

B.TECH

COMPUTER SCIENCE AND ENGINEERING
(CYBER SECURITY)

JOIN THE FUTURE:

WITHOUT CYBER EDUCATION
THERE WILL BE NO CYBER SECURITY.

ACADEMIC YEAR 2024-25



IARE
INSTITUTE OF
AERONAUTICAL ENGINEERING

NAAC ACCREDITATION **A++** GRADE

NBA NATIONAL BOARD OF ACCREDITATION

nirf INDIA RANKINGS 2023

TOP 200 ENGINEERING RANK 151-200

TOP 100 INNOVATION RANK 51-100

24 YEARS OF
Excellence

VISION AND MISSION OF THE INSTITUTE

VISION

To bring forth students, professionally competent and socially progressive, capable of working across cultures meeting the global standards ethically.

MISSION

To provide students with an extensive and exceptional education that prepares them to excel in their profession, guided by dynamic intellectual community and be able to face the technically complex world with creative leadership qualities.

Further, be instrumental in emanating new knowledge through innovative research that emboldens entrepreneurship and economic development for the benefit of wide spread community.

VISION AND MISSION OF THE DEPARTMENT

VISION

The vision of the department is to produce competent graduates with multicultural capability to promote IT security standards, practices, products and services to address the challenges faced by government, industry and individuals.

MISSION

The department achieves by imparting innovative teaching learning practices by providing updated information on emerging cyber security standards and practices.

Program Educational Objectives (PEOs)

PEO-I

Recognized as effective professionals for their applied skills, problem solving capabilities and professional skills in the field of cyber security.

PEO-II

Develop themselves as effective communicators that help them for employment in the areas of cyber security and related fields.

PEO-III

Incorporate ethical, legal and social implications as outcomes of their profession

PEO-IV

Actively engage themselves in activities which allow for the continuous development of their computing and cyber security skills.

Knowledge and Attitude Profile

WK1

A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.

WK2

Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.

WK3

A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.

WK4

Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.

WK5

Knowledge, including efficient resource use, environmental impacts, whole-life cost, reuse of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.

WK6

Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.

WK7

Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.

WK8

Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.

WK9

Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.

Program Outcomes (POs)

PO-1 Engineering Knowledge

Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

PO-2 Problem Analysis

Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

PO-3 Design/Development of Solutions

Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

PO-4 Conduct Investigations of Complex Problems

Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).

PO-5 Engineering Tool Usage

Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

PO-6 The Engineer and The World

Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).

PO-7 Ethics

Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

PO-8 Individual and Collaborative Team work

Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO-9 Communication

Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

PO-10

Project Management & Finance

Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multi disciplinary environments.

PO-11 Life-Long Learning

Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

Program Specific Outcomes (PSOs)

PSO-I

Develop secure software with vulnerability assessment, and security requirements, designed with the least privileges for the protection of digital applications.

PSO-II

Evaluate the function of cyber security by identifying the tools and systems to minimize the risk to an organization's cyberspace.

PSO-III

Apply machine learning models, methods, and techniques for data analysis, data handling, and data visualization for effective decision-making.



ABOUT CYBER SECURITY

Cybersecurity is paramount for safeguarding digital systems, networks, and data from unauthorized access, attacks, and breaches. Effective cybersecurity requires a proactive approach, encompassing risk assessment, threat detection, incident response, and ongoing security awareness training.

Why study here CSE(Cyber Security) @ IARE

- At IARE, studying cybersecurity means engaging with a cutting-edge curriculum designed by industry experts, providing you with practical, hands-on experience.
- Our program emphasizes real-world scenarios, ensuring that you graduate with the skills needed to tackle the dynamic challenges of cybersecurity.
- With access to state-of-the-art laboratories and resources, you'll have the opportunity to experiment with the latest cybersecurity tools and techniques.
- Our faculty consists of experienced professionals who are not only experts in their field but also passionate about mentoring the next generation of cybersecurity professionals.
- Studying cybersecurity at IARE means being part of a vibrant and supportive academic community that fosters collaboration and innovation.
- We prioritize industry connections, providing opportunities for internships, industry projects, and networking events to help you kick-start your career in cybersecurity.
- With a focus on practical learning and problem-solving, our program ensures that you develop the critical thinking and analytical skills necessary to excel in the field.
- By choosing to study cybersecurity at IARE, you'll be prepared to make a meaningful impact in the ever-evolving world of cybersecurity, both locally and globally.

Expertise and focus

We are committed to quality and excellence in research, engaging in both fundamental and applied research that focus on real world problems or issues.

We emphasize on creating new knowledge and innovative products that make impact to the society, academia, government, industry and environment.

Our curriculum is carefully crafted to cover a wide range of cybersecurity domains, including network security, cryptography, ethical hacking, and digital forensics.

