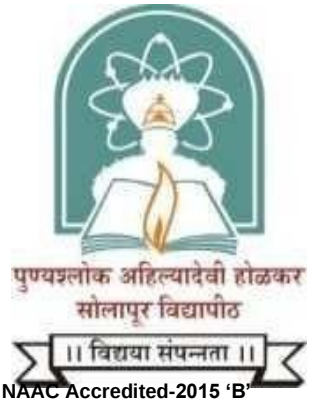
Punyashlok Ahilyadevi Holkar Solapur University, Solapur



NAAC Accredited-2015 'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Information Technology

Name of the Course: S.Y. B.Tech with Honors

Name of the Course: T.Y. B.Tech with Honors

(Syllabus to be implemented from w.e.f. June- 2022-23)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Syllabus for Honors Degree –

Artificial Intelligence and Machine Learning

Computer Science & Engineering and Information Technology

Course Code	*Year & Sem*	*Course Name*	*Hrs./week*			*Credits*	*Examination Scheme*			
			L	*T*	*P*		*ISE*	*ESE*	*ICA*	*Total*
Hn411	S.Y. B.Tech. Sem II	Machine Learning	3	1		4	30	70	25	125
Hn512	T.Y. B. Tech Sem I	Reinforcement Learning	3		2	4	30	70	25	125
Hn513	T.Y. B.Tech Sem I	Seminar			2*	1			25	25
Hn614	T.Y. B.Tech Sem II	Natural Language Processing	3		2	4	30	70	25	125
Hn715	Final Year B.Tech Sem I	Mini Project			4*	2		50	50	100
Hn716	Final Year B.Tech Sem II	Deep Learning	3		2	4	30	70	25	125
	Sub Total		13	1	12	19	120	330	175	625

* indicates contact hours

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Honors in Artificial Intelligence and Machine Learning

T.Y. B. Tech. (CSE & IT), Semester-I

Hn511 – REINFORCEMENT LEARNING

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 70 Marks
Practical : 2 hrs/week, 1 credit	ISE : 30 Marks
	ICA : 25 Marks

Introduction :

Reinforcement learning is an area of machine learning, where an agent or a system of agents learns to archive a goal by interacting with their environment. In recent years there has been success in reinforcement learning research in both theoretical and applied fields. This course primarily focuses on training students to frame reinforcement learning problems and to tackle algorithms from dynamic programming, Monte Carlo and temporal-difference learning.

Course Prerequisite:

A basic course on Artificial Intelligence & Machine learning

Course Outcomes :

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

1. Demonstrate the use of Reinforcement Learning tasks.
2. Describe the core principles of applying Reinforcement Learning.
3. Implement in code common used principles in Reinforcement Learning
4. Identify current advanced techniques and applications in Reinforcement Learning

SECTION I

Unit 1 Introduction (05Hrs)

Reinforcement Learning, Examples, Elements of Reinforcement Learning, History of Reinforcement Learning

Unit 2 Evaluative Feedback (05Hrs)

A k-armed Bandit Problem, Action-value Methods, The 10-armed Test-bed, Incremental Implementation

Unit 3 The Reinforcement Learning Problem (06Hrs)

The Agent–Environment Interface, Goals and Rewards, Returns, Unified Notation for Episodic and Continuing Tasks, Value Functions, Optimal Value Functions, Optimality and Approximation

Unit 4 Finite Markov Decision Processes (6Hrs)

The Agent–Environment Interface, Goals and Rewards, Returns and Episodes, Unified Notation for Episodic and Continuing Tasks, Policies and Value Functions.

SECTION II

Unit 5 Dynamic Programming (5Hrs)

Policy Evaluation (Prediction), Policy Improvement, Policy Iteration, Value Iteration, Asynchronous Dynamic Programming, Generalized Policy Iteration, Efficiency of Dynamic Programming, Introduction to Monte Carlo Methods.

Unit 6 Temporal-Difference Learning (5Hrs)

TD Prediction, Advantages of TD Prediction Methods, Optimality of TD(0), SARSA: On-policy TD Control, Q-learning: Off-policy TD Control.

Unit 7 Planning and Learning (6Hrs)

Models and Planning, Dyna: Integrating Planning, Acting, and Learning , When the Model Is Wrong , Prioritized Sweeping, Expected vs. Sample Updates.

