompiled contracts	**08 Hours L(4):T(4)**
Module 5	**Alternative Blockchains:** Blockchains Blockchain-Outside of Currencies: Internet of Things, Government, Health, Finance, Media	**08 Hours L(4):T(4)**

Course outcomes:

At the end of the course the student will be able to:

CO1: Define and explain the fundamentals of Blockchain.

CO2: Illustrate the technologies of blockchain.

CO3: Describe the models of blockchain.

CO4: Analyse and demonstrate the Ethereum.

CO5: Analyse and demonstrate Hyperledger fabric.

Text Books:

1. Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Imran Bashir, Packet Publishing Ltd, Second Edition, ISBN 978-1-78712-544-5, 2017.

References:

3. Bitcoin and Cryptocurrency Technologies, Arvind Narayanan, Joseph Bonneau, Edward Felten, 2016.
4. Blockchain Basics: A Non-Technical Introduction in 25 Steps, Daniel Drescher, Apress, First Edition, 2017.
5. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos, O'Reilly Media, First Edition, 2014.

Professional Elective -III/IV (21AI733)

VII Semester DIGITAL IMAGE PROCESSING			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T: P	2:2:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Digital image fundamentals**: Digital Image Representation, Fundamental steps in Image Processing, Elements of Visual Perception, Image Sensing and Acquisition, Image Sampling and Quantization, Relationships between pixels, colour models.	**08 Hours L(4):T(4)**
Module 2	**Image enhancement**: Spatial Domain: Gray level transformations, Histogram processing, Basics of Spatial Filtering, Smoothing and Sharpening Spatial Filtering, **Frequency Domain:** 2D Fourier Transform, Smoothing and Sharpening frequency domain filters.	**08 Hours L(4):T(4)**
Module 3	**Image restoration and segmentation**: Noise models, Mean filters, Order Statistics, Adaptive filters, Band reject filters, Band pass filters, Notch filters, Optimum Notch filtering, Inverse filtering, Wiener filtering. **Segmentation:** Edge detection Edge Linking and Boundary detection, Region based segmentation, Morphological processing, erosion and dilation.	**08 Hours L(4):T(4)**
Module 4	**Image compression and representation:** Compression Fundamentals, Image Compression models, Error Free Compression, Lossy compression, Image Compression standards	**08 Hours L(4):T(4)**
Module 5	**Image representation and recognition:** Boundary representation, Chain Code, Polygonal approximation, signature, Boundary segments, Boundary description, Shape number Fourier Descriptor, moments, Regional Descriptors, Topological feature, Texture, Patterns and Pattern classes, Recognition based on matching.	**08 Hours L(4):T(4)**

Course outcomes:

At the end of the course the student will be able to:

CO1: Discuss digital image fundamentals.
CO2: Articulate image enhancement and restoration techniques.
CO3: Articulate image restoration and implementing segmentation techniques
CO4: Examining image compression Techniques and its representation
CO5: Representation and recognition of images

Text Books

1. Rafael C. Gonzales, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson Education, 2010.
2. Anil Jain K. "Fundamentals of Digital Image Processing", PHI Learning Pvt. Ltd., 2011.

References

1. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing Using MATLAB", Third Edition Tata Mc Graw Hill Pvt. Ltd., 2011.
2. Willliam K Pratt, "Digital Image Processing", John Willey, 2002.
3. Malay K. Pakhira, "Digital Image Processing and Pattern Recognition", First Edition, PHI Learning Pvt. Ltd., 2011.

References:

1. Aidas Bendroraitis, Jake Kronika, Django 3 Web Development Cookbook, Fourth Edition, Packt Publishing, 2020
2. William Vincent, Django for Beginners: Build websites with Python and Django, First Edition, Amazon Digital Services, 2018
3. Antonio Mele, Django3 by Example, 3rd Edition, Pack Publishers, 2020
4. Arun Ravindran, Django Design Patterns and Best Practices, 2nd Edition, Pack Publishers, 2020.
5. Julia Elman, Mark Lavin, Light weight Django, David A. Bell, 1st Edition, Oreily Publications, 2014.