Other relevant high demands of research focus also may be not limited to:

Artificial Intelligence Security

Cloud Security

Biometric Security:

IoT Security

Cloud Security

Block chain Technology

Cyber-Physical Systems Security

Privacy Enhancing Technologies

Advanced Threat Detection and Response

DEPARTMENT SPECIFIC LABORATORIES

Cyber Security

Cybersecurity labs are specialized environments where individuals or organizations can test, analyze, and learn cybersecurity defenses. Cybersecurity is the practice of protecting systems, networks, and programs from digital attacks



Figure. 1 Department Specific Laboratories

Network Security laboratory

The main importance of this lab is to provide understanding of the issues related to security in modern networked computer systems.

Benefits:

- Gain the knowledge about real-world configurations
- Hands on experience to handle the vulnerabilities
- Implementation of security algorithms for data protections and risk mitigation



Figure. 2 Reference Image of Network Security

Desktop Computer Systems – 15 Nos

Make: Intel

Model: Think Center Neo 50s

Processor: 12th Generation Intel Core i5-12400 Processor,
16 GB DDR4 RAM, 256GB SSD HDD, Bluetooth, WiFi, 22" Monitor,

Operating system: Kali Linux / Windows

Software: Nmap, GNS3, Network Simulator NSP

Penetration Testing and Cyber Operation Laboratory

The purpose of this lab is to identify security vulnerabilities in an organization's databases, networks, and devices and provide a clear understanding of assessing an application or infrastructure for vulnerabilities

Benefits:

- Identifying and fixing vulnerabilities before they can be exploited, you can reduce the risk of a data breach and protect your business from financial damages
- Prevent Hackers from Infiltrating Systems
- Identify known security exposures before attackers find them



Figure. 3 Focused Lifecycle Processing Tasks in Penetration Testing and Cyber Operations Laboratory

Desktop Computer Systems – 15 Nos

Make: Intel

Model: Think Center Neo 50s

Processor: 12th Generation Intel Core i5-12400 Processor,
16 GB DDR4 RAM, 256GB SSD HDD, Bluetooth, WiFi, 22" Monitor,

Operating system: Kali Linux / Windows

Software: EnCase, FTK, X-Ways Forensics, Autopsy, Magnet Axion

DEPARTMENT SPECIFIC LABORATORIES

Digital Forensics Laboratory

This lab focuses mainly on the analysis of physical storage media and volume analysis. It covers the major phases of digital investigation such as preservation, analysis and acquisition of artifacts that reside in hard disks and random-access memory.

Benefits:

- By analyzing digital evidence, investigators can build a strong case against criminals and ensure justice is served.
- Help security teams better understand cyber threats, create more effective incident response
- Pursuing this laboratory tasks will ensure the set of digital forensics skills that useful for social applications

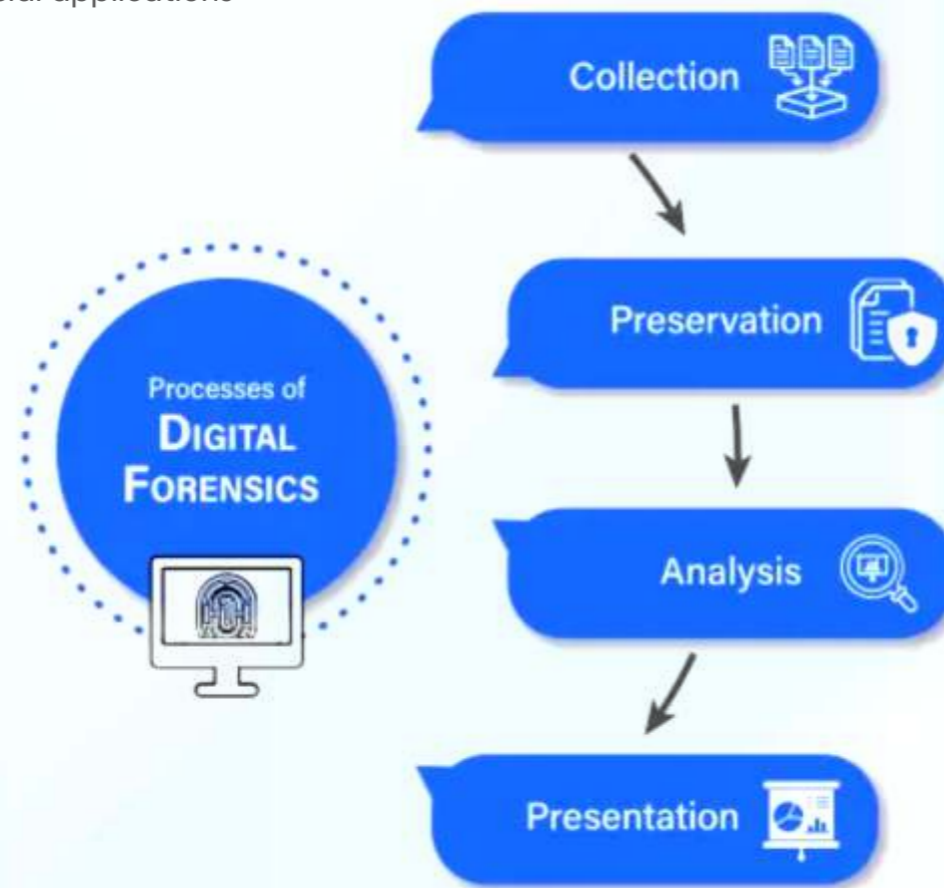


Figure. 4 Experimental Tasks in the Digital Forensics Laboratory

Desktop Computer Systems – 15 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor,
16 GB DDR4 RAM, 256GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Kali Linux / Windows
Software: EnCase, FTK, X-Ways Forensics, Autopsy, Magnet Axion