Unit 8 Applications and Case Studies (6Hrs)

TD-Gammon, Samuel's Checkers Player, Watson's Daily-Double Wagering, Mastering the Game of Go and AlphaGo.

Internal Continuous Assessment (ICA) :

Analysis and implementation of

1. Flappy Kernel Markov Decision Process
2. Implementation of Performance Difference Lemma.
3. Implementation of Pong with Deep Q Learning.
4. Estimation of Warfarin Dose
5. Implementing Bayesian regret bound for Thomson Sampling

Text Books:

1. Reinforcement Learning: An Introduction (Second edition + Upcoming Edition) by: Richard S. Sutton and Andrew G. Barto, MIT Press Publication

(The book is available at http://incompleteideas.net/book/the-book-2nd.html Upcoming edition's January 1 2018 draft available at http://incompleteideas.net/book/bookdraft2018jan1.pdf]

Reference Books:

1. Reinforcement Learning: With Open AI, TensorFlow and Keras Using Python ByAbhishek Nandy, Manisha Biswas. Apress Publication
2. Reinforcement Learning: State-of-the-Art, Marco Wiering and Martijn van Otterlo, Eds.
3. Artificial Intelligence: A Modern Approach, Stuart J. Russell and Peter Norvig.
4. Deep Learning, Ian Goodfellow, Yoshua Bengio, and Aaron Courville.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Honors in Artificial Intelligence and Machine Learning

T.Y. B. Tech. (CSE & IT), Semester-I

Hn513 – SEMINAR

Teaching Scheme: **Examination Scheme:**

ICA : 25 Marks

Course Objectives:

1. To study, analyze & prepare a topic for presentation on emerging technology.
2. To exhibit effective communication.
3. To work in teams having brainstorming session for group discussion.

Course Outcomes:

At the end of the course students will be able to

1. Explore research areas and conduct literature survey to decide seminar topic.
2. Compile information and knowledge effectively
3. Effectively communicate their work in writing and oral presentation
4. Inculcate habit of self study and lifelong learning

Every student of Honors Degree will give a seminar on a topic related to their domain from the honors degree. Seminar should consist of a presentation of about 30-40 minutes. The seminar should be based on topics in the emerging area in which the student has carried out the literature survey. The student will also propose a problem which he intends to give a solution in his project work to be carried out in subsequent semesters. A report on the seminar should be submitted to the department. Assessment should be jointly done by panel of teachers consisting of respective guide and other teachers from the department working in the area of the domain included in the respective honors degree.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Honors in Artificial Intelligence and Machine Learning

T.Y. B. Tech. (CSE & IT), Semester-II

Hn614 – : NATURAL LANGUAGE PROCESSING

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 70 Marks
Practical : 2 hrs/week, 1 credit	ISE : 30 Marks
	ICA : 25 Marks

Introduction :

Natural Language Processing (NLP) is basically how you can teach machines to understand human languages and extract meaning from text. This course is intended as a theoretical and methodological introduction to a the most widely used and effective current techniques, strategies and toolkits for natural language processing, This course also covers basis of semantic analysis and discourse analysis and drives it to machine translation.

Course Prerequisite:

A basic course in a object-oriented programming Language, Theory of computation and parsers.

Course Outcomes:

At the end of this course students will be able to

1. Demonstrate the fundamental mathematical models and algorithms in the field of NLP.
2. Apply these mathematical models and algorithms in applications of software design and implementation for NLP.
3. Use tools to analyze language resource annotation and apply to data for acquiring intended information.
4. Design and implement various NLP applications.

SECTION-I

Unit 1 Introduction **(6Hrs)**

Introduction to NLP, Machine Learning and NLP, Biology of Speech Processing; Place and Manner of Articulation, Word Boundary Detection, Arg-Max Computation, Lexical Knowledge Networks.

Unit 2 Word-net Theory **(6Hrs)**

Semantic Roles , Word Sense Disambiguation (WSD) : Word-Net, Word-net Application in Query Expansion , Wiktionary, semantic relatedness , Measures of Word-Net Similarity, Similarity Measures . Resnick's work on Word-Net Similarity, Indian Language Word-nets and Multilingual Dictionaries, Multi-linguality, Metaphors, Co references

Unit 3 Theories of Parsing **(6Hrs)**

Parsing Algorithms , Evidence for Deeper Structure, Top Down Parsing Algorithms, Noun Structure, Non-noun Structure and Parsing Algorithms, Robust and Scalable Parsing on Noisy Text as in Web documents Probabilistic parsing, Hybrid of Rule Based and Probabilistic Parsing sequence labeling, Training issues , Arguments and Adjuncts , inside-outside probabilities , Scope Ambiguity and Attachment Ambiguity resolution.

