Annexure-5 1

HPU ADD-ON COURSES (AOCs) OFFERED BY DEPARTMENT OF DATA SCIENCE AND ARTIFICIAL INTELLIGENCE

Name of the Course	**Introduction to Ethical Hacking**		
Course Code		Credits-2	L-2, T-0, P-0
Lectures to be Delivered	30 (1 Hr Each) (L=30, T=0 for each semester)		
Semester End Examination	**Max Marks: 25**	**Min Pass Marks: 40%**	**Max. Time: 1.5 hrs**
Internal Assessment (based on sessional test (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			**Max Marks: 25**

Programme Details:

a. **Programme** : Add-On Course
b. **Duration** : 6 months
c. **Eligibility** : Any Engineering Graduate or Any other graduate with Mathematics/Computer/IT/Statistics as Major Subjects in all three years with 50% aggregate marks in qualifying exam (45% for SC/ST/PWD)

Course Objectives (COs)	At the end of this course, the student will be able to:
CO1	perform basic ethical hacking techniques within a virtual lab environment.
CO2	analyze cryptographic vulnerabilities and implement secure communication practices.
CO3	uncover zero-day vulnerabilities and create evasive malware in a controlled setting.
CO4	exploit common web flaws and analyze corporate network attack vectors.

Learning Outcomes (LOs)	At the end of this course, the student will be able to:
LO1	configure a virtual lab environment using tools like VirtualBox and pfSense.
LO2	analyze network traffic, perform ARP spoofing attacks, and create reverse shells.
LO3	utilize fuzzing techniques to discover vulnerabilities and create basic Trojans and rootkits.
LO4	perform SQL injection attacks, crack passwords, and exploit vulnerabilities in corporate networks.

Chairman
Department of Data Science &
Artificial Intelligence
H.P. University
Shimla-5

INTRODUCTION TO ETHICAL HACKING

SECTION-A

Unit-1

Principles of Hacking & Legal Parameters

Ethical Hacking Overviews, Hacking concept, what is hacking?, Terms we use in hacking, Need of Ethical hacking.

Principles of Ethical hacking: Basic Principle, Commandments of Ethical Hacking, Hacking Methodologies, Types of Hacking, Building the foundation for Ethical hacking, Hacking Phases.

Role of Ethical Hacker, Types of Hackers, Roles and Responsibilities, Scope & limitations of hacking, Advantages & scope for hacking, Drawbacks & Limitations of hacking.

Unit- 2:

Cyber Threats and Attacks Vectors

Threats & categories, Attack Vectors and Exploitation.

Hacking tools and techniques: Common Hacking Tools, Hacking Techniques & Approaches.

Policies and Controls: Information Security policies, Risk Management & Incident Management, information security controls, Data Management.

SECTION- B

Unit 3

Network penetration Testing : network basics, connection to a wireless adapter, MAC address, wireless modes, enabling monitor mode manually, enabling monitor mode using airmon-ng, WEP theory,basic web cracking, fake authentication attack, ARP request replay, WPA introduction, WPS cracking, securing network from attacks.

Unit 4

Cryptography and Ransome: Encryption: One-Time Pad, Pseudorandom Generators, Insecure Block Ciphers Modes, Secure Block Ciphers Modes, Encrypting and Decrypting a File, Email Encryption: Public-Key Cryptography, Rivest–Shamir–Adleman Theory, The RSA Math, Encrypting a File with RSA, writing ransomware.

TEXTBOOKS:

1. Daniel G. Graham, "ETHICAL HACKING A Hands-on introduction to Breaking In", no starch press 2021.
2. Zaid Sabih, "Learn ethical hacking from Scratch", packt publishing 2018.