Cloud Security Laboratory

This lab covers and allows to consolidate protection of cloud-based networks for streamlined, continuous monitoring and analysis of numerous devices, endpoints, and systems.

Benefits:

- Access greater cybersecurity job opportunities by enhancing the skills to preserve the data security consistency in the cloud environments
- Facilitate the good practice environment by solving the security problems in virtual environments
- Improvised the security knowledge to automate and standardize backups, freeing your teams from monitoring manual backups and troubleshooting security problems



Figure. 5 Cloud Security Lab Tasks in AWS and Microsoft Azure

Desktop Computer Systems – 15 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor,
16 GB DDR4 RAM, 256GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Kali Linux / Windows
Software: AWS CLI, Azure CLI, Google Cloud SDK, Devops

Laboratory Details

1 Penetration Testing and Cyber Operation Laboratory

This lab used to identify and exploit zero-day vulnerabilities will have different archival requirements than labs used to identify and exploit publicly available vulnerabilities.

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Kali Linux/Windows
Tools used: Wireshark, Cryptool

2 Cyber Crime Investigation and Digital Forensics Laboratory

Cyber Crime Investigation and Digital Forensics Analyzing and collecting digital evidence in real-time to uncover, track, ensuring timely resolution and mitigation of security breaches.

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Kali Linux

3 Security Architecture and Protocols Laboratory

Security Architecture provide Designing and implementing robust, scalable security frameworks in real-time to protect systems and data against evolving threats

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Kali Linux/Windows
Tools used: Devops

4 Web Systems Engineering Laboratory

Web Systems Engineering is a field that combines principles of web development and software engineering to design, implement, and maintain web-based systems and applications.

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Front-End : HTML, CSS, Node.js, Angular, React.js, JavaScript, Vue.js

5 Computer Networks Laboratory

Computer Networks in real-time Cyber Security enable continuous monitoring and defense against threats by facilitating rapid detection and response to cyber incidents.

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Kali Linux/Windows
Operating system: Python

6 Database Management Systems Laborator

A DBMS provides facilities for controlling data access, enforcing data integrity, managing concurrency control, and recovering the database after failures and restoring it from backup files, as well as maintaining database security.

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Kali Linux/Windows
Operating system: Python

7 Design and Analysis of Algorithms (DAA) Laboratory

The "DAA Concepts" is increasingly becoming the default choice of the IT industry especially industries involved in software development at system level. It improves the problem solving skills by addressing the graph design challenges and complexity issues

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Kali Linux/Windows
Operating system: Python

8 Mobile Applications Development Laboratory

Mobile application development is the process of creating software applications that run on a mobile device

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Kali Linux/Windows
Operating system: Python

9 Object Oriented Programming with Java Laboratory

It gives the good skills on features of object-oriented programming include Abstraction, Polymorphism, Inheritance, and Encapsulation

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Windows
Tools used: JDK

10 Programming for Problem Solving Laboratory

Problem solving in programming skills helps to gain more knowledge over coding and programming, which is a major benefit. These problem solving skills also help to develop more skills in a person and build a promising career.

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Windows
Operating system: Python

11 Data Structures Laboratory

It provide practical learning on various data structures and to understand the processing of different algorithm for problem-solving.

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Windows
Operating system: Python

12 Computer Systems Internals and Linux Laboratory

This lab facilitates to students on Linux operation commands and practices the various controls / scripts in Linux environment. Operating commands with Linux and systems controls scripts related tasks practiced by the students for industry ready.

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Windows
Operating system: Python

13 Artificial Intelligence Laboratory

This lab provides cutting-edge problem based solutions to data mining, and machine learning problems arising in various applications areas involving data analytics.

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Windows
Operating system: Clementine, TensorFlow, Python, Spark

14 Operating Systems Laboratory

It offers students a hands-on experience on Operating System concepts using a constructivist approach and problem-oriented learning.

Major Equipment

Desktop Computer Systems – 36 Nos

Make: Intel
Model: Think Center Neo 50s
Processor: 12th Generation Intel Core I5-12400 Processor, 16 GB DDR4 RAM, 256 GB SSD HDD, Bluetooth, WiFi, 22" Monitor,
Operating system: Linux, Python

FACULTY INFORMATION



Dr. K. Rajendra Prasad

Head of the Department

Ph.D (2015), Doctoral Degree, JNTUA, Anantapur, A.P

MTech (2004), Chaitanya Bharathi
Visvesvaraya Technological University, Belgum, Karnataka.