Unit 4 Speech **(6Hrs)**

Phonetics , HMM, Morphology, Morphology fundamentals; Morphological Diversity o f Indian Languages; Morphology Paradigms; Finite State Machine Based Morphology; Automatic Morphology Learning; Shallow Parsing; Named Entities; Maximum Entropy Models; Random Fields.

SECTION-II

Unit 5 Graphical Models **(6Hrs)**

Graphical Models for Sequence, Labelling in NLP, Consonants (place and manner of articulation) and Vowels , Forward Backward probability, Viterbi Algorithm

Unit 6 Phonology **(6Hrs)**

Sentiment Analysis and Opinions on the Web, Machine Translation and MT Tools - GIZA++ and Moses. Text Entailment, POS Tagging. ASR, Speech Synthesis, Precision, Recall, F-score, Map.

Unit 7 Semantic Relations **(6Hrs)**

UNL, Towards Dependency Parsing, Universal Networking Language, Semantic Role Extraction, Baum Welch Algorithm, HMM and Speech Recognition. HMM training, Baum Welch Algorithm; HMM training

Unit 8 Applications **(6Hrs)**

Sentiment Analysis; Text Entailment; Robust and Scalable Machine Translation; Question Answering in Multilingual Setting; Cross Lingual Information Retrieval (CLIR)..

Text Books:

1. Allen, James, "Natural Language Understanding", Second Edition, Benjamin/Cumming, 1995.
2. Charniack, Eugene, "Statistical Language Learning", MIT Press, 1993.
3. Jurafsky, Dan and Martin, James, Speech and Language Processing, Second Edition, Prentice Hall, 2008.
4. Manning, Christopher and Heinrich, Schutze, Foundations of Statistical Natural Language Processing, MIT Press, 1999.

Reference Books:

1. Jurafsky, D., and Martin, J.H. (2008). "Speech and Language Processing" (2nd Edition). Upper Saddle River, NJ: Prentice Hall
2. Bird, S., Klein, E., Loper, E. (2009). "Natural Language Processing with Python". Sebastopol, CA: O'Reilly Media.
3. Radford, Andrew et. al., "Linguistics, An Introduction", Cambridge University Press, 1999.

Internal Continuous Assessment (ICA) :

ICA shall include at least eight of the following:

1) Perform sentiment analysis of tweets using logistic regression and then naïve Bayes,
2) Use vector space models to discover relationships between words and use PCA to reduce the dimensionality of the vector space and visualize those relationships,
3) Write a simple English to French translation algorithm using pre-computed word embeddings and locality sensitive hashing to relate words via approximate k-nearest neighbor search.
4) Create a simple auto-correct algorithm using minimum edit distance and dynamic programming,
5) Apply the Viterbi Algorithm for part-of-speech (POS) tagging, which is important for computational linguistics,
6) Write a better auto-complete algorithm using an N-gram language model,
7) Write your own Word2Vec model that uses a neural network to compute word embeddings using a continuous bag-of-words model.
8) Train a neural network with GLoVe word embeddings to perform sentiment analysis of tweets,
9) Generate synthetic Shakespeare text using a Gated Recurrent Unit (GRU) language model,
10) Train a recurrent neural network to perform named entity recognition (NER) using LSTMs with linear layers,
11) Use so-called 'Siamese' LSTM models to compare questions in a corpus and identify those thatare worded differently but have the same meaning.
12) Translate complete English sentences into German using an encoder-decoder attention model,
13) Build a Transformer model to summarize text,
14) Use T5 and BERT models to perform question-answering
15) Build a chatbot using a Reformer model.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Syllabus for Honors Degree – Data Science

