



Shri Shankaracharya Technical Campus, Bhilai

(An Autonomous Institute Affiliated to CSVTU Bhilai)

Scheme of Teaching & Examination (Effective from 2020-2021 Batch)

SCHEME OF EXAMINATION

B. Tech- 4th Year

Semester: 8th

Branch: (CSE) Data Science

S.N.	Subject Name	Subject Code	Periods per week			Scheme of Exam			Total Marks	Credit L+ (T+P)/2
			L	T	P	Theory/Practical				
						ESE	CT	TA		
1	Natural Language Processing	CS110801	3	1	-	100	20	30	150	4
2	Professional Elective –IV	Refer Table –IV	3	0	-	100	20	30	150	3
3	Open Elective – III	Refer Table-III	3	0	-	100	20	30	150	3
4	Computer vision Lab	CS110891	-	-	2	25	-	25	50	1
5	Natural Language Processing Lab	CS102894	-	--	2	25	-	25	50	1
6	Capstone Project Phase-II	CS102895	-	-	16	300	-	150	450	8
Total			8	2	20	650	60	290	1000	20

Professional Elective -IV

Sr. No.	Subject Code	Name of Subject
1.	CS102825	Computer Vision
2.	CS102826	Cyber Security Law and Intellectual Property

Open Elective -III

Sr. No.	Subject Code	Name of Subject
1.	CS100842	Data Warehousing and Data Mining

Chairman (AC)	Chairman (BoS)	Date of Release	1.00 Version	Applicable for AY 2021-22 Onwards
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Scheme of Teaching & Examination (Effective from 2020-2021 Batch)

Subject Code CS110801	Natural Language Processing	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
<p>The ultimate goal of NLP is to help computers understand language as well as we do. It is the driving force behind things like virtual assistants, speech recognition, sentiment analysis, automatic text summarization, machine translation and much more.</p>	<p>At the end of the course, the students will be able to:</p> <p>CO1: <i>Understand the fundamentals of NLP</i></p> <p>CO2: <i>Process the text data at syntactic and semantic level.</i></p> <p>CO3: <i>Extract the key information from Text data.</i></p> <p>CO4: <i>Analyze the text content to provide predictions related to a specific domain using language models</i></p> <p>CO5: <i>Generate the use cases for usage of NLP tools for real life applications.</i></p>
<p>UNIT-I Fundamentals of NLP: Natural Language Processing – Linguistic Background - Mathematical Foundations-Morphological Analysis-Tokenization- Stemming Lemmatization - Boundary Determination.</p>	
<p>UNIT-II Understanding Data: Reading unstructured data - Representing text data - Part of speech tagging - Syntactic representation - Text similarity - WordNet based similarity- Shallow parsing - Semantic representation.</p>	
<p>UNIT-III Information Retrieval: Information retrieval and Information extraction - Named Entity Recognition - Relation Identification-Template filling. Language model - Probabilistic Models - n-gram language modelsHidden Markov Model- Topic Modelling - Graph Models -Feature Selection and classifiers -Rulebased Classifiers - Maximum entropy classifier – Clustering-Word and Phrase-based Clustering. Detailed description of transformer architecture, use cases and various models for natural language processing</p>	
<p>UNIT-IV-Introduction to Generative AI: What is a Prompt? Elements of a Prompt. Tips for Designing Prompt, Example prompts for various use cases, Introduction to AI Chatbots, Working of AI Chatbots, Popular AI Chatbots, ChatGPT and its working, How to use ChatGPT, Usecases of ChatGPT for various users, Role of AI in Image Generation, Image Sourcing Vs, Image Generation, Popular AI tools for Image Generation. Midjourney for Image Generation, Working of midjourney, Advantages and disadvantages of Midjourney, How to use Midjourney, Usecases of Midjourney</p>	

			1.00	Applicable for
Chairman (AC)	Chairman (BoS)	Date of Release	Version	AY 2021-22 Onwards



Shri Shankaracharya Technical Campus, Bhilai

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Scheme of Teaching & Examination (Effective from 2020-2021 Batch)

UNIT-V -Detailed description of GAN architecture, Transformer and Large Language Model (LLM), its training and variants, Alternative Chatbots, Comparison of ChatGPT, Bard, LLAMA, Claude, How to get into Generative AI domain, why genAI is special, future of genAI, Next steps.