B.Tech (1999), JNTUH, Hyderabad, T.S

AREA OF SPECIALIZATION

Data Mining, Pattern Recognition, Artificial Intelligence,
Speech and Signal Processing, Soft Computing Techniques,
Information Retrieval Techniques, Data Visualization Methods



Dr. R Obulakonda Reddy

Professor, Deputy HoD

Ph.D (2017), Doctoral Degree,
JNTUA, Anantapur, A.P

M.Tech (2009), JNTU, Hyderabad, TS

B.Tech(2005), SV University, Tirupathi, AP

AREA OF SPECIALIZATION

Pattern Recognition, Image processing,
cloud computing and Data mining



Dr. P Ramadevi

Associate Professor

Ph.D (2016), Doctoral Degree,
JNTUA, Anantapur, A.P

M.Tech (2002), University of Madras, TN

B.Tech(2000), IEl, Calcutta, West Bengal

AREA OF SPECIALIZATION

Applied Electronics,
Ad hoc Wireless Networks



Dr. Mahammad Rafi D

Associate Professor

Ph.D (2020), Doctoral Degree,
Veltech (Deemed to be University), TN

M.Tech (2008), JNTUH, Hyderabad, T.S

B.Tech(2005), JNTUH, Hyderabad, T.S

AREA OF SPECIALIZATION

Data Mining, Artificial Intelligence and
Machine Learning, Deep Learning

Assistant Professors

Mr. Y Manohar Reddy

Mr. S Lakshmanachari

Ms. K Naveena

Mr. B Santhosh Kumar

Mr. B Santhosh Kumar

Mr. B Ramesh

Ms. K Praveena

Ms. N Sreevani

Ms. Sahana Susheela

Ms. Sumangala Pujari

Cyber Security System

A Cyber Security System protects digital assets by employing technologies and processes to prevent unauthorized access, data breaches, and cyberattacks.



It encompasses measures such as encryption, firewalls, and intrusion detection systems to safeguard sensitive information and ensure system integrity.

Five Skills of Cyber Security

Information Security:

Information Security protects data from unauthorized access, disclosure, alteration, and destruction to ensure confidentiality, integrity, and availability.

Cloud Security Services:

Cloud Security Services protect cloud-based systems and data through comprehensive strategies including encryption, access control, and continuous monitoring.

Web Security:

Web Security ensures the protection of websites and online services from cyber threats like hacking, data breaches, and malware.

Network Security:

Network Security safeguards the integrity, confidentiality, and availability of data and resources as they are transmitted across or accessed through networks.

Security Architecture:

Security Architecture designs and integrates security controls into an IT infrastructure to protect systems and data from threats.



Types of cyber security

Vital types of cyber securities focuses on securing computer networks from unauthorized access, data breaches, and other network-based threats



Cyber security is a broad field encompassing various strategies, technologies, and practices to protect the computer systems, networks and data from unauthorized access

Possible Applications for Cyber Security

Cybersecurity is a set of standards and practices organizations use to protect their applications, data, programs, networks, and systems from cyberattacks and unauthorized access in defense, healthcare, and sensitive data.



Cyber Security **FRAMEWORK**

A Cyber Security Framework provides structured guidelines and best practices to manage and mitigate cyber risks effectively

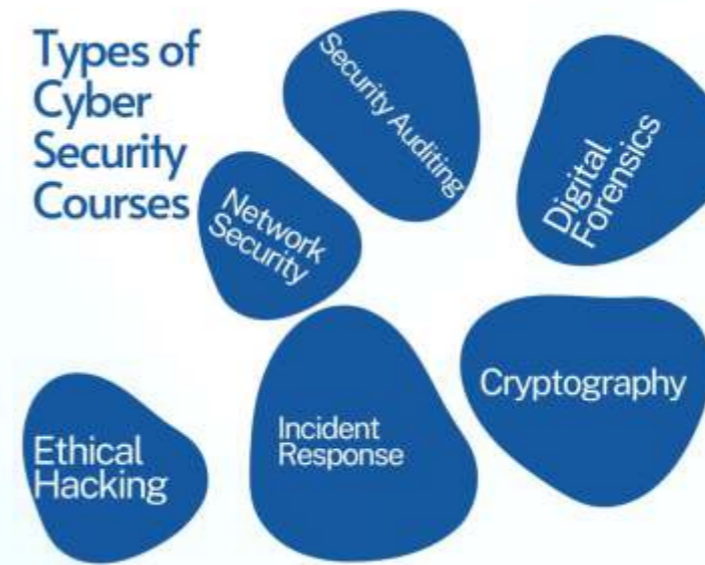


It offers a systematic approach to identifying, protecting, detecting, responding to, and recovering from cyber threats. Cybersecurity companies provide solutions that integrate seamlessly and ensure a strong defense against cyberattacks.

| Identify | Protect | Detect | Respond | Recover |
|--------------------------|--|--------------------------------|-------------------|-------------------|
| Asset Management | Access Control | Anomalies and Events | Response Planning | Recovery Planning |
| Business Environment | Awareness and Training | Security Continuous Monitoring | Communication | Improvements |
| Governance | Data Security | Detection Processes | Analysis | Communication |
| Risk Assessment | Info Protection Processes and Procedures | | Mitigation | |
| Risk Management Strategy | Maintenance | | Improvements | |
| | Protective Technology | | | |

Cyber security Learning Emerging Courses Types

Cyber security learning involves acquiring knowledge and skills to protect systems, networks, and data from cyber threats.



