Semester IV

SL.NO	Category	Code no.	Course title	Hours per week			Total Contact Hrs/Week	Credit
				L	T	P		
1	Essential Subject-5	ES-401	Operating System Theory	3	0	0	3	3
2	Programme Core course-9	AIPC402	Digital Image processing	2	0	0	2	2
3	Essential Subject-6	ES-403	Computer Networks	2	0	0	2	2
4	Programme elective course-1	1. AIPC404/1 2. AIPC404/2 3. AIPC404/3	a.cryptography b.Soft Computing c.Natural Languages processing	3	0	0	3	3
5	Programme Core course-10	AIPC405	Machine Learning	0	0	2	2	1
6	Programme Core course-11	AIPC406	Operating System Lab	0	0	2	2	1
7	Programme Core course-12	AIPC407	Digital Image Processing Lab	3	0	0	3	3
8	Mandatory course	HS408	Professional Skill Development	3	0	0	3	3
9	Minor Project	AIPR409	Mini Project	0	0	0	0	3
10	Mandatory c Ourse-1	AU410	Essence of Indian Knowledge & Tradition	0	0	2	2	1
Total								22

Operating System

Course Code	ES-401
Course Title	Operating System
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	Computer Organization and Digital Design
Course Category	Essential Subject-5

Course Outcome:-

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

C.O. 1: Understand the basics of operating systems like kernel, shell, types and services ofoperating systems. (K2)

C.O. 2:Understand the concept of program, process and thread and analyse various CPU scheduling Algorithms. (K2,K3)

C.O. 3: Describe and analyse the memory management and its allocation policies. (K3)

C.O. 4: Understand the issues related to file system interface and implementation.(K2,K3)

C.O. 5: Understand disk management and explain disk scheduling algorithms for better utilization of external memory. (K2, K3)

C.O. 6: Configure OS in an efficient and secure manner. (K3)

Course Content:

Module 1

Introduction
Learning

Outcome:

- Define system call with an example.
- Explain single, multi user operating system structure.

Content:

Overview of Operating System, basic concepts, UNIX/LINUX Architecture, Kernel, services and systems calls, system programs.

Module 2 – Process Management and Memory management Learning

Outcomes:-

Students will be able to-

- Define process, threads and multithreading.
- Understand b) process state diagram c) process control block.
- Describe process creation and termination.
- Explain various scheduling algorithms – FCFS, SJF, Priority, Round Robin,
- Explain inter process communication.
- Explain single partition allocation and multiple partition allocation, paging and segmentation.
- Describe page replacement algorithms - FIFO, LRU, Optimal.
- Define concept of thrashing and page fault.

Content:

Process Management: Process concepts, operations on processes, IPC, Process Scheduling, Multithreaded programming.

Memory management: Memory allocation, Swapping, Paging, Segmentation, Virtual Memory, various faults.

Module 3 –File management

Outcomes:-

Students will be able to-

- Define file management.
- List and explain various file operations and file access methods.
- Explain directory structure organization.
- Describe the concept of file protection.
- Understand Different types of file systems.

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Content:

Concept of a file, access methods, directory structure, file system mounting, filesharing and protection, file system structure and implementation, directory implementation, free space management, efficiency and performance. Different types of file systems.

Module 4 – I/O System

Outcomes:-

Students will be able to-

- Explain disk structure.
- Understand swap space management.
- Explain various disk scheduling algorithms- FCFS, SST, SCAN,C-SCAN, LOOK.

- Explain various RAID levels

Content:

Mass storage structure - overview, disk structure, disk attachment, disk scheduling algorithms, swap space management, RAID types.

Module 5–OS

Outcomes:-

Students will be able to-

- Understand and identify potential threats to operating system,
- Explain different Authentication schemes.

2. Explain security features design to guard against threats

Content:

Authentication, Access Control, Access Rights, System Logs

References/ Suggested Learning Resources:-

- Operating System Concepts, Silberschatz and Galvin, Wiley India Limited
- UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education
- Operating Systems, Internals and Design Principles, Stallings, Pearson Education, India
- Operating System Concepts, Ekta Walia, Khanna Publishing House
- Modern Operating Systems, Andrew S. Tanenbaum, Prentice Hall of India
- Operating systems, Deitel & Deitel, Pearson Education, India
- Principles of Operating Systems, Naresh Chauhan, Oxford University Press India.