Weblinks and Video Lectures (e-Resources):

1. MVT architecture with Django: https://freevideolectures.com/course/3700/django-tutorials

2. Using Python in Django: https://www.youtube.com/watch?v=2BqoLiMT3Ao

3. Model Forms with Django: https://www.youtube.com/watch?v=gMM1rtTwKxE

4. Real time Interactions in Django: https://www.youtube.com/watch?v=3gHmfoeZ45k

5. AJAX with Django for beginners: https://www.youtube.com/watch?v=3VaKNyjlxAU

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

1. Real world problem solving - applying the Django framework concepts and its integration with AJAX to develop any shopping website with admin and user dashboards.

Professional Elective -III/IV (21AI734)

VII Semester FUZZY SETS THEORY			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T: P	2:2:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Historical perspective, utility of fuzzy systems, limitations of fuzzy systems, statistics and random processes, uncertainty in information, fuzzy sets and membership, chance versus fuzziness, sets as points in Hypercube. **Classical Sets and Fuzzy Sets:** classical sets, operations on them, mapping of classical sets to functions, fuzzy sets, fuzzy set operations, properties of fuzzy sets, non-interactive fuzzy sets	**08 Hours L(4):T(4)**
Module 2	**Classical Relations and Fuzzy Relations:** Cartesian Product, Crisp Relations, Cardinality of Crisp Relations, Operations on Crisp Relations, and Properties of Crisp Relations, Composition. **Fuzzy Relations;** Cardinality of Fuzzy Relations, Operations on Fuzzy Relations, Properties of Fuzzy Relations, Fuzzy Cartesian Product and Composition, non-interactive Fuzzy Sets.	**08 Hours L(4):T(4)**
Module 3	**Membership Functions:** Features of the Membership Function, Standard Forms and Boundaries, Fuzzification, defuzzification to crisp sets, Lambda-Cuts for Fuzzy Sets, Lambda Cuts for Fuzzy Relations, Defuzzification Methods.	**08 Hours L(4):T(4)**
Module 4	**Fuzzy Arithmetic and the Extension Principle:** Crisp Functions, Mapping and Relations, Functions of fuzzy Sets, Extension Principle, Fuzzy Transform (Mapping), Practical Considerations. Fuzzy Numbers Interval Analysis in Arithmetic. **Methods of Extension:** Vertex method, DSW Algorithm, Restricted DSW Algorithm, Comparisons. Fuzzy Vectors.	**08 Hours L(4):T(4)**
Module 5	**Fuzzy Rule Based Systems:** Natural Language, Linguistic Hedges, Rule-Based Systems, Canonical Rule Forms, Decomposition of Compound Rules, Likelihood and Truth Qualification, Aggregation of Fuzzy Rules. Graphical Techniques of Inference.	**08 Hours L(4):T(4)**

Course outcomes:

At the end of the course the student will be able to:

CO1: Provide basic elements of fuzzy sets.

CO2: Differentiate between fuzzy set and classical set theory.

CO3: Apply fuzzy membership functions to solve value assignment problems.

CO4: Explain approximate methods of fuzzy arithmetic and extension principle.

CO5: Discuss the applications of fuzzy rule-based systems.

Text Books:

1. Fuzzy Logic with Engineering Applications Timothy J. Ross Wiley India International edition,2010.

References:

1. Fuzzy Logic- Intelligence, Control, and information John Yen Reza Langari Pearson Education 1st Edition, 2004
2. Fuzzy Sets and Fuzzy Logic-Theory and Applications George J. KlirBo Yuan Prentice Hall of India 1 st Edition, 2000
3. Fuzzy Mathematical approach to pattern Recognition, S K Pal, and D Dutta Majumder, John Wiley 1986
4. Neuro-fuzzy pattern recognition: methods in soft computing, S K Pal and S Mitra
5. Fuzzy set theory and its applications by H J Zimmermann, Springer Publications

Professional Elective -III/IV (21AI735)