Ensure that all software, including operating systems, applications, and antivirus programs, is kept up-to-date. Regular updates patch security vulnerabilities, reducing the risk of cyber-attacks and data breaches.

Differences between Cyber Security and Cyber Safety

cyber security is primarily concerned with protecting the integrity and confidentiality of digital assets on a larger scale. Cyber safety emphasis safe and responsible online behavior to mitigate risks and protect personal information



New Mind Set of Cyber Security

Inculcating a cybersecurity mindset in your organization is not just about implementing security measures but also about fostering a culture of cybersecurity awareness.



COURSE MENU

Curriculum is designed based on professional modules from Microsoft, Alibaba, Huawei, CTS, IEEE, ACM, and AICTE Model Curriculum in several subjects and so that students have opportunity to obtain professional certificates from the companies upon graduation

I SEMESTER

| Course Code | Course Name | Pre-Requisite |
|-------------|--|---------------|
| AHSD02 | Matrices and Calculus | |
| AHSD03 | Engineering Chemistry | |
| AHSD07 | Applied Physics | |
| ACSD01 | Object Oriented Programming | |
| AHSD09 | Applied Physics Laboratory | |
| ACSD02 | Object Oriented Programming with Java Laboratory | |
| AHSD05 | Engineering Chemistry Laboratory | |
| AMED03 | Engineering Graphics | |
| ACSD04 | Mobile Applications Development | |
| AHSD06 | Environmental Science | |

II SEMESTER

| Course Code | Course Name | Pre-Requisite |
|-------------|--|-----------------------------|
| AHSD01 | Professional Communication | |
| AHSD08 | Differential Equations and Vector Calculus | Matrices and Calculus |
| ACSD05 | Essentials of Problem Solving | Object Oriented Programming |
| AEED01 | Elements of Electrical and Electronics Engineering | |
| AHSD04 | Professional Communication Laboratory | |
| ACSD06 | Programming for Problem Solving Laboratory | |
| AMED02 | Manufacturing Practice | |
| AEED03 | Electrical and Electronics Engineering Laboratory | |
| ACSD03 | Essentials of Innovation | |
| AHSD10 | Gender Sensitization | |

III SEMESTER

| Course Code | Course Name | Pre-Requisite |
|-------------|--|--|
| AECD04 | Digital Design and Embedded Systems | Elements of Electrical and Electronics Engineering |
| ACSD08 | Data Structures | Object Oriented Programming |
| ACSD09 | Computer Architectures and Operating Systems | Programming for Problem Solving Laboratory |
| AHSD11 | Probability and Statistics | Matrices and Calculus |
| ACCD01 | Essentials of Cyber Security | Basics of Computer Security |
| ACSD10 | Operating Systems Laboratory | Object Oriented Programming |
| ACSD11 | Data Structures Laboratory | Object Oriented Programming |
| AITD02 | Programming with Objects Laboratory | Programming for Problem Solving Laboratory |
| ACSD12 | Prototype and Design Building | Programming for Problem Solving Laboratory |

IV SEMESTER

| Course Code | Course Name | Pre-Requisite |
|-------------|---|--|
| ACSD13 | Design and Analysis of Algorithms | Programming for Problem Solving |
| AITD03 | Database Management Systems | Data Structures |
| AITD04 | Computer Networks | Essentials of Cyber Security |
| ACSD15 | Object Oriented Software Engineering | Object Oriented Programming |
| ACCD02 | Ethical Hacking | Essentials of Cyber Security |
| ACSD16 | Design and Analysis of Algorithms Laboratory | Programming for Problem Solving Laboratory |
| ACCD03 | Computer Networks Laboratory | Essentials of Cyber Security |
| AITD05 | Database Management Systems Laboratory | Data Structures Laboratory |
| ACSD18 | DevOps Engineer # (Git, Maven, Jenkins, Docker, Kubernetes) | Computer Architectures and Operating Systems |