Computer Science & Engineering and Information Technology

Course Code	*Sem*	*Course Name*	*Hrs./week*			*Credits*	*Examination Scheme*			
			L	*T*	*P*		*ISE*	*ESE*	*ICA*	*Total*
Hn421	S.Y. B.Tech. Sem II	Mathematics for Data Science	3	1		4	30	70	25	125
Hn522	T.Y. B.Tech Sem I	Data Preprocessing & Visualization	3		2	4	30	70	25	125
Hn523	T.Y. B.Tech Sem I	Seminar			2*	1			25	25
Hn624	T.Y. B.Tech Sem II	Machine Learning	3		2	4	30	70	25	125
Hn725	Final Year B.Tech Sem I	Mini Project			4*	2		50	50	100
Hn726	Final Year B.Tech Sem II	Predictive Analytics	3		2	4	30	70	25	125
	Sub Total		12	1	12	19	120	330	175	625

* indicates contact hours

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Honors in Data Science

T.Y. B. Tech. (Information Technology), Semester-I

Hn522 – DATA PRE-PROCESSING AND VISUALIZATION

Teaching Scheme:
Lecture: 3 hrs/week, 3 credits
Practical : 2 hrs/week, 1 credit

Examination Scheme:
ESE : 70 Marks
ISE : 30 Marks
ICA : 25 Marks

Introduction:

Data science is a field of study and application that has been growing rapidly for the past several decades. As a growing field, it is gaining a lot of attention in both the media as well as in the job market. This course will introduce students to data pre-processing and visualization techniques and tools.

Prerequisite:

Fundamentals of Python Programming

Course Outcomes:

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

1. Identify the different types of data
2. Transform raw data into understandable format
3. Use python libraries for data pre processing and visualization
4. Represent the data in various graphical forms.

SECTION - I

Unit 1 - Introduction and Describing Data (6Hrs)

Overview, Sources of Data ,Process for Making Sense of Data, Observations and Variable , Types of Variables, Central Tendency, Distribution of the Data, Confidence Intervals, Hypothesis Tests

Unit 2 - Preparing Data Tables (8 Hrs)

Overview, Cleaning the Data, Removing Observations and Variables, Generating Consistent Scales Across Variables, New Frequency Distribution, Converting Text to Numbers, Converting Continuous Data to Categories, Combining Variables, Generating Groups, Preparing Unstructured, Data Visualizing Relationships between Variables, Calculating Metrics about Relationships.

Unit 3 - Introduction to NumPy (8 Hrs)

Understanding Data Types in Python, The Basics of NumPy Arrays, Computation on NumPy Arrays: Universal Functions, Aggregations: Min, Max, and Everything in Between, Computation on Arrays: Broadcasting, Comparisons, Masks, and Boolean Logic, Fancy Indexing ,Sorting Arrays, Structured Data: NumPy's Structured Arrays

SECTION-II

Unit 4 - Data Manipulation with Pandas (7Hrs)

Installing and Using Pandas, Introducing Pandas Objects, Data Indexing and Selection, Operating on Data in Pandas, Handling Missing Data, Hierarchical Indexing, Combining Datasets: Concat and Append, Combining Datasets: Merge and Join, Aggregation and Grouping, Pivot Tables, Vectorized String Operations, Working with Time Series, High-Performance Pandas.

Unit 5 - Data Visualization (6 Hrs)

Overview, Visualization Design Principles, Tables, Univariate Data Visualization, Multivariate Data Visualization, Visualizing Groups, Dynamic Techniques

Unit 6 - Visualization with Matplotlib and Seaborn (9Hrs)

General Matplotlib Tips, Two Interfaces for the Price of One, Simple Line Plots, Visualizing Errors, Density and Contour Plots, Histograms, Binnings, and Density, Customizing Plot Legends, Customizing Colorbars, Multiple Subplots, Text and Annotation, Customizing Matplotlib: Configurations and Stylesheets, Three-Dimensional Plotting in Matplotlib, Geographic Data with Basemap, Introduction to Seaborn: Seaborn functionalities and usage, Spatial Visualizations and Analysis in Python with Folium, Case Study.

Internal Continuous Assessment (ICA):

ICA should consist of Solving 8- 10 practical assignments on above units.

Text Book:

1. Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2014. (Unit- I and II)
2. Glenn J. Myatt, Making sense of Data: A practical Guide to Data Visualization, Advanced Data Mining Methods and Applications, John Wiley Publishers, 2009.(Unit-V)
3. Python Data Science Handbook – Essential Tools for working with Data : Jake VanderPlas, O'rielly (Unit III, IV, VI)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Honors in Data Science

T.Y. B. Tech. (Information Technology), Semester-I

Hn523 – SEMINAR

Teaching Scheme: **Examination Scheme:**

ICA : 25 Marks

Course Objectives:

4. To study, analyze & prepare a topic for presentation on emerging technology.
5. To exhibit effective communication.
6. To work in teams having brainstorming session for group discussion.