VII Semester GENERATIVE ARTIFICIAL INTELLIGENCE			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T: P	2:2:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Generative AI:** Overview of AI and generative models, Differences between discriminative and generative models, Applications of generative AI, Introduction to key concepts: probability distributions, latent variables, etc.	**08 Hours L(4):T(4)**
Module 2	**Deep Learning for Generative Models**: Neural networks refresher, Autoencoders and Variational Autoencoders (VAEs), Introduction to Generative Adversarial Networks (GANs), **Advanced Generative Models**: Deep Convolutional GANs (DCGANs), Recurrent Neural Networks (RNNs) and their generative applications, Transformer models and their generative capabilities, **Hands-on:** Building a simple generative model.	**08 Hours L(4):T(4)**
Module 3	**Applications and Evaluation of Generative AI:** Data augmentation with generative models, Generative models in design and manufacturing, Evaluation metrics for generative models, Ethical considerations and societal impacts. **Case Studies**: Image and text generation and enhancement, Natural Language Processing, Music and audio generation, Style transfer and creative arts, Healthcare and drug discovery	**08 Hours L(4):T(4)**
Module 4	**Generative AI Prompt Engineering Basics:** principles of prompt engineering, Introduction to Prompt Engineering, Techniques for Effective Prompt Engineering, Examples of successful prompts in generative AI, crafting clear and specific prompts, Utilizing context and examples in prompts, Iterative testing and refinement of prompts.	**08 Hours L(4):T(4)**
Module 5	**Capstone Project:** Project ideation and proposal, Dataset collection and Preprocessing, Model selection, training, and refinement, Presentation of projects and peer review.	**08 Hours L(4):T(4)**

Course outcomes:

At the end of the course the student will be able to:

CO1: Understand the principles and algorithms behind generative models.

CO2: Apply generative models to create new data instances and solve engineering problems.

CO3: Evaluate the performance of generative models in various applications.

CO4: Explore the ethical implications and responsible use of generative AI.

CO5: Develop a capstone project that incorporates generative AI techniques to address a real-world problem.

Text Books:

1. "Deep Learning" by Ian Goodfellow, Yoshua Bengio, and Aaron Courville

References:

1. "Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play" by David Foster
2. "GANs in Action: Deep learning with Generative Adversarial Networks" by Jakub Langr and Vladimir Bok

Online Resources:

1. TensorFlow and PyTorch documentation for practical exercises
2. ArXiv for accessing the latest research papers on generative models
3. Online courses and tutorials (Coursera, edX, Udacity)

Professional Elective -III/IV (21AI736)

VII Semester INFORMATION RETRIEVAL			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T: P	2:2:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction:** Basic Concepts, Retrieval Process Modelling Classic Information, Retrieval Set Theoretic, Algebraic and Probabilistic Models.	**08 Hours L(4):T(4)**
Module 2	**Retrieval Techniques:** Structured Text Retrieval Models, Retrieval Evaluation, Word Sense Disambiguation.	**08 Hours L(4):T(4)**
Module 3	**Querying: Languages:** Key Word-based Querying, Pattern Matching, Structural Queries, Query Operations, User Relevance Feedback, Local and Global Analysis	**08 Hours L(4):T(4)**
Module 4	**Text Operations:** Document Pre-processing, Clustering, Text Compression, Indexing and Searching, Inverted files, Boolean Queries, Sequential searching, Pattern matching.	**08 Hours L(4):T(4)**
Module 5	**User Interface & Applications:** User Interface and Visualization, Human Computer Interaction, Access Process, Starting Points, Query Specification, Context User relevance Judgment, Interface for Search. **Searching the Web Challenges:** Characterizing the Web, Search Engines, Browsing, Meta searchers, Online IR systems, Online Public Access Catalogs.	**08 Hours L(4):T(4)**

Course outcomes:

At the end of the course the student will be able to:

CO1: Apply information retrieval principles to locate relevant information in large collections of data and Implement features of retrieval systems for web-based search tasks.
CO2: Apply the common algorithms and techniques for information retrieval related to document indexing and query processing
CO3: Demonstrate a thorough understanding and solid knowledge of the principles and techniques of human-computer interaction
CO4: Implement graphical user interfaces with modern software tools and develop and design interactive software systems applications for real time applications
CO5: Design and develop web applications for the effective informational retrieval

Text Books:

1. Ricardo Baeza-Yate, Berthier Ribeiro-Neto, Modern Information Retrieval, Pearson Education Asia, 2012.

References:

1. G.G. Chowdhury, Introduction to Modern Information Retrieval, Second Edition, Neal- Schuman Publishers, 2010.

Professional Elective -III/IV (21AI737)