Chairman
Department of Data Science &
Artificial Intelligence
H.P. University
Shimla-5

Name of the Course	Indian Knowledge System		
Course Code		Credits-2	L-2, T-0, P-0
Lectures to be Delivered	30 (1 Hr Each) (L=30, T=0 for each semester)		
Semester End Examination	**Max Marks: 25**	**Min Pass Marks: 40%**	**Max. Time: 1.5 hrs**
Internal Assessment (based on sessional test (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			**Max Marks: 25**

Programme Details:

a. **Programme** : Add-On Course
b. **Duration** : 6 months
c. **Eligibility** : Plus two examination under 10+2 system or examination equivalent there to of a Board/University established by law in India with 40% marks (35% marks in case of SC/ST)

Course Objectives (COs)	At the end of this course, the student will be able to:
CO1	explain the genesis and evolution of the Bharatiya civilization and its unique knowledge systems.
CO2	identify and discuss the contributions of major Bharatiya figures in arts, literature, and philosophy.
CO3	explain key scientific and mathematical concepts originating in ancient India.
CO4	describe the engineering, technological, and architectural advancements of ancient Bharatiya civilizations.

Learning Outcomes (LOs)	At the end of this course, the student will be able to:
LO1	discuss the geographical and historical context of the Saraswati-Sindhu civilization.
LO2	summarize the main ideas and contributions of major schools of philosophy and ancient educational institutions in India.
LO3	identify and explain key scientific discoveries and mathematical principles attributed to ancient Indian scholars.
LO4	describe the engineering techniques and materials used in ancient Indian structures and artifacts.

Chairman
Department of Data Science & Artificial Intelligence
H.P. University
Shimla-5

Indian Knowledge System
Section-A

UNIT -I: Bhāratīya Civilization and Development of Knowledge System

Genesis of the land, Antiquity of civilization, On the Trail of the Lost River, Discovery of the Saraswatī,River, the Saraswatī-Sindhu Civilization, Traditional Knowledge System, The Vedas, Main Schools of Philosophy , Ancient Education System, the Takṣaśilā University, the Nālandā University, Alumni, Knowledge Export from Bhārata.

UNIT-II: Arts, Literature, and Scholars

Art, Music, and Dance, Naṭarāja– A Masterpiece of Bhāratīya Art, Literature, Life and works ofAgastya, Lopāmudrā, Ghoṣā, Vālmīki, Patañjali, Vedavyāsa, Yājñavalkya, Gārgī, Maitreyī, Bodhāyana, Caraka, Suśruta, Jīvaka, Nāgārjuna, Kaṇāda, Patañjali, Kauṭīlya, Pāṇini, Thiruvalluvar, Āryabhaṭa, Varāhamihira, Ādi Śaṅkarācārya, Bhāskarācārya, Mādhavācārya.

Section-B

UNIT-III: Science, Astronomy, and Mathematics

Concept of Matter, Life and Universe, Gravity, Sage Agastya's Model of Battery, Velocity of Light,Vimāna: Aeronautics, Vedic Cosmology and Modern Concepts, Bhāratīya Kāla-gaṇanā, History and Culture of Astronomy, Sun, Earth, Moon, and Eclipses, Earth is Spherical and Rotation of Earth.

UNIT-IV: Engineering, Technology, and Architecture

Pre-Harappan and Sindhu Valley Civilization, Laboratory and Apparatus, Juices, Dyes, Paints and Cements, Glass and Pottery, Metallurgy, Engineering Science and Technology in the Vedic Age and Post-Vedic Records, Iron Pillar of Delhi, Rakhigarhi, Mehrgarh, Sindhu Valley Civilization, Marine Technology, and Bet–Dwārkā.

Text books:

1. Textbook on The Knowledge System of Bhārata , Bhag Chand Chauhan , Garuda Prakashan , 1st Edition (2023).

2.History of Science in India Volume-1, Part-I, Part-II, Volume VIII, Sibaji Raha , National Academy of Sciences India and The Ramakrishna Mission Institute of Culture, Kolkata ,1st Edition (2014).