Text Books:

S. No.	Title	Author(s)	Publisher
1	Foundations of Statistical Natural Language Processing	Christopher D. Manning and Hinrich Schutze	MIT Press, 1999

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Practical Text Analytics: Interpreting Text and Unstructured Data for Business Intelligence	Steven Struhl	Kogan Page, 2015
2	Mining the Social Web	Matthew A. Russell	O'Reilly Media, 2013
3	Natural Language Processing with Python	Steven Bird, Ewan Klein and Edward Loper	1 st Edition, O'Reilly Media, 2009

			1.00	Applicable for
Chairman (AC)	Chairman (BoS)	Date of Release	Version	AY 2021-22 Onwards



Shri Shankaracharya Technical Campus, Bhilai

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Subject Code CS110891	Computer Vision Lab	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	-
	Minimum number of Experiments – 10				

Course Objectives	Course Outcomes
<ol style="list-style-type: none"> To be able to use Python for Image handling and processing. To perform Geometric transformations and computer homography matrix in Python. To be able to perform perspective transformation, edge detection, line detection and corner detection. To be able to implement SIFT, SURF and HOG in Python. 	<p>After undergoing the course, students will be able to</p> <ol style="list-style-type: none"> Apply Python for Image handling and processing. Apply Python for Geometric transformations and computer homography matrix. Apply Python for perspective transformation, edge detection, line detection and corner detection. Apply Python for SIFT, SURF and HOG.

Write program stopper form following activities:

- Perform basic Image Handling and Processing operations on the image.
- Geometric Transformation
- Compute Homography Matrix
- Perspective Transformation
- Camera Calibration
- Compute Fundamental Matrix
- Edge Detection, Line Detection and Corner Detection
- SIFT Feature descriptor
- SURF and HOG feature descriptor
- Project based on Computer Vision Applications.

Text Books:

S. No.	Title	Author(s)	Publisher
1	Programming Computer Vision with Python	Jan Erik Solem	O'Reilly Media
2	Practical Machine Learning for Computer Vision: End-to-End Machine Learning for Images	Valliappa Lakshmanan,	O'Reilly Media

			1.00	Applicable for AY 2021-22 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	



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Scheme of Teaching & Examination (Effective from 2020-2021 Batch)

Subject Code CS102894	Natural Language Processing Lab	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	25	-	25	50	-
	Minimum number of Experiments - 10				

Course Objectives	Course Outcomes
To introduce the students with the basics of NLP which will empower them for developing advanced NLP tools and solving practical problems in the field.	CO1 Use network-based tools for network analysis CO2 Use techniques for Network scanning CO3 Identify network vulnerability CO4 Use tools to simulate intrusion detection system CO5 To understand and install a firewall CO6 Identify the basic steps of ethical hacking and protecting real-life applications through the development of countermeasures

Write programs to perform following activities:

1. To study Preprocessing of text (Tokenization, Filtration, Script Validation, Stop Word Removal, Stemming)
2. To Study Morphological Analysis
3. To study N gram model
4. To study POS tagging
5. To study Chunking
6. To study Named Entity Recognition
7. Virtual Lab on Word Generation
8. N-Grams Smoothing
9. Miniproject based on NLP applications
10. To Study word analysis and word Generation

			1.00	Applicable for AY 2021-22 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	



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Scheme of Teaching & Examination (Effective from 2020-2021 Batch)

Subject Code CS102895	Capstone Project Phase-II	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	300	-	150	450	-
	Research Paper to be Published - 02				

Guideline for Allocation of project:

- Information regarding broad area must be made available to the students well in advance (may be during previous semester).
- Information must cover following parameters.
 - Broad area: Subject or expertise/application area.
 - Required skills: Knowledge of subject(s), software, tools & other characteristics.
 - Type of project: Hardware, software, design, survey, study based etc.
 - Guide available: Name of Guide (S) from Department & Institute.
 - Other related information depending upon specific branch & institute.
- It is also recommended to give proper counseling to pick up suitable project.
- Students must get chance to select projects as per their choice or decided mutually between students and department faculty (HoD) concern.
- One project group must contain maximum four students, however students can do project individually but it should be approved by department.
- Compiled list of projects must be submitted to the University within 25 days of start of semester.
- Compiled list may contain following parameters.

Monitoring of project:

- It is recommended to give projects as per the specializations of existing faculty of the department instead of outside person/agency.
- Project must be allocated, developed and monitored by department / institution itself, but not by outside agencies.
- Regular review by guide is recommended to ensure development & contribution of students.

Internal Evaluation & Submission of project:

- Evaluation of project would be as per the examination scheme of the University, which is based on internal as well as external evaluation.
- Internal assessment requires submission of project report for getting approved by the concern authority. However printing and binding would be as per the conventional format.
- Evaluation will be based on live demonstration / presentation and Viva.
- Final submission of project is expected as,
 - Submission of a copy to the University,
 - One copy to the Institution central library,
 - One copy to the department.