VII Semester PREDICTIVE ANALYTICS			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T: P	2:2:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Predictive analytics:** Business analytics: types, applications, Analytical Techniques, Tools.	**08 Hours L(4):T(4)**
Module 2	**Predictive Modelling:** Propensity Models, Cluster Models, Applications.	**08 Hours L(4):T(4)**
Module 3	**Modelling Techniques:** Statistical Modelling, Machine Learning, Empirical Bayes Method, Point Estimation.	**08 Hours L(4):T(4)**
Module 4	**Data Pre-processing:** Data Transformations for Individual Predictors, Data Transformation for Multiple Predictors, Dealing with Missing Values, Removing Predictors, Adding Predictors, Binning Predictors. Over-Fitting and Model Tuning.	**08 Hours L(4):T(4)**
Module 5	**Regression Models:** Measuring Performance in Regression Models, Linear Regression and Its Cousins, Non-Linear Regression Models, Regression Trees and Rule-Based Models. **Case Study:** Compressive Strength of Concrete Mixtures.	**08 Hours L(4):T(4)**

Course outcomes:

At the end of the course the student will be able to:

CO1: Understand the importance of predictive analytics, able to prepare and process data for the models.

CO2: Apply the statistical techniques for predictive models.

CO3: Comprehend the transformation of data in the predictors.

CO4: Apply regression and classification models for decision making and evaluate the performance.

CO5: Apply and build the time series forecasting models in a variety of business contexts.

Text Books:

2. Jeffrey S. Strickland, Predictive Analytics using R,2014.
3. Max Kuhn and Kjell Johnson, Applied Predictive Modelling, 1st edition Springer, 2013.

References:

1. Dean Abbott, Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst, 1st Edition Wiley, 2014.

Professional Elective -III/IV (21AI738)

VII Semester SOFT COMPUTING			
No. of Teaching hour/Week	2	**CIE Marks**	50
No. of Tutorial hours/week	2	**SEE Marks**	50
Total No. of Lecture hours	40	**Exam Hours**	03
L: T: P	2:2:0	**Credits**	03

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Soft computing:** Neural networks, Symbolic Data, Genetic algorithms, Hybrid systems and its applications. (ANN, FS, GA, SI, ES, Comparing among intelligent systems) **BNN:** introduction, biological inspiration, BNN & ANN, classification, first Generation NN, perceptron, illustrative problems (2nd generation), introduction, BPN, KNN, HNN, BAM, RBF, SVM and illustrative problems.	**08 Hours L(4):T(4)**
Module 2	**Symbolic Data:** Symbolic and Classical Data, Categories, Concepts, and Symbolic Objects, Basic Descriptive Statistics: One Variate, Descriptive Statistics: Two or More Variates, Principal Component Analysis, Regression Analysis, **Cluster Analysis:** Dissimilarity and Distance Measures, Clustering Structures, Partitions, Hierarchy–Divisive Clustering, Hierarchy–Divisive Clustering.	**08 Hours L(4):T(4)**
Module 3	**Genetic algorithms:** Introduction, Basic operations, Traditional algorithms, Simple GA General genetic algorithms, Operators, Stopping conditions for GA flow.	**08 Hours L(4):T(4)**
Module 4	**Swarm Intelligence System:** Introduction, background of SI, Ant colony system Working of ant colony optimization, ant colony for TSP. Unit commitment problem, Particle Swarm Intelligence system, Artificial bee colony system, Cuckoo search system.	**08 Hours L(4):T(4)**
Module 5	**Hybrid Systems:** Sequential Hybrid Systems, Auxiliary Hybrid Systems, Embedded Hybrid Systems, Neuro-Fuzzy Hybrid Systems, Neuro-Genetic Hybrid Systems, Fuzzy-Genetic Hybrid Systems.	**08 Hours L(4):T(4)**

Course outcomes:

At the end of the course the student will be able to:

CO1: Implement machine learning through neural networks.
CO2: Design Genetic Algorithm to solve the optimization problem.
CO3: Develop a Fuzzy expert system.
CO4: Model Neuro Fuzzy system for clustering and classification.
CO5: Understand soft computing techniques Apply the learned techniques to solve realistic problems Differentiate soft computing with hard computing techniques

Text Books:

1. Principles of Soft computing, Shivanandam, Deepa S. N, Wiley India, 2011/Reprint2014
2. Soft Computing with MATLAB Programming, N. P. Padhy, S.P. Simon, Oxford, 2015.
3. Symbolic Data Analysis: Conceptual Statistics and Data Mining, Editor(s): Edwin Diday, Monique Noirhomme-Fraiture, First published:18 January 2007.

References:

1. Neuro-fuzzy and soft computing, S.R. Jang, C.T. Sun, E. Mizutani, Phi (EEE edition), 2012.
2. Soft Computing, Saroj Kaushik, Sunita Tiwari, McGraw-Hill, 2018.