Websites for Reference: http://swayam.gov.in

Digital Image Processing

Course Code	AIPC402
Course Title	Digital Image Processing
Prerequisites	Basic Knowledge of Mathematics and Signals
Course Category	Program Core Course-9
Number of classes	36 hours
Number of credits	03 (L: 3, T: 0, P: 0)

Course Outcome:

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

Course Outcomes(COs): At the end of the course, the student will be able to		
CO Number	CO Description	K-level
CO-1	Mathematically represent images and analyze different relationships and operations on them.	K2
CO-2	Utilize different techniques employed for the enhancement ofimages	K3
CO-3	Analyze various colour image models and restorationapproaches.	K4
CO-4	Develop algorithms for image compression and coding.	K4
CO-5	Analyze the Shape	K4

COURSE CONTENT

Module 1: Digital Image Fundamentals (8 lectures)

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

Module 2: Image Transforms and Enhancement (10 lectures)

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

Module 3: Color Models and Image Restoration (8 lectures)

Color Image Processing-Color models–RGB, YUV, HSI; Color transformations– formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation.

Image Observation And Degradation Model, Circulant And Block Circulant Matrices and Its Application In Degradation Model - Algebraic Approach to Restoration- Inverse By Wiener Filtering - Generalized Inverse-SVD and Interactive Methods - Blind Deconvolution-Image Reconstruction From Projections.

Module 4: Image compression and Segmentation (10 lectures)

Redundancy and Compression Models -Loss Less And Lossy. Loss Less- Variable-Length, Huffman, Arithmetic Coding - Bit-Plane Coding, Loss Less Predictive Coding, Lossy Transform (DCT) Based Coding, JPEG Standard - Sub Band Coding,

Image Segmentation: Edge Detection - Line Detection - Curve Detection - Edge Linking And Boundary Extraction, Boundary Representation, Region Representation and Segmentation, Morphology-Dilation, Erosion, Opening and Closing. Hit And Miss Algorithms Feature Analysis.

Module 5: Shape Analysis (8 Lectures)

Shape Analysis – Gestalt principles, shape number, moment Fourier and other shape descriptors, skelton detection, Hough transform, topological and texture analysis, shape matching. Practical Applications – Finger print classification, signature verification, text recognition, map understanding, bio-logical cell classification.

References / Suggested Learning Resources:

- R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008

- Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India.2nd edition2004
- Digital Image Processing, Kenneth R Castleman, Pearson Education,1995.
- Digital Image Procesing, S. Jayaraman, S. Esakkirajan, T. Veerakumar, McGraw Hill Education ,2009. Pvt Ltd, NewDelhi
- www.nptel.ac.in

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COMPUTER NETWORKS

Course Code	ES-403
Course Title	Computer Networks
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	-
Course Category	Essential Subject-6

Course Outcomes: -Upon completion of the course the students will be able to: 1)Describe the Computer networks and network models **(K2)**

- Use different transmission media **(K3)**
- Explain network layer and routing **(K2)**
- Explain the transport layer and its protocols **(K2)**
- Utilize different network devices **(K3)**

Course Content:-

Module-1: Introduction

Number of class hours: 3-4 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

- Describe the computer networks
- Describe the OSI reference model
- Describe the TCP/IP model
- Detailed content of the unit: - Introduction to computer networks; Network Models- OSI Reference Model, TCP/IP Model

Module-2: Transmission Media

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

- Utilize wired transmission media
- Explain various wireless transmission media
- Explain data link layer & different protocols

- Detailed content of the unit: - Transmission Media – principles, issues and examples; Wired Media
- Coaxial, UTP, STP, Fiber Optic Cables; Wireless Media – HF, VHF, UHF, Microwave, Ku Band; Network topologies; Data Link Layer –design issues, example protocols (Ethernet, WLAN, Bluetooth); Switching Techniques

Module-3:

Network Layer

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

- Explain network layer and its protocols
- Explain principles/issues in routing
- Explain different routing algorithms and protocols

- Detailed content of the unit: - Network Layer - design issues, example protocols (IPv4); Routing - principles/issues, algorithms (Distance-vector, Link-state) and protocols (RIP, OSPF)

Module-4:
Transport Layer
Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

- Describe different design issues of transport layer
- Explain transport layer protocols (TCP)
- Describe different application layer protocols (SMTP, DNS)

- Detailed content of the unit: - Transport Layer - design issues, example protocols (TCP); Application Layer Protocols (SMTP, DNS)