External Evaluation:

External assessment of project would be like conduction of practical exams of University, and must be executed as per the norms of practical exams.

NOTE: Completion of Project outside the department/Institution should not be encouraged.

			1.00	Applicable for AY 2021-22 Onwards
Chairman (AC)	Chairman (BoS)	Date of Release	Version	



Shri Shankaracharya Technical Campus, Bhilai

(An Autonomous Institute Affiliated to CSVTU Bhilai)

Scheme of Teaching & Examination (Effective from 2020-2021 Batch)

Subject Code CS102825	Computer Vision	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
<ol style="list-style-type: none"> 1. To learn fundamentals of computer vision and its applications. 2. To understand the basic image processing operations to enhance, segment the images 3. To Understand the analyzing and extraction of relevant features of the concerned domain problem. 4. To Understand and apply the motion concepts and its relevance in real time applications 5. To Apply the knowledge in solving high level vision problems like object recognition, image classification etc. 	<p>After completion of this course the students will be able to</p> <ol style="list-style-type: none"> 1. To Know the fundamental video, audio ,image, text processing techniques 2. Acquire the basic skill of designing video compression, audio compression, image compression, text compression. 3. To Know the basic techniques in designing video transmission systems : error control and rate control 4. To Identify basic concepts, terminology, theories, models and methods in the field of computer vision.

UNIT-I: Introduction To Computer Vision

Overview, computer imagingsystems,lenses,Imageformationandsensing,Imageanalysis,pre-processingand Binary image analysis, feature detection, image classification: Image Formation and Representation: Imaging geometry, radiometry, digitization, cameras and Projections, rigid and affine transformation Image Processing: Pixel transforms, color transforms, histogram processing, histogram equalization, filtering, convolution, Fourier transformation and its applications in sharpening, blurring and noise removal.

UNIT-II Feature detection: edge detection, corner detection, line and curve detection, active contours, SIFT and HOG descriptors, shape context descriptors, Morphological operations Segmentation: Active contours, split & merge, watershed, region splitting, region merging, graph-based segmentation, mean shift and model finding, Normalized cut Camera calibration: camera models; intrinsic and extrinsic parameters; radial lens distortion; direct parameter calibration; camera parameters from projection matrices; orthographic, weak perspective, affine, and perspective camera models.

UNIT-III-Motion representation: the motion field of rigid objects; motion parallax; optical flow, the image brightness constancy equation, affine flow; differential techniques; feature-based techniques; regularization and robust estimation Motion tracking: statistical filtering; iterated estimation; observability and linear systems; the Kalman filter Object recognition and shape representation:

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Chairman (AC)	Chairman (BoS)	Date of Release	Version	AY 2021-22 Onwards



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Scheme of Teaching & Examination (Effective from 2020-2021 Batch)

alignment, appearance-based methods, invariants, image eigenspaces

UNIT-IV: Data Compression Coding requirement, Source, entropy, hybrid coding, JPEG, MPEG, Text compression using static Huffman technique, Dynamic Huffman Technique, Statistical coding techniques.

UNIT-V: Optical Storage Media Video disk and other WORMS, Compact Disk digital audio, Advantage of CD-DA Frames tracks blocks of CD-DA, CD-ROM, and Further CD-ROM based developments, Principles of CDWO, Prospects of CD technologies.

Text Books:

S. No.	Title	Author(s)	Publisher
1	Computer Vision Algorithms and Applications	R. Szeliski	Springer
2	Computer Vision : A modern approach	Forsyth & Ponce	Pearson 2011
3	Introductory techniques for 3D computer vision	E. Trucco and A. Verri	Prentice Hall, 1998

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Multimedia Computing Communication and Application	Steinmetz	Pearson Edn
2	Fundamentals of Computer Graphics and Multimedia	D. P. Mukherjee	PHI

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Scheme of Teaching & Examination (Effective from 2020-2021 Batch)