Ability Enhancement Course-III (21AEC751)

VII Semester DIGITAL IMAGE PROCESSING APPLICATIONS			
No. of Teaching hour/Week	0	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	
Total No. of Lecture hours	20	**Exam Hours**	03
L: T: P	0:0:2	**Credits**	01

PART	Course Content	Teaching Hours
PART A	1. Write a Program to read a digital image. Split and display image into 4 quadrants, up, down, right and left. 2. Write a program to show rotation, scaling, and translation of an image. 3. Read an image, first apply erosion to the image and then subtract the result from the original. Demonstrate the difference in the edge image if you use dilation instead of erosion.	**10 Hours**
PART B	4. Read an image and extract and display low-level features such as edges, textures using filtering techniques. 5. Demonstrate enhancing and segmenting low contrast 2D images	**10 Hours**

Mini Project List:

- Student should develop a mini project, some of the projects are listed and it is not limited to:

Similar to but not limited to:

- ✓ Recognition of License Plate through Image Processing.
- ✓ Recognition of Face Emotion in Real-Time.
- ✓ Detection of Drowsy Driver in Real-Time.
- ✓ Recognition of Handwriting by Image Processing.
- ✓ Detection of Kidney Stone.
- ✓ Verification of Signature.
- ✓ Compression of Colour Image.
- ✓ Classification of Image Category.
- ✓ Detection of Skin Cancer.
- ✓ Marking System of Attendance using Image Processing.
- ✓ Detection of Liver Tumour.
- ✓ IRIS Segmentation.
- ✓ Detection of Skin Disease and / or Plant Disease.
- ✓ Biometric Sensing System.
- ✓ Mobile Phone Camera-based Light Communications.
- ✓ Modelling of Perspective Distortion within Face Images & Library for Object Tracking.
- ✓ Controlling of Intelligent Traffic Light & Image Processing.
- ✓ Controlling of Pests in Agriculture Field with Image Processing.

Laboratory Outcomes:

The student should be able to illustrate the following operations:

- Image Segmentation algorithm development.
- Image filtering in spatial and frequency domain.
- Morphological operations in analyzing image structures.

Course Learning Objectives:

This course will enable students to:

CO1: Demonstrate the basic skills of image process.

CO2: Demonstrate the application development skills.

CO3: Design and develop the applications of images.

Descriptions (if any):

1. Programming tools preferred: MATLAB, SCILAB, Python, Java or any other relevant platform.
2. For Part A: Students must exhibit the results and its print copy to be attached to Lab record.
3. For Part B: Real Time Images can be used to demonstrate the work.

Installation procedure of the required software must be demonstrated, carried out in groups and documented in the journal.

Ability Enhancement Course-III (21AEC752)

VII SEMESTER GENERATIVE AI APPLICATIONS			
No. of Teaching hour/Week	0	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	
Total No. of Lecture hours	20	**Exam Hours**	03
L: T: P	0:0:2	**Credits**	01

PART	Course Content	Teaching Hours
PART A	1. **Autoencoders:** Implement a basic autoencoder for image compression and reconstruction. **Dataset**: MNIST or CIFAR-10. 2. **Variational Autoencoders (VAEs):** Build and train a VAE to generate new images. **Dataset:** Fashion-MNIST or a subset of CelebA. 3. **Introduction to GANs**: Create a simple Generative Adversarial Network to generate digits. **Dataset**: MNIST. 4. **DCGANs**: Implement a Deep Convolutional GAN to generate higher quality images. **Dataset**: CIFAR-10. 5. **Text Generation with RNNs**: Use a Recurrent Neural Network to generate text character by character. **Dataset**: A text corpus like Shakespeare's plays or a collection of tweets. 6. **Conditional GANs:** Develop a conditional GAN to generate images conditioned on class labels. **Dataset**: MNIST or CIFAR-10 with class labels.	**10 Hours**
PART B	1. **Style Transfer**: Implement neural style transfer to apply the artistic style of one image to another. **Dataset**: A content image and a style reference image. 2. **Pix2Pix:** Use Pix2Pix (a conditional GAN) for image-to-image translation tasks. **Dataset**: Facades or Maps for translating sketches to real images. 3. **CycleGAN**: Implement CycleGAN for unpaired image-to-image translation. **Dataset**: Horse2Zebra or other available CycleGAN datasets. 4. **Text-to-Image Generation**: Build a model to generate images from textual descriptions. **Dataset**: CUB-200 (birds) with text annotations or a similar dataset. 5. **Music Generation with LSTM**: Create a Long Short-Term Memory (LSTM) network to generate musical sequences. **Dataset**: ABC notation of folk music tunes or MIDI files of simple melodies. a. Voice Synthesis with WaveNet b. Implement a WaveNet model to generate raw audio waveforms. **Dataset**: A small subset of the VCTK corpus or other available speech datasets.	**10 Hours**