Module- 5: Functioning of Network Devices

Number of class hours: 5-6 Hours

Suggestive Learning Outcomes: After completing this module students will be able to-

- Use different network devices

Reference Books:

1) Computer Networks, 4th Edition (or later), Andrew S. Tanenbaum, PHI
2) TCP/IP Illustrated, Volume-1, W. Richard Stevens, Addision Wesley
3) Data and Computer Communications, William Stallings, PHI
4) An Engineering Approach to Computer Networking, S. Keshav, Addision Wesley/Pearson
5) An Integrated Approach to Computer Networks, Bhavneet Sidhu, Khanna Publishing House

Machine Learning

Course Code	AIPC405
Course Title	Machine Learning
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	Data Mining, AI
Course Category	Program Core Course-10
Number of classes	26 hours

Course Outcome:

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

CO Number	CO Description	K-level
CO-1	Explain the concepts of computational intelligence like machine learning	K2
CO-2	Apply machine learning techniques to address the real time problems in different areas.	K3
CO-3	Illustrate the Ensemble methods and its usage in machine learning application	K3
CO-4	Apply Reinforcement learning techniques to respective problems.	K4

Course Content:

Module 1: Introduction (6)

Introduction: Machine learning, Terminologies in machine learning, Types of machine learning: supervised, unsupervised, semi-supervised learning. Review of probability. **Decision Trees,** Clustering - K-means/Kernel K-means, Dimensionality Reduction - PCA and kernel PCA, MatrixFactorization and Matrix Completion

Module 2: Discriminative Models (6)

Least Square Regression, Gradient Descent Algorithm, Univariate and Multivariate Linear Regression, Prediction Model, probabilistic interpretation, Regularization, Logistic regression, multi class classification, Support Vector Machines- Large margin classifiers, Nonlinear SVM, kernel functions, SMO algorithm.

Module 3: Generative models (6)

k-Nearest Neighbour Classification, Bayesian concept learning, Likelihood, Posterior predictive distribution, beta-binomial model, Naive Bayes classifiers, classifying documents using bag of

words. Bayesian Statistics and Frequentist statistics. Directed graphical models (Bayes nets), Conditional independence, Inference.

Module 4: Advanced ML Models (8)

Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests)
Scalable Machine Learning (Online and Distributed Learning) A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference.

Recent trends in various learning techniques of machine learning and classification methods.

Module 5: Inference and recent trends(3)

Inference in Graphical Models, Introduction to nm Bayesian Learning and Inference. Recent trends in various learning techniques of machine learning and classification methods.

References / Suggested Learning Resources:

- E. Alpaydin, "Introduction to Machine Learning", PHI, 2005.
- Tom Mitchell, "Machine Learning", McGraw Hill, 1997
- Kevin P. Murphy, "Machine Learning, a probabilistic perspective", The MIT Press Cambridge, Massachusetts, 2012.
- Alex Smola and SVN. Viswanathan, "Introduction to Machine Learning", Cambridge University Press, 2008.
- Introduction to Machine Learning(link is external) | Nils J. Nilsson, Stanford University

Operating System Lab

Course Code	AIPC406
Course Title	Operating System Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	Computer Programming using C
Course Category	Programme Core Course-11

Course Outcome:-

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

C.O. 1: Learns Operating systems- LINUX/UNIX.**(K2)**
C.O. 2: Understand various UNIX commands on a standard UNIX/LINUX OperatingSystem.**(K2)**
C.O. 3: Apply the scheduling algorithms for the given problem.**(K3)**
C.O. 4: Implement the process synchronous concept using message queue, shared memory . **(K3)**
C.O. 5: Implement the various methods in memory allocation and page replacement algorithm.**(K3)**

List of Practical's/ Activities *(To perform minimum 6 practical)*

- Revision practice of various commands like man, cp, mv, ln, rm, unlink, mkdir, rmdir, etc and many more that were learnt in IT Workshop course and later.
- Implement two way process communication using pipes.
- Implement message queue form of IPC
- Implement shared memory and semaphore form of IPC
- Simulate the CPU scheduling algorithms - Round Robin, SJF, FCFS, priority

- Simulate all FIFO Page Replacement Algorithm using C program
- Simulate all LRU Page Replacement Algorithms using C program
- Simulate Paging Technique of Memory Management
- Practice various commands/utilitiessuch as catnl, uniq, tee, pg, comm, cmp, diff, tr, tar, cpio, mount, umount, find, umask, ulimit, sort, grep, egrep,fgrep cut, paste, join, du, df , ps, who, etcand many more.