V SEMESTER

| Course Code | Course Name | Pre-Requisite |
|-------------|--|--|
| ACSD19 | Data Mining and Knowledge Discovery | Database Management Systems |
| ACSD14 | Web Application Development | Object Oriented Programming, Mobile Applications Development |
| ACSD21 | Artificial Intelligence | Design and Analysis of Algorithms |
| ACCD04 | Information Security Management | Essentials of Cyber Security, Ethical Hacking |
| | Program Elective - I | |
| ACSD26 | Artificial Intelligence Laboratory | Design and Analysis of Algorithms |
| ACSD17 | Web Application Development Laboratory | Object Oriented Programming, Mobile Applications Development |
| ACCD09 | Network Security / Administrator # | Essentials of Cyber Security, Ethical Hacking |
| ACSD29 | Engineering Design Project | Prototype and Design Building |

VI SEMESTER

| Course Code | Course Name | Pre-Requisite |
|-------------|---|--|
| ACSD31 | Theory of Computation | Essentials of Problem Solving |
| ACCD10 | Penetration Testing and Cyber Operations | Ethical Hacking |
| | Program Elective - II | |
| | Program Elective - III | |
| | Open Elective - I | |
| ACSD41 | Computer System Internals and Linux Laboratory | Computer Architectures and Operating Systems |
| ACCD18 | Penetration Testing and Cyber Operations Laboratory | Essentials of Cyber Security |
| ACSD44 | Data Scientist / AI Specialist # | DevOps Engineer # Artificial Intelligence |
| ACSD45 | Development Project | DevOps Engineer # |

VII SEMESTER

| Course Code | Course Name | Pre-Requisite |
|-------------|--|---------------------------------|
| ACCD19 | Security Architecture and Protocols | Computer Networks |
| ACCD20 | Cyber Crime Investigation & Digital Forensics | Information Security Management |
| | Program Elective - IV | |
| | Program Elective - V | |
| | Open Elective - II | |
| ACCD25 | Cyber Crime Investigation & Digital Forensics | Information Security Management |
| ACCD26 | Security Architecture and Protocols Laboratory | Computer Networks |
| | Project Work (Phase - I) | |
| AHSD14 | Essence of Indian Traditional Knowledge | |

VIII SEMESTER

| Course Code | Course Name | Pre-Requisite |
|-------------|---|---------------|
| AHSD15 | Managerial Economics and Financial Analysis | |
| | Program Elective - VI | |
| | Open Elective - III | |
| | Project Work (Phase - II) | |



ELECTIVE COURSES

PROGRAM ELECTIVES COURSES (PEC)

The below listed courses are Professional electives and the student has to study six courses as professional electives.

| Course Code | Name of the Course | Prerequisites | Preferred Semester |
|-------------|---|--|--------------------|
| ACSD22 | Programming Language Paradigms | Object Oriented Programming | V |
| ACCD06 | Principles of Computer Security | Computer Networks | V |
| ACCD08 | Parallel and Distributed Computing | Computer Architecture and Operating Systems | V |
| ACCD05 | Computer Vision | Computer Architecture and Operating Systems | V |
| ACCD08 | Principles of Internet of Things | Computer Networks | V |
| ACCD11 | Cyber Security Techniques and Tools | Essentials of Cyber Security | VI |
| ACSD25 | Software Project Management | Object Oriented Software Engineering | VI |
| ACCD12 | Wireless Adhoc and Sensors Networks | Computer Networks | VI |
| AITD22 | Software Testing and Automation | Object Oriented Software Engineering | VI |
| ACDD09 | Mobile Computing | Computer Networks | VI |
| ACCD13 | Software Defined Networks | Object Oriented Software Engineering | VI |
| AITD16 | Agile Development and Scrum Practices | Object Oriented Software Engineering | VI |
| ACCD14 | Database Security | Principles of Computer Security, Database Management Systems | VI |
| ACCD15 | Digital Visualizations | Probability and Statistics | VI |
| ACAD09 | Cyber Physical Systems | Essentials of Cyber Security | VI |
| AITD13 | High-Performance computing | Computer Architecture and Operating Systems | VII |
| ACAD26 | Augmented Reality and Virtual Reality | Computer Vision | VII |
| ACSD38 | Software Architecture and Design Patterns | Object Oriented Software Engineering | VII |
| ACCD21 | Network Programming Management | Computer Networks | VII |
| AITD20 | Big Data Tools and Techniques | Data Mining | VII |
| ACCD22 | Edge Computing | Computer Networks | VII |
| ACCD23 | Optimization Techniques | Problem Solving | VII |
| ACAD15 | Machine Learning | Computer Networks, Artificial Intelligence | VII |
| AITD11 | Natural Language Processing | Artificial Intelligence | VII |
| ACCD28 | Parallel Programming | Parallel and Distributed Computing | VIII |
| ACCD29 | Cloud Services and Applications | Cloud Application Development | VIII |
| ACAD14 | Human Computer Interaction (UI & UX) | Computer Networks and Operating Systems | VIII |
| ACSD57 | Blockchain Technologies | Computer Networks | VIII |
| AITD12 | Quantum Computing | High-Performance computing | VIII |

OPEN ELECTIVE COURSES (OEC)