Laboratory Outcomes: To provide practical experience in implementing and working with generative models. The student should be able to illustrate the following operations:

- Focus on the key learning objectives within the time constraints.
- datasets should be pre-processed if necessary to allow students to focus on the generative modeling aspects.
- Evaluate the performance of generative models in various applications.

Course Learning Objectives:

This course will enable students to:

CO1: Implementing various neural network architectures for image compression, reconstruction, and generation.
CO2: Designing and training advanced generative models for high-quality images.
CO3: Developing and applying neural network techniques for diverse applications.
CO4: Utilizing deep learning models for creative tasks like neural style transfer and text-to-image generation.
CO5: Understanding and applying soft computing techniques for solving realistic problems.

Descriptions (if any):

Software Requirements: Python programming environment with libraries such as TensorFlow, Keras, PyTorch, NumPy, Matplotlib, and Jupyter Notebooks

Ability Enhancement Course-III (21AEC753)

VII SEMESTER PROJECT MANAGEMENT USING GIT			
No. of Teaching hour/Week	0	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	
Total No. of Lecture hours	20	**Exam Hours**	03
L: T: P	0:0:2	**Credits**	01

Modules	Course Content	Teaching Hours
Module 1	**Introduction to Version Control and Git:** Overview of version control systems, **Introduction to Git:** basic commands and workflows, setting up a GitHub account and understanding the GitHub interface, creating repositories, cloning, committing, pushing, and pulling changes	**04 Hours**
Module 2	**Collaboration and Branching Strategies:** Branching and merging workflows, Collaborative development using forks and pull requests, Code reviews and managing pull requests, Branching strategies for project management (e.g., Git Flow)	**04 Hours**
Module 3	**Issue Tracking and Project Management:** Using GitHub Issues for tracking bugs and feature requests, Labelling, filtering, and searching issues, Milestones, projects, and Kanban boards for project planning, Automating workflows with GitHub Actions	**04 Hours**
Module 4	**Advanced Git Features**: Managing project documentation with GitHub Pages, securing repositories with branch protection rules and security policies, Utilizing GitHub Actions for continuous integration (CI) and continuous deployment (CD), GitHub Advanced Security features and code scanning.	**04 Hours**
Module 5	**Open-Source Projects and Community Engagement:** Best practices for open-source project maintenance, **Engaging with the community**: issues, discussions, and contributions - Licensing and the legal aspects of open-source projects, Case studies of successful projects managed on GitHub.	**04 Hours**

Laboratory Outcomes:

The student should be able to illustrate the following operations:

- The principles and practices of project management with a focus on using GitHub as a platform for collaboration, version control, and project tracking
- manage software development projects effectively using GitHub's tools and features.
- Basic understanding of software development and version control concepts.

Course Learning Objectives:

This course will enable students to:

CO1: Understand the basics of version control and the Git workflow

CO2: Utilize GitHub for project collaboration and source code management

CO3: Implement issue tracking and project management features in GitHub

CO4: Apply best practices for maintaining and contributing to open-source projects on GitHub

CO5: Integrate external tools and services with GitHub for continuous integration and deployment.

Descriptions (if any):

Main Resource:

1. GitHub Docs (https://docs.github.com/en)

Reference Resources:

2. "Pro Git" by Scott Chacon and Ben Straub (available for free at https://git-scm.com/book/en/v2)
3. "GitHub Essentials" by Achilleas Pipinellis.