Course Outcomes:

At the end of the course students will be able to

5. Explore research areas and conduct literature survey to decide seminar topic.
6. Compile information and knowledge effectively
7. Effectively communicate their work in writing and oral presentation
8. Inculcate habit of self study and lifelong learning

Every student of Honors Degree will give a seminar on a topic related to their domain from the honors degree. Seminar should consist of a presentation of about 30-40 minutes. The seminar should be based on topics in the emerging area in which the student has carried out the literature survey. The student will also propose a problem which he intends to give a solution in his project work to be carried out in subsequent semesters. A report on the seminar should be submitted to the department. Assessment should be jointly done by panel of teachers consisting of respective guide and other teachers from the department working in the area of the domain included in the respective honors degree.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Honors in Data Science

T.Y. B. Tech. (Information Technology), Semester-II

Hn621 – MACHINE LEARNING

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week, 3 credits	ESE : 70 Marks
Practical : 2 hrs/week, 1 credit	ISE : 30 Marks
	ICA : 25 Marks

Introduction :

Machine learning is the science of getting computers to act without being explicitly programmed. This course provides a broad introduction to machine learning and its mathematical foundation. It includes the types and the best practices in machine learningalong with its real world applications.

Pre-requisite:

Knowledge of Probability & Statistics with a basic course in Python.

Course Outcomes :

At the end of the course students will be able to

1. Demonstrate types of machine learning algorithms.
2. Design a model by selecting appropriate machine learning algorithm for a given problem.
3. Validate designed machine learning model.
4. Evaluate and tune machine learning model based on various parameters.
5. Design various applications using machine learning algorithm.

SECTION I

Unit 1: Introduction to Machine learning (08Hrs)

Understanding Machine Learning: What Is Machine Learning?, Leveraging the Power of Machine Learning, The Roles of Statistics and Data Mining with Machine Learning, Putting Machine Learning in Context, Typesof machine Learning, Applications of Machine Learning. Applying Machine Learning: Getting Started with a Strategy, Applying Machine Learning to Business Needs, Understanding Machine Learning Techniques, Tying Machine Learning Methods to Outcomes.

Unit 2: Offerings of Machine learning (05 Hrs)

Looking Inside Machine Learning: The Impact of Machine Learning on Applications, Data Preparation, The Machine Learning Cycle.

Getting Started with Machine Learning: Understanding How Machine Learning Can Help, Focus on the Business Problem, Requirement of Collaboration in Machine Learning, Executing a Pilot Project, Determining the Best Learning Model.

Unit 3: Basic mathematics for Machine Learning (10 Hrs)

Getting Started with The Math Basics, Working with Data, Exploring the World of Probabilities, Describing the Use of Statistics, Interpreting Learning As Optimization, Exploring Cost Functions, Descending the Error Curve, Updating by Mini-Batch and Online.

SECTION II

Unit 4: Validating Machine Learning Models (10 Hrs)

Validating Machine Learning: Checking Out-of-Sample Errors, Getting to Know the Limits of Bias, KeepingModel Complexity in Mind and Solutions Balanced, Training, Validating, and Testing, Resorting to Cross- Validation. Looking for Alternatives in Validation. Optimizing Cross-Validation Choices, Avoiding Sample Bias and Leakage Traps, Discovering the Incredible Perceptron

Simplest learning strategies to learn from Data: Discovering the Incredible Perceptron, Growing GreedyClassification Trees, Taking a Probabilistic Turn

Unit 5: Improving Machine Learning Models (08Hrs)

Improving Machine Learning Models, Studying Learning Curves, Using Cross-Validation Correctly,Choosing the Right Error or Score Metric, Searching for the Best Hyper-Parameters,Testing Multiple Models, Averaging Models, Stacking Models, Applying Feature Engineering, Selecting Features and Examples,Looking for More Data.

Unit 6: Applications of Machine Learning (04 Hrs)

Applying Learning to Real Problems**,** Classifying Images, Scoring Opinions and Sentiments, Recommending Products and Movies, Using Machine Learning to Provide Solutions to Business Problems, Future of MachineLearning.