Reference Books:

- Operating System Concepts, Silberschatz, Abraham and Galvin, Peter, Wiley India Limited.
- UNIX Concepts and Applications, Sumitabha Das, McGraw-Hill Education.
- Operating System Concepts, Ekta Walia, Khanna Publishing House.

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Digital Image Processing Lab

Course Code	AIPC407
Course Title	Digital Image Processing Lab
Prerequisites	Theoretical knowledge of Digital Image Processing
Course Category	Program Core course-12
Number of classes	24 hours
Number of credits	01 (L: 0, T: 0, P: 4)

Course Outcome:

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

Course Outcomes(COs): At the end of the course, the student will be able to		
CO Number	CO Description	K-level

CO-1	Illustrate and execute basic commands in working environment/tool.	K3
CO-2	Explain discrete transform works including concepts ofbasic images.	K2
CO-3	Apply de-noising and restoration techniques.	K3
CO-4	Apply binary image processing operations	K3

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

- Familiarize the working environment/tool.
- Digital Signal Processing Basics
- Image Enhancement
- Image Segmentation
- Image Restoration and Denoising
- Binary Image Processing

Laboratory softwares / programming languages which may be used

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

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Cryptography and Network Security

Course Code	AIPE-404/1
Course Title	Cryptography and Network Security
Number of Credits	03 (L: 3, T: 0, P: 0)
Prerequisites	Computer Network
Course Category	Program Elective course-1
Number of classes	36 hours

Course Outcome:

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

CO Number	CO Description	K-level
CO-1	Demonstrate security of the data over the network.	K2
CO-2	Utilize the concept of cipher	K3
CO-3	Implement various networking protocols on authentication	K2
CO-4	Apply the methods to protect any network from the threats in the world.	K4
CO-5	Math Background of network Security	K3

Course Content:

Module 1: Introduction **(8)**

Attacks on Computers and Computer Security: Introduction, The need for security, Security approaches, Principles of

security, Types of Security attacks, Security services, Security Mechanisms, A model for Network Security.
Cryptography: Concepts and Techniques: Introduction, plain text and cipher text, substitution techniques, transposition techniques, encryption and decryption, symmetric and asymmetric key cryptography, stenography, key range and key size, possible types of attacks.

Module 2: Ciphers **(10)**

Symmetric key Ciphers: Block Cipher principles & Algorithms (DES, AES, Blowfish), Differential and Linear Crypt analysis, Block cipher modes of operation, Stream ciphers, RC4, Location and placement of encryption function, Key distribution.
Asymmetric key Ciphers: Principles of public key crypto systems, Algorithms (RSA, Diffie- Hellman, ECC), Key Distribution.

Module 3: Authentication **(10)**

Message Authentication Algorithms and Hash Functions: Authentication requirements, Functions, Message authentication codes, Hash Functions, Secure hash algorithm, Whirlpool, HMAC, CMAC, Digital signatures, knapsack algorithm.
Authentication Applications: Kerberos, X.509 Authentication Service, Public – Key Infrastructure, Biometric Authentication.

Module 4: Applications **(8)**

E-Mail Security: Pretty Good Privacy, S/MIME

IP Security: IP security overview, IP Security architecture, Authentication Header, Encapsulating security payload, combining security associations, key management.
Web Security: Web security considerations, Secure Socket Layer and Transport Layer Security, Secure electronic transaction Intruders, virus and Firewalls: Intruders, Intrusion detection, password management, virus and related threats, Countermeasures, Firewall design principles, types of firewalls
Case Studies on Cryptography and security: Secure Inter-branch Payment Transactions, Cross site Scripting Vulnerability, Virtual E lections

Module 5: Math Background **(8)**

Modular Arithmatic, Euclidean and Extended Euclidean algorithm, Prime numbers, Fermat and Euler's Theorem.

References / Suggested Learning Resources:

- William Stallings, "Cryptography and Network Security," 3rd ed, Pearson Education (Asia) Pte. Ltd./ Prentice Hall of India, 2003.
- C. Kaufman, R. Perlman, and M. Speciner, "Network Security: Private Communication in a Public World," 2nd ed, Pearson Education (Asia) Pte. Ltd., 2002.
- B. Forouzan, "Cryptography & Network Security", Tata McGraw-Hill.
- Atul Kahate, "Cryptography and Network Security," Tata McGraw-Hill, 2003.
- Eric Maiwald, "Fundamentals of Network Security," McGraw-Hill, 2003.