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not

| S. No. | Code | Course | Tick (✓) If passed | Credit Earned |
|--|--------|---|--------------------|---------------|
| Computer Science and Engineering (Cyber Security) Courses | | | | |
| Core Courses | | | | |
| SEMESTER I | | | | |
| 1. | AHSD02 | Matrices and Calculus | | 4 |
| 2. | AHSD03 | Engineering Chemistry | | 3 |
| 3. | AHSD07 | Applied Physics | | 3 |
| 4. | ACSD01 | Object Oriented Programming | | 3 |
| 5. | AHSD09 | Applied Physics Laboratory | | 1 |
| 6. | ACSD02 | Object Oriented Programming with Java Laboratory | | 2 |
| 7. | AHSD05 | Engineering Chemistry Laboratory | | 1 |
| 8. | AMED03 | Engineering Graphics | | 2 |
| 9. | ACSD04 | Mobile Applications Development | | 1 |
| 10. | AHSD06 | Environmental Science | | 0 |
| 11. | AHSD01 | Professional Communication | | 3 |
| SEMESTER II | | | | |
| 12. | AHSD08 | Differential Equations and Vector Calculus | | 4 |
| 13. | ACSD05 | Essentials of Problem Solving | | 3 |
| 14. | AEE001 | Elements of Electrical and Electronics Engineering | | 3 |
| 15. | AHSD04 | Professional Communication Laboratory | | 1 |
| 16. | ACSD06 | Programming for Problem Solving Laboratory | | 2 |
| 17. | AMED02 | Manufacturing Practice | | 2 |
| 18. | AEE003 | Electrical and Electronics Engineering Laboratory | | 1 |
| 19. | ACSD03 | Essentials of Innovation | | 1 |
| 20. | AHSD10 | Gender Sensitization | | 0 |
| SEMESTER III | | | | |
| 21. | AECD04 | Digital Design and Embedded Systems | | 3 |
| 22. | ACSD08 | Data Structures | | 3 |
| 23. | ACSD09 | Computer Architectures and Operating Systems | | 3 |
| 24. | AHSD11 | Probability and Statistics | | 4 |
| 25. | ACCD01 | Essentials of Cyber Security | | 3 |
| 26. | ACSD10 | Operating Systems Laboratory | | 1 |
| 27. | ACSD11 | Data Structures Laboratory | | 1 |
| 28. | AITD02 | Programming with Objects Laboratory | | 1 |
| 29. | ACSD12 | Prototype and Design Building | | 1 |
| SEMESTER IV | | | | |
| 30. | ACSD13 | Design and Analysis of Algorithms | | 3 |
| 31. | AITD03 | Database Management Systems | | 3 |
| 32. | AITD04 | Computer Networks | | 3 |
| 33. | ACSD15 | Object Oriented Software Engineering | | 3 |
| 34. | ACCD02 | Ethical Hacking | | 3 |
| 35. | ACSD16 | Design and Analysis of Algorithms Laboratory | | 1 |
| 36. | ACCD03 | Computer Networks Laboratory | | 1 |
| 37. | AITD05 | Database Management Systems Laboratory | | 1 |
| 38. | ACSD18 | DevOps Engineer # (Git, Maven, Jenkins, Docker, Kubernetes) | | 2 |

| SEMESTER V | | | | |
|----------------------|--------|--|--|----|
| 39. | ACSD19 | Data Mining and Knowledge Discovery | | 3 |
| 40. | ACSD14 | Web Application Development | | 3 |
| 41. | ACSD21 | Artificial Intelligence | | 3 |
| 42. | ACCD04 | Information Security Management | | 3 |
| 43. | | Principles of Computer Security (Program Elective - I) | | 3 |
| 44. | ACSD26 | Artificial Intelligence Laboratory | | 1 |
| 45. | ACSD17 | Web Application Development Laboratory | | 1 |
| 46. | ACCD09 | Network Security / Administrator # | | 2 |
| 47. | ACSD29 | Engineering Design Project | | 1 |
| SEMESTER VI | | | | |
| 48. | ACSD31 | Theory of Computation | | 3 |
| 49. | ACCD10 | Penetration Testing and Cyber Operations | | 3 |
| 50. | ACSD25 | Software Project Management (Program Elective - II) | | 3 |
| 51. | ACAD09 | Cyber Physical Systems (Program Elective - III) | | 3 |
| 52. | | Data Communications and Protocols (Open Elective - I) | | 3 |
| 53. | ACSD41 | Computer System Internals and Linux Laboratory | | 1 |
| 54. | ACCD18 | Penetration Testing and Cyber Operations Laboratory | | 1 |
| 55. | ACSD44 | Data Scientist / AI Specialist # | | 2 |
| 56. | ACSD45 | Development Project | | 1 |
| SEMESTER VII | | | | |
| 57. | ACCD19 | Security Architecture and Protocols | | 3 |
| 58. | ACCD20 | Cyber Crime Investigation & Digital Forensics | | 3 |
| 59. | ACCD21 | Network Programming Management (Program Elective - IV) | | 3 |
| 60. | ACAD15 | Machine Learning (Program Elective - V) | | 3 |
| 61. | | Fundamentals of Cryptography (Open Elective - II) | | 3 |
| 62. | ACCD25 | Cyber Crime Investigation & Digital Forensics | | 1 |
| 63. | ACCD26 | Security Architecture and Protocols Laboratory | | 1 |
| 64. | ACCD27 | Project Work (Phase - I) | | 3 |
| 65. | AHSD14 | Essence of Indian Traditional Knowledge | | 0 |
| SEMESTER VIII | | | | |
| 66. | AHSD15 | Managerial Economics and Financial Analysis | | 3 |
| 67. | ACSD57 | Blockchain Technologies (Program Elective - VI) | | 3 |
| 68. | | Cloud Data Engineering (Open Elective - III) | | 3 |
| 69. | ACCD32 | Project Work (Phase - II) | | 11 |