Internal Continuous Assessment (ICA):

Student should implement the following:

1. Basic mathematics for Machine Learning –
   Simulating solutions using Python to
   I. Matrix operations
   II. Problems using Probability
   III. Statistical Estimations.
2. Introduction to Jupyter Notebook and Colab.
3. Working with data.
4. Data Exploration and Preprocessing.
5. Linear Regression
6. Introduction to Dimensionality Reduction
7. Logistic Regression
8. Decision Trees
9. Ensemble Models
10. Clustering (Unsupervised Learning)

Text Books:

1. Machine Learning For Dummies, IBM Limited Edition by Judith Hurwitz, Daniel Kirsch(Published byWiley, First edition).
2. Machine Learning For Dummies by John Paul Mueller, Luca Massaron (Published by ForDummies; Firstedition).

Reference Books :

1. Introduction to Machine Learning (Second Edition) by Ethem Alpaydın (published byThe MIT PressCambridge, Massachusetts London, England
2. Machine Learning by Tom M. Mitchell (Publisher: McGraw Hill Education; First edition +New Chaptersfrom Second edition).

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Honors in Cyber Security

T.Y. B. Tech. (Information Technology)

Course Code	*Semester*	*Course Name*	*Hrs./week*			*Credits*	*Examination Scheme*			
			L	*T*	*P*		*ISE*	*ESE*	*ICA*	*Total*
Hn431	S.Y. B.Tech. Sem II	Cryptography	3	1		4	30	70	25	125
Hn532	T.Y. B.Tech Sem I	Network Security andSecure Coding	3		2	4	30	70	25	125
Hn533	T.Y. B.Tech Sem I	Seminar			2*	1			25	25
Hn634	T.Y. B.Tech Sem II	Cyber forensic	3		2	4	30	70	25	125
Hn735	Final Year B.Tech Sem I	Mini Project			4*	2		50	50	100
Hn736	Final Year B.Tech Sem II	Information Auditingand Monitoring	3		2	4	30	70	25	125
	Sub Total		12	1	12	19	120	330	175	625

*indicates contact hours

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Honors in Cyber Security

T.Y. B. Tech. (Information Technology), Semester-I

Hn532 : NETWORK SECURITY AND SECURE CODING

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours/Week, 3 credits	ESE: 70 Marks
Practical : 2 Hour/Week, 1 credit	ISE: 30 marks
	ICA: 25 Marks

Course Outcomes:

After the completion of this course the student should be able to

1. Gain a complete knowledge on types of security attacks, services and mechanisms.
2. Understand the implementation of Internetwork security model and its standards and vulnerabilities.
3. Demonstrate the Conventional Encryption Principles and the Public key cryptography principles
4. Identify the vulnerable points for attacks in simple networks.

SECTION-I

Unit 1 : Security Attacks **(08 Hrs)**

Interruption, Interception, Modification and Fabrication, Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.

Unit 2 :Conventional Encryption Principles **(07 Hrs)**

Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication ,Secure Hash Functions and HMAC.

Unit 3 : Public key cryptography principles **(07 Hrs)**

Public key cryptography algorithms, digital signatures, digital Certificates, Certificate Authority and key management Kerberos, X.509 Directory Authentication Service.

SECTION-II

Unit 4 : Email privacy **(08 Hrs)**

Pretty Good Privacy (PGP) and S/MIME.IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.

Unit 5 **(07 Hrs)**

Basic concepts of SNMP , SNMPv1 Community facility and SNMPv3. Intruders, Viruses and related threats. Firewall Design principles, Trusted Systems. Intrusion Detection Systems.

Unit 6: Secure Coding **(07 Hrs)**

Memory safety and vulnerabilities: attacks and defenses, Memory safety and vulnerabilities: attacks and defenses, Fuzzing, Symbolic execution and static analysis , Secure Architecture Concepts and Principles

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Internal Continuous Assessment (ICA) :
Minimum 8-10 assignments based on above topics.

Text Books:

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Hack Proofing your network by Ryan Russell, Dan Kaminsky, Rain Forest Puppy, Joe Grand, David Ahmad, Hal Flynn Ido Dubrawsky, Steve W.Manzuik and Ryan Permeh, Wiley Dreamtech

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Reference Books:

1. Network Security and Cryptography: Bernard Menezes, CENGAGE Learning.
2. Network Security - Private Communication in a Public World by CharlienKaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Cryptography and network Security, Third edition, Stallings, PHI/Pearson
4. Principles of Information Security, Whitman, Cengage Learn

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Honors in Cyber Security

T.Y. B. Tech. (Information Technology), Semester-I

Hn533 : SEMINAR

Teaching Scheme **Examination Scheme**

ICA – 25 Marks

Course Objectives:

7. To study, analyze & prepare a topic for presentation on emerging technology.
8. To exhibit effective communication.
9. To work in teams having brainstorming session for group discussion.

Course Outcomes:

At the end of the course students will be able to

9. Explore research areas and conduct literature survey to decide seminar topic.
10. Compile information and knowledge effectively
11. Effectively communicate their work in writing and oral presentation
12. Inculcate habit of self study and lifelong learning

Every student of Honors Degree will give a seminar on a topic related to their domain from the honors degree. Seminar should consist of a presentation of about 30-40 minutes. The seminar should be based on topics in the emerging area in which the student has carried out the literature survey. The student will also propose a problem which he intends to give a solution in his project work to be carried out in subsequent semesters. A report on the seminar should be submitted to the department. Assessment should be jointly done by panel of teachers consisting of respective guide and other teachers from the department working in the area of the domain included in the respective honors degree.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Honors in Cyber Security

T.Y. B. Tech. (Information Technology), Semester-II

Hn634 : Cyber Forensic

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours/Week, 3 credits	ESE: 70 Marks
Practical : 2 Hour/Week, 1 credit	ISE: 30 marks
	ICA: 25 Marks

Course Outcome (CO):

On completion of course student will able to :

1. Classify the cybercrime based on their type
2. Explore Cybercrime/Cyber Forensic concepts along with multiple tools.
3. Use Cyber forensic in cybercrime legal investigation

SECTION - I

Unit-1 Introduction to Cyber Security **(07 Hrs)**

Introduction, Definition and Origins of the Word, Cybercrime and Information Security, Who are Cyber Criminals, Classification of Cybercrimes, How Criminal plan the Attack, Cyberstalking.

Unit-2 Tools and Method used in cybercrime **(07 Hrs)**

Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and spywares, Virus and warms, Trojan Horses and Backdoors, DoS and DDoS Attacks, SQL Injection, Buffer Overflow.

Unit-3 Cyber Crime : The Legal Perspectives **(06 Hrs)**

Introduction, Cybercrime and Legal Landscape around the World, Why do we need cyber law: the Indian Context, The Indian IT Act, Digital Signature and Indian IT Act, Amendment to the Indian IT Act.

SECTION– II

Unit - 4 Understanding Computer Forensics **(07 Hrs)**

Introduction, Background of Cyber Forensics , Digital Forensics Science, Need for Computer Forensics , Cyber forensics and Digital Evidence, Digital Forensics Life Cycle, Chain of Custody Concept, Challenges in Computer Forensics,

Unit- 5 Network Forensics **(08 Hrs)**

Network Basics for Digital Investigators: Introduction, Network basics for digital investigators: History, Technical overview, Network Technologies, Connecting networks using Internet Protocols.

Applying Forensic Science to Networks: Preparation & Authorization, Identification, Documentation Collection Preservation, Filtering Data reduction, Class / Individual characteristics, evaluation of source, evidence recovery, investigation reconstruction, reporting results.

Unit - 6 Forensics of Hand-Held Devices **(06 Hrs)**

Introduction, Understanding Cell Phone Working Characteristics, Hand-Held Devices and Digital Forensics, Toolkits for Hand-Held Device Forensics, Techno-Legal Challenges with Evidence from Hand-Held Devices.

Internal Continuous Assessment (ICA):
Minimum 8 to 10 Experiments/Assignments based on above topic

Text Books :

1. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives by Nina Godbole, Sunita Belapure
2. Digital Evidence & Computer Crime – Forensic science, Computers & The Internet', Eoghan Casey, 3rd edition
3. 'Computer Forensics Computer Crime scene investigation', 2nd edition, Johm R. Vacca

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Reference Books :

1. 'Computer Forensics Investigating Network Intrusions & Cybercrime', EC–Council press, Cengage Learning
2. Guide to Computer Forensics & Investigations, 4th edition, Bill Nelson, Amelia Phillips & Christopher Steuart, Cengage Learning
3. 'Guide to Integrating Forensic Techniques into Incident Response', NIST, Karen Kent, Suzanne Chevalier Tim Grance, Hung Dang