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Soft Computing

Course Code	AIPE-404/2
Course Title	Soft Computing
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	Mathematics, Artificial Intelligence
Course Category	Program Elective course-1
Number of classes	26 hours

Course Outcome:

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

CO Number	CO Description	K-level
CO-1	Explain soft computing techniques and their applications	K2
CO-2	Apply various neural network model to solve real-life problems	K3
CO-3	Explain fuzzy logic and its applications	K2
CO-4	Solve various optimization problems using genetic algorithm	K3
CO-5	Apply C and C++ to various Network	K3

Course Content:

Module 1: Introduction (4 hours)

Introduction to soft computing, soft computing vs. hard computing, various types of soft computing techniques, Requirement of Soft computing, Major Areas of Soft Computing, Applications of Soft Computing.

Module2:NeuralNetworks

Biological neurons and its working, Simulation of biological neurons to problem solving, artificial neuron, characteristic and applications of ANN, various activation functions, McCulloch–Pitt neural network, Perceptron training algorithm, Linear separability, Hebb's learning rule/Delta rule, Backpropagation Learning and Architecture, Introduction to Associative Memory, Self Organizing Map, Adaptive Resonance Theory, Applications of ANNs to solve some real-life problems.

Module3:FuzzySystems

(7hours)

Introduction to Fuzzy logic. Fuzzy versus Crisp set, Fuzzy sets and membership functions, Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications, and inferences, Defuzzification techniques, Fuzzy logic controller design, Some applications of Fuzzy logic.

Module 4: Genetic Algorithm (7 hours)

History of Genetic Algorithms (GA),Concept of "Genetics" and "Evolution", Basic GA framework and different GA architectures, GA operators: Encoding, Crossover, Selection, Mutation, etc., Solving single-objective optimization problems using Gas, Concept of multi-objective optimization problems (MOOPs) and issues of solving them.

Module 5: Soft Computing Techniques Using C and C++

Neural Network implementation. Perceptron Nextwork , Adaline Network , Madaline Network for XOR function, Backpropagation Network,Counter Propagation Network, Fuzzy Logic implementation . Implement various Premitive oparation of classcial set , To varify various laws associate with classcial set

(

7 hours)

References / Suggested Learning Resources:

- S.N. Sivanandam & S.N. Deepa, Principles of Soft Computing,Wiley Publications, 2nd Edition,2011.
- S, Rajasekaran & G.A. Vijayalakshmi Pai, Neural Networks,Fuzzy Logic & Genetic Algorithms, Synthesis & applications, PHIPublication, 1st Edition, 2009.
- Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications,S.Rajasekaran, G. A. Vijayalakshami, PHI.
- Genetic Algorithms: Search and Optimization, E. Goldberg.
- Neuro-Fuzzy Systems, Chin Teng Lin, C. S. George Lee, PHI.
- S.N. Shivanandam, Principle of soft computing, WileyISBN13: 9788126527410 (2011).
- Jyh-Shing Roger Jang, Chuen-Tsai Sun, EijiMizutani, "Neuro-Fu
- George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications",Prentice Hall, 1995

- James A. Freeman and David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques”, Pearson Edition, 2003.
- Mitchell Melanie, “An Introduction to Genetic Algorithm”, Prentice Hall, 1998.
- David E. Goldberg, Genetic Algorithms in Search, Optimization & Machine Learning, Addison Wesley, 1997.

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Natural Language Processing

Course Code	AIPE-404/3
Course Title	Natural Language Processing
Number of Credits	02 (L: 2, T: 0, P: 0)
Prerequisites	Nil
Course Category	Program Elective course-1
Number of classes	26 hours

Course Outcome:

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

CO Number	CO Description	K-level
CO-1	Explain the various challenges of NLP.	K2
CO-2	Implement a parser by providing suitable grammar and words	K3
CO-3	Perform syntax and semantic analysis using language analysis tools.	K4
CO-4	Design and evaluate the NLP applications.	K3
CO-5	Learn self-Organising networks	K2

Course Content:

Module 1: Overview and Language Modeling (6)

Overview: Origins and challenges of NLP – Language and Grammar – Processing Indian Languages – NLP Applications: Machine Translation – Information Extraction. Language Modeling: Introduction – Various Grammar-Based Language Models – Statistical Language Model

Module 2: Part-of-Speech Tagging and Context-Free Grammars (7)

English Word classes – Tag sets for English – Part-of-Speech Tagging – Rule based Part-of- Speech Tagging – Stochastic Part-of-Speech Tagging – Transformation-Based Tagging. Stemming – Context-Free Grammars for English: Constituency – Context Free Rules and Trees – Sentence Level Constructions – The Noun Phrase - Coordination – Agreement – The Verb Phase and Sub categorization – Auxiliaries – Spoken Language Syntax – Grammars Equivalence

and Normal Form–Finite-State and Context-Free Grammars – Grammars and Human Processing

Module 3: Parsing & Semantics (8)

Parsing and Advanced Features: Parsing as Search – A Basic Top-Down Parser – Problems with the Basic Top-Down Parser – The Early Algorithm – Finite-State Parsing Methods. Features and Unification: Feature Structures – Unification of Feature Structures – Features Structures in the Grammar – Implementing Unification – Parsing with Unification Constraints – Types andInheritance.
Semantics Analysis and Lexical Semantics: Semantic Representing Meaning – Meaning Structure of Language – First Order Predicate Calculus – Semantic Analysis: Syntax-Driven Semantic

Analysis – Attachments for a Fragment of English – Integrating Semantic Analysis into the Early Parser – Idioms and Compositionality – Robust Semantic Analysis – Lexical Semantics: Relational among Lexemes and their Senses – Word Net: A database of Lexical Relations – The Internal Structure of Words.

Module 4: Evaluation Metrics & Applications of NLP (5)

Manual Evaluation – Fluency and Adequacy – Other Evaluation Criteria – Automatic Evaluation

– Precision and Recall – F-Measure – Word Error Rate – BilinguaEvaluation Understudy – METEOR – Multiple Reference Translations – Pearson's Correlation Coefficient – Hypothesis Testing – Pair wise comparison – Task oriented Evaluation.
Applications of NLP: NL Interfaces, Text Summarization, Sentiment Analysis, Machine Translation, Question answering.
Recent Trends in NLP

Module 5: Self organizing networks(6)

UN supervised learning of clusters, winner-take-all learning, recall mode, Initialization of weights, seperability limitations.

References / Suggested Learning Resources:

- Jurafsky, Daniel, and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Speech Recognition, and Computational Linguistics", PrenticeHall, 2000.

- Christopher D. Manning and Hinrich Schütze, "Foundations of Statistical Natural Language Processing". Cambridge, MIT Press, 1999.
- James Allen, "Natural Language Understanding", Benjamin/Cummings, 2ed, 1995.
- Eugene Charniak, "Statistical Language Learning", MIT Press, 1996.
- Martin Atkinson, David Britain, Harald Clahsen, Andrew Redford, "Linguistics", Cambridge University Press, 1999.
- P. Lieberman, "Toward an evolutionary biology of language", Harvard University Press, 2006.
- Philipp Koehn, “Statistical Machine Translation”, 1st Edition, Cambridge University Press, January 2010.
- Tanveer Siddiqui, U.S. Tiwary, “Natural Language Processing and Information Retrieval”, 3rd Edition, Oxford University Press
- Nitin Indurkhya, Fred J. Damerau, “Handbook of Natural Language Processing”, 2ed, CRC Press, 2010.

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Professional Skill Development

Course Code	:	HS 408
Course Title	:	Professional Skill Development
Number of Credits	:	3 (L: 2, T: 1, P:0)
Prerequisites	:	NIL
Course Category	:	HU

Course Outcomes:

After successful completion of this course, students would be able to:
CO1: Understand the importance of soft skills and personality in a person's career growth. K2 **CO2**: Communicate uprightly while looking for a job. K3
CO3: Learn and utilize the key skills while facing job interview. K2 & K3 **CO4**: Demonstrate effective writing skills for professional excellence. K2
CO5: Explore ways to make oral communications interesting and captivating. K3

Module – 1Soft Skills & Personality Development

Number of Class Hours: 12 **Marks: 08**

Learning Outcomes:

- Get acquainted with the details of soft skills and the importance of personality. K1
- Understand the importance of communication skills in developing one's personality. K2
- Understand the importance of soft skills and personality in a person's career growth. K2

Detailed Content:

- **Soft skills - Demand of Every Employer:** How soft skills complement hard skills, Soft skills as competitive weapon, Classification of soft skills into personal and interpersonal traits, Soft skills needed for career growth- Time management, Leadership traits, Communication and networking skills, Teamwork and Interpersonal skills, Empathy and Listening skills, Responsibility, Attitude, Ethics, Integrity, Values and Trust.

- **Personality Development – A must for career Growth:** Grooming one's personality as a signal that others read, mapping different personality types – Perfectionists,

Helpers, Achievers, Romantics, Observers, Questioners, Enthusiasts or adventurers, Bosses or asserters, Mediators or peacemakers.

Module – 2 Looking for a Job

Number of Class Hours: 05 Marks: 08

Learning Outcomes:

•Learn to write Job Applications, Cover Letter, Resume, Curriculum Vitae, bio data. K2

•Develop interpersonal skills/ soft skills through Group Discussion. K3

Detailed Content

Job Application : Job Application Letters in response to advertisements, Self-application letters for Jobs

Curriculum Vitae/Resume: Formats of Resume and CV for a fresher and for someone with experience, Differences between Resume, CV, Bio-data, and choice of referees.

Group Discussion : A test of soft skills

Module – 3 Job Interviews

Number of Class Hours: 12

Marks: 08

Learning Outcomes:

- Understand the importance of Job interviews in the selection procedure. K2
- Comprehend and Adapt to various types, stages and processes of job interviews. K1&K3
- Demonstrate appropriate body language in interviews. K3

Detailed Content:

- Job Interviews: Definition, processes of Interviews, Types of Interviews
- Stages in Job interviews: Before interview stage, On D' Day, After interview stage.
- Importance of Body language in Interviews: : Facing an interview, Using proper verbal and non- verbal cues, the perfect handshake ,Exhibiting confidence, the business etiquettes to maintain, body language ,and dress code - what to speak, how to speak in an interview and answer interview questions, negative body language, handling an awkward situation in an interview.
- Probable interview questions and answers.

- Mock interviews to be conducted by mock interview boards.

Module – 4 Enhancing Writing skills

Number of Class Hours: 12 Marks: 08

Learning Outcomes:

- Write dialogues on given topics / situations. K3
- Express facts & ideas effectively in written form. K3
- Learn to write formal and informal
- letters & emails. K2

Detailed Content

- **Art of Condensation**: Principles to increase clarity of written communication.
- **Dialogue Writing:** Meeting and Parting, Introducing and Influencing, Requests, Agreeing and Disagreeing, Inquiries and Information.
- **Letter Writing:** Placing an order, Letter to Inquiry, Letter of Complaint, Letter seekingpermission.
- **E- mail writing**: writing the perfect e-mail, steps to the perfect e-mail, formal and informal greetings, requests through an e-mail, writing an apology, complaint and seeking help and information in an e-mail, informing about a file attached in an email, writing the formal ending of an e-mail.

Module – 5 Conversations, Panel Discussion and Public Speaking

Number of Class Hours: 05 Marks: 08

Learning Outcomes:

- Speak persuasively on a given topic fluently and clearly. K3
- Participate in formal and informal conversations. K3
- Express ideas and views on given topics

Detailed Content

- **Conversation & Dialogue Practice:**
  - Introducing oneself
  - Introduction about family
  - Discussion about the weather
  - Seeking Permission to do something
  - Seeking Information at Railway Station/ Airport
  - Taking Appointments from superiors and industry personnel

- Conversation with the Cashier- College/ bank
- Discussing holiday plans
- Asking about products in a shopping mall
- Talking over the Telephone

Panel Discussion: Act of a moderator - ways to respond to audience questions. Suggested topics: Current Affairs

Public Speaking: Art of Persuasion, Making speeches interesting, Delivering different types of speeches: Ceremonial, Demonstrative, Informative, Persuasive.

List of Software/Learning Websites

- http://www.free-english-study.com/
- http://www.english-online.org.uk/course.htm
- http://www.english-online.org.uk
- http://www.talkenglish.com/
- http://www.learnenglish.de/

Reference Books:

(Name of Authors/ Title of the Book /Edition /Name of the Publisher)

- Sanjay Kumar &Pushp Lata, Communications Skills, 2nd Edition, Oxford University Press
- Meenakshi Raman & Sangeeta Sharma Technical Communication: Principles & Practice Oxford University Press
- M. Raman & S. Sharma Technical Communication Oxford University Press
- Barun Kumar Mitra, Personality Development and Soft Skills Oxford University Press

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Mini Project

Course Code	AIPR409
Course Title	Minor Project
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	Nil
Course Category	Project Work (PR)

Course Outcome:-

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

C.O.1: Demonstrate a through and systematic understanding of project contents (K2).

C.O. 2: Identify the methodologies and professional way of documentation and communication(K3).

C.O. 3: Illustrate the key stages in development of the project (K2).

C.O. 4: Develop the skill of working in a Team (K3).

C.O. 5: Apply the idea of mini project for developing systematic work plan in major project(K3).

Course Content:-

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

- Perform detailed study about various components of a project.
- Study about methodologies and professional way of documentation and communication related to project work.
- Develop idea about problem formulation.
- Knowledge of how to organize, scope, plan, do and act within a project thesis.
- Familiarity with specific tools (i.e. hardware equipment and software) relevant to the projectselected.

- Demonstrate the implementation of a minor project work.

Essence of Indian Knowledge and Tradition

Course Code	AU410
Course Title	Essence of Indian Knowledge and Tradition
Number of Credits	0 (L: 2, T: 0, P: 0)
Prerequisites	NA
Course Category	Audit

Course Outcomes: -

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

CO 1: Understand the essence of Indian tradition and the importance of carrying them forward.($\mathbf{K_2}$)

CO 2: Understand the Vedic literature and important ideas discussed in the Vedas. ($\mathbf{K_2}$)

CO 3: Describe scientific heritage of ancient India along with comprehending its relevance and application in various modern scientific disciplines. ($\mathbf{K_1}$)

CO 4: Relate the theoretical and practical sides of the science of Yoga and Aurveda with modernknowledge systems. ($\mathbf{K_1}$)

CO 5: Explain the worth of Indian intellectual heritage, traditional practices and Indian lifestyle from scientific lenses. ($\mathbf{K_4}$)

Module- 1

Introduction to Vedic Literature

Number of class hours: 05

Content:

•General structure of Vedic Literature,
•Different theories on the age of the Vedas,
•Educational system in the Vedic times

•Subject-matter of Ṛgveda-samhitā, Sāmaveda -Saṁhitā, Yajurveda-Saṁhitā, Atharvaveda- Saṁhitā, Brāhmaṇaand Āraṇyaka literature, Upaveda
Learning outcomes of the Module

1.	Describe the Vedic literature (K1)
2.	Outline the heritage of ancient India specially the scientific knowledge that is embedded in the Vedas will be shown through this module (K2)

Module- 2
Name of the Unit: Fundamental doctrines of the Upaniṣads
Number of class hours:05
Content:

- General introduction of Upaniṣadic literature
- Philosophical ideas and ethics in Upaniṣadas Learning outcomes of the Module

Module- 3
Name of the Unit: Vedāṅgas, Purāṇasand Dharmaśāstra Literature .

Number of class hours:05

Content:

- Introduction to Vedāṅga Literature
- History of Sanskrit Grammar
- An Overview of Purāṇic literature
- History of Dharmaśāstra Learning outcomes of the Module

Module- 4
Introduction to Indian Philosophical Systems, Scientific aspects of Indianknowledge systems

Number of class hours: 05
Content:

- General introduction to Indian Philosophical systems, i.e. Orthodox and Heterodox
- Glimpse of ancient Indian Science and technology.

Learning outcomes of the Module

1.	Describe the Indian Philosophical systems and their relevance and application in modern scientific enquiry (K1)
2.	Remember the various scientific methods, means and validity of knowledge as discussed in these systems, methods of discussion, debate and systemic learning as structured in ancient Indian knowledge literature (K1)

Module- 5
Name of the Unit: Introduction to Yoga & Āyurveda
Number of class hours: 05
Content:

- General ideas about Yoga,
- Origin and Development of Pātañjala Yoga,
- Origin and Development of Āyurveda and its relevance

Learning outcomes of the Module

1.	Understand about principles and philosophy of Yogic sciences and Āyurveda. (K2)
2.	Identify various ancient texts, practices of Yoga and Āyurveda along with gaining basic practical and theoretical knowledge which they will be able to relate with modern healthcaresystems (K4)

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- Jha, R.N. *Science and Consciousness Psychotherapy and Yoga Practices*. Delhi: VidyanidhiPrakashan, 2016.
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- Wujastiyk, Dominik. *The Roots of Ayurveda*. India: Penguin India,