Reference Books:

1. Pradeep Kohli, "Pride of India - A Glimpse of India's Scientific Heritage", Samskrit Bharati, 1st Edition, (2006).
2. Keshav Dev Verma, "Vedic Physics", Motilal Banarsidass Publishers, 1st Edition, (2012).
3. Suresh Soni, "India's Glorious Scientific Tradition", Ocean Books Pvt. Ltd., 1st Edition, (2010).

Chairman
Department of Data Science &
Artificial Intelligence
H.P. University
Shimla-5

Name of the Course	Responsible Artificial Intelligence		
Course Code		Credits-2	L-2, T-0, P-0
Lectures to be Delivered	30 (1 Hr Each) (L=30, T=0 for each semester)		
Semester End Examination	**Max Marks: 25**	**Min Pass Marks: 40%**	**Max. Time: 1.5 hrs**
Internal Assessment (based on sessional test (2) 50%, Tutorials/Assignments 30%, Quiz/Seminar 10%, Attendance 10%)			**Max Marks: 25**

Programme Details:

a. **Programme** : Add-On Course
b. **Duration** : 6 months
c. **Eligibility** : Any Engineering Graduate or Any other graduate with Mathematics/Computer/IT/Statistics as Major Subjects in all three years with 50% aggregate marks in qualifying exam (45% for SC/ST/PWD)

Course Objectives (COs)	At the end of this course, the student will be able to:
CO1	define artificial intelligence and its key concepts, including autonomy, adaptability, and human-AI interaction.
CO2	analyze ethical theories and values relevant to AI development and decision-making.
CO3	explain the concepts of responsibility, accountability, and transparency in the context of AI systems.
CO4	evaluate the ethical implications of AI systems and discuss approaches for designing and implementing ethical AI.

Learning Outcomes (LOs)	At the end of this course, the student will be able to:
LO1	explain the concepts of autonomy, adaptability, and interaction in AI systems.
LO2	identify ethical dilemmas in AI and propose solutions based on ethical frameworks.
LO3	design AI systems that incorporate ethical considerations and values.
LO4	critically assess the current state of AI ethics and contribute to discussions about responsible AI development.

Chairman
Department of Data Science & Artificial Intelligence
H.P. University
Shimla-5

Section-A

Unit I: Foundations of Artificial Intelligence

Introduction to Artificial Intelligence: Artificial Intelligence , Background of AI ,Key Concepts: Autonomy, Adaptability, Interaction, Deep Dive into AI, Autonomy and AI Systems, Adaptability in AI, Human-AI Interaction.

Unit II: Ethical Frameworks and Decision-Making in AI

Introduction to Ethical Decision-Making: Introduction to Ethical Decision-Making in AI, **Ethical Theories and Values:** Overview of Ethical Theories ,Understanding Core Values in Ethics, Ethics in Practice: Applying Ethics in AI Practices, Implementing Ethical Reasoning in AI.

Section-B

Unit III: Responsibility and Accountability in AI

Introduction to Responsibility in AI: Responsible Research and Innovation, The ART of AI: Accountability, Responsibility, Transparency.

Design for Values: Integrating Values in AI Design, Practical Examples and Case Studies.

Unit IV: Ethical AI Systems and Future Perspectives

Introduction to Ethical AI Systems: Ethical Action, Approaches to Ethical Reasoning by AI: Different Approaches to Ethical Reasoning, Designing Artificial Moral Agents, Implementing and Assessing Ethical AI: Implementing Ethical Deliberation, Levels of Ethical Behaviour, Assessing the Ethical Status of AI Systems.

Textbook:

1. Barry O'Sullivan, Cork, Ireland Michael Wooldridge, Oxford, United Kingdom Responsible Artificial Intelligence, Springer, 2022.

Reference Books:

1. Stuart Russell and Peter Norvig "Artificial Intelligence: A Modern Approach" , Pearson, 4th Edition, 2020.
2. Nick Bostrom "Superintelligence: Paths, Dangers, Strategies", Oxford University Press, 1st edition, 2014.

Chairman
Department of Data Science &
Artificial Intelligence
H.P. University
Shimla-5