Subject Code CS102826	Cyber Security Law and Intellectual Property	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
<ol style="list-style-type: none"> To make attentive to students about different cybercrimes To understand key terms and concept in cybercrimes and cyberlaw To make attentive to students about security privacy and challenges To make attentive to students about copyright and Patents 	<p>After undergoing the course, students will be able to</p> <ol style="list-style-type: none"> Understand the cyber security threat landscape. Understand Cybercrimes and cyber laws. Understand various privacy and security concerns on online Social media its legal aspects and best practices. Understand the importance and applications of IPR it regulations. <p>Understand the application process of patent file and other related aspects such as search, registration and grant</p>
<p>UNIT-I : Introduction to cybercrimes Definition, cybercrime and information security, classes of cyber crime and categories, cyber offences, cyber crimes with mobile and wireless devices, cyber crime against women and children, financial frauds, social engineering attacks.</p>	
<p>UNIT-II: Cybercrime and Cyber law Malware and ransom ware attacks, zero day and zero click attacks, Legal perspective of cybercrime, IT Act 2000 and its amendments, Cyber crime and offences, Organizations dealing with Cyber crime and Cyber studies security in India</p>	
<p>UNIT-III: Social Media Overview and Security Introduction to Social networks. Types of Social media, Social media platforms, Social media monitoring, Hashtag, Viral content, Social media marketing, Social media privacy, Challenges, opportunities and pitfalls in online social network, Security issues related to social media, Flagging and reporting of inappropriate content, Laws regarding Posting of inappropriate content, Best practices for the use of Social media, Case studies.</p>	
<p>UNIT-IV: Introduction to Intellectual Property Rights(IPR) Introduction to IPR, International Instruments and IPR, WIPO – TRIPS – WTO -Laws Relating to IPR , IPR Tool Kit : Protection and Regulation, Copyrights and Neighboring Rights, Agencies for IPR Registration, Emerging Areas of IPR, Use and Misuse of Intellectual Property Rights.</p>	
<p>UNIT-V : Patents Introduction to Patents, Laws Relating to Patents in India, Patent Requirements ,Product Patent and Process Patent, Patent Search, Patent Registration and Granting of Patent,</p>	

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Exclusive Rights and Limitations, Ownership and Transfer, Revocation of Patent, Patent Appellate Board, Infringement Of Patent, Compulsory Licensing, Patent Cooperation Treaty, New developments in Patents, Software Protection and Computer related Innovations.

Text Books:

S. No.	Title	Author(s)	Publisher
1	Intellectual Property Rights (Patents & Cyber Law)	Dr. A. Srinivas	Oxford University Press, New Delhi
2	Cyber Laws: Intellectual property & E Commerce Security	Kumar K	Dominant Publisher
	Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives	Sumit Belapure and Nina Godbole	Wiley India Pvt.Ltd

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Cyber Law Text & Cases	Gerald R. Ferrera, Margo E. K. Reder	CENGAGE LEARNING Publication
2	Intellectual Property (Trade Marks and the Emerging concepts of Cyber property rights (HB)	P. Narayanan	Universal Book Traders

			1.00	Applicable for
Chairman (AC)	Chairman (BoS)	Date of Release	Version	AY 2021-22 Onwards



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Subject Code CS100842	Data Warehousing and Data Mining	L = 3	T = 0	P = 0	Credits = 3
Examination Scheme	ESE	CT	TA	Total	ESE Duration
	100	20	30	150	3 Hours
	Minimum number of class tests to be conducted=02			Minimum Assignments=02	

Course Objectives	Course Outcomes
<ul style="list-style-type: none"> To understand the principles of Data warehousing and Data Mining. To be familiar with the Data warehouse architecture and its Implementation. To know the Architecture of a Data Mining system. To understand the various Data preprocessing Methods. To perform classification and prediction of data. 	Technical knowhow of the Data Mining principles and techniques for real time applications.

UNIT I : Data Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse –Data Warehouse Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.

UNIT II : Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation- Architecture Of A Typical Data Mining Systems- Classification Of Data Mining Systems. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – Association Mining to Correlation Analysis – Constraint-Based Association Mining.

UNIT III : Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor – Ensemble Methods – Model Section.

UNIT IV : Cluster Analysis: - Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-

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Scheme of Teaching & Examination (Effective from 2020-2021 Batch)

Based Methods – Model-Based Clustering Methods – Clustering High-Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

UNIT V : Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

Text Books:

S. No.	Title	Author(s)	Publisher
1	Data Mining Concepts and Techniques	Jiawei Han, Micheline Kamber and Jian Pei	Third Edition, Elsevier, 2011
2	Introduction to Data Mining	Pang-Ning Tan, Michael Steinbach and Vipin Kumar	Pearson Education, 2007

Reference Books:

S. No.	Title	Author(s)	Publisher
1	Data Warehousing, Data Mining & OLAP	Alex Berson and Stephen J. Smith	Tata McGraw – Hill Edition
2	Insight into Data mining Theory and Practice	K.P. Soman, Shyam Diwakar and V. Ajay	Easter Economy Edition, Prentice Hall of India
3	Introduction to Data Mining with Case Studies	G. K. Gupta	Easter Economy Edition, Prentice Hall of India

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