Value-Added Courses (VAC) and Certifications in the Department

1. EC-Council
2. National Cyber Security Scholar (NCSS)
3. Cyber Security Governance Professional
4. Certified Cybercrime Intervention Officer (CCIO)
5. Certified Industrial Security Professional (CISP)
6. Certified Drone Security Professional
7. Certified IoT Security Professional
8. Certified Forensics Investigator
9. Certified Malware Analyst

Competency building Courses

In order to achieve excellence in cyber security, the students completing the following in addition with the course curriculum.

- CCNA (Cisco Certified Network Associate)
- CCNP (Cisco Certified Network Professional)
- CCIE (Cisco Certified Internetwork Expert)
- Cisco SD-WAN (Software – Defined Wide Area Network)

Career Development Courses:

- Introduction to Cyber Security Specialization (Coursera)
- Certified Information Systems Security Professional (CISSP)
- Cybersecurity Analyst (CySA+)
- Certified Ethical Hacker (CEH)
- Security Certification Training (SANS Institute)
- Google IT Support Professional Certificate (Coursera)
- Certified Information Security Manager (CISM)
- Microsoft Certified: Azure Security Engineer Associate
- Penetration Testing and Ethical Hacking (Pluralsight)
- IBM Cybersecurity Analyst Professional Certificate (Coursera)

Career Path in Cyber Security



COURSE SYNOPSIS

ACSD09 COMPUTER ARCHITECTURES AND OPERATING SYSTEMS

Computer Architecture and Operating Systems course provides theoretical knowledge about the computer architecture; the structure of operating systems, process, memory management and virtual memory implementation principles, input-output management and deadlock avoidance, file system structure. It deals with the transfer of programs in and out of memory; organizes processing time between programs and users. Learned knowledge will be implemented in design and development of hybrid operating systems, command control systems, and in real time environments.

ACCD01 ESSENTIALS OF CYBER SECURITY

Cyber security course gives the comprehensive overview of the cybersecurity policies and concepts and learn the challenges in designing a security program. This course contains basic cyber security concepts, laws, forensic investigation challenges, cyber-crimes in wireless devices, organizational implications and cybercrime mini-cases. The security model of cyber security will help the learner to develop an appropriate planning for organizations to safe guard themselves from cyberattacks.

ACSD13 DESIGN AND ANALYSIS OF ALGORITHMS

Pre-requisite: Programming for Problem Solving, Data Structures

Design and analysis of algorithms is the process of finding the computational complexity of algorithms. It helps to design and analyze the logic on how the algorithm will work before developing the actual code for a program. It focuses on introduction to algorithm, asymptotic complexity; sorting and searching using divide and conquer, greedy method, dynamic programming, backtracking, branch and bound. NP-hard and NPcomplete problems. The applications of algorithm design are used for information storage, retrieval, transportation through networks, and presentation to users.

AITD03 DATABASE MANAGEMENT SYSTEMS

Pre-requisite: Programming for Problem Solving, Data Structures

The purpose of this course is to provide a clear understanding of fundamentals with emphasis on their applications to create and manage large data sets. It highlights on technical overview of database software to retrieve data from n database. The course includes database design principles, normalization, concurrent transaction processing, security, recovery and file Organization techniques.

AITD04 COMPUTER NETWORKS

The main emphasis of this course is on the organization and management of local area networks (LANs) wide area networks (WANs). The course includes learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks. Topics include layered network architectures, addressing, naming, forwarding, routing, communication reliability, the client-server model, and web and email protocols. The applications of this course are to design, implement and maintain basic computer networks.

ACSD15 OBJECT ORIENTED SOFTWARE ENGINEERING

This course concentrates on developing basic understanding about various activities that are involved in a software development. This course enables the student to develop necessary skills for developing a product or applications. The course focuses on all activities involved in software development (communication, planning, modelling, construction, deployment). In this course; students will gain a broad understanding of the discipline of software engineering and its application to the development and management of software systems. Student can implement and get knowledge about development of the software and gains knowledge of basic engineering methods and practices, and their appropriate application.

ACCD02 ETHICAL