Online Tutorials and Courses:

4. GitHub Learning Lab (https://lab.github.com/)
5. GitHub Guides (https://guides.github.com/)

Ability Enhancement Course-III (21AEC754)

VII SEMESTER TECHNICAL WRITING WITH LATEX			
No. of Teaching hour/Week	0	**CIE Marks**	50
No. of Practical hours/week	2	**SEE Marks**	
Total No. of Lecture hours	20	**Exam Hours**	03
L: T: P	0:0:2	**Credits**	01

<table>
<tr><th>PART</th><th>Course Content</th><th>Teaching Hours</th></tr>
<tr><td>PART A</td><td>
1. Develop a LaTeX script to create a simple document that consists of 2 sections [Section1, Section2], and a paragraph with dummy text in each section. And also include header [title of document] and footer [institute name, page number] in the document.
2. Develop a LaTeX script to create a document that displays the sample Abstract/Summary
3. Develop a LaTeX script to create a simple title page of the VTU project Report [Use suitable Logos and text formatting]
4. Develop a LaTeX script to create the Certificate Page of the Report [Use suitable commands to leave the blank spaces for user entry]
5. Develop a LaTeX script to create a document that contains the following table with proper labels.
<table>
<tr><th rowspan="2">Sl.No</th><th rowspan="2">USN</th><th rowspan="2">Student Name</th><th colspan="3">MARKS</th></tr>
<tr><th>S1</th><th>S2</th><th>S3</th></tr>
<tr><td>1</td><td>4XX22XX001</td><td>Name 1</td><td>89</td><td>60</td><td>90</td></tr>
<tr><td>2</td><td>4XX22XX002</td><td>Name 2</td><td>78</td><td>45</td><td>98</td></tr>
<tr><td>3</td><td>4XX22XX003</td><td>Name 3</td><td>67</td><td>55</td><td>59</td></tr>
</table>
6. Develop a LaTeX script to include the side-by-side graphics/pictures/figures in the document by using the subgraph concept.
</td><td>10 Hours</td></tr>
<tr><td>PART B</td><td>
7. Develop a LaTeX script to create a document that consists of the following two mathematical equations.
$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$
$$= \frac{-2 \pm \sqrt{2^2-4*(1)*(-8)}}{2*1}$$
$$= \frac{-2 \pm \sqrt{4+32}}{2}$$
$$\varphi_\sigma^\lambda A_t = \sum_{\pi \in C_t} \mathrm{sgn}(\pi)\varphi_\sigma^\lambda \varphi_\pi^\lambda$$
$$= \sum_{\tau \in C_{\sigma t}} \mathrm{sgn}(\sigma^{-1}\tau\sigma)\varphi_\sigma^\lambda \varphi_{\sigma^{-1}\tau\sigma}^\lambda$$
$$= A_{\sigma t}\varphi_\sigma^\lambda$$
8. Develop a LaTeX script to demonstrate the presentation of Numbered theorems, definitions, corollaries, and lemmas in the document
9. Develop a LaTeX script to create a document that consists of two paragraphs with a minimum of 10 citations in it and display the reference in the section
</td><td>10 Hours</td></tr>
</table>

	10. Develop a LaTeX script to design a simple tree diagram or hierarchical structure in the document with appropriate labels using the Tikz library 11. Develop a LaTeX script to present an algorithm in the document using algorithm/algorithmic/algorithm2e library 12. Develop a LaTeX script to create a simple report and article by using suitable commands and formats of user choice.	

Course outcomes:
At the end of the course the students will be able to:

CO1: Understand the fundamental concepts of technical writing and LaTeX.
CO2: Create and format professional documents using LaTeX.
CO3: Incorporate graphics, tables, and mathematical equations into LaTeX documents.
CO4: Manage bibliographies and citations with BibTeX.
CO5: Develop a comprehensive understanding of advanced LaTeX features for professional document preparation.

References:

1. Guide to LATEX, fourth edition, Helmut Kopka, Patrick W.Daly
2. https://www.overleaf.com/learn/latex/Beamer#Reference_guide.
3. https://mirror.niser.ac.in/ctan/macros/latex/contrib/beamer/doc/beameruserguide.pdf

Textbooks:

1. "Guide to LaTeX" by Helmut Kopka and Patrick W. Daly.

Reference Textbooks:

2. "LaTeX: A Document Preparation System" by Leslie Lamport.
3. "The LaTeX Companion" by Frank Mittelbach and Michel Goossens.

Online Resources:

1. CTAN (Comprehensive TeX Archive Network) for packages and documentation.
2. Overleaf and ShareLaTeX for online LaTeX editing and collaboration.
3. LaTeX Stack Exchange for community support and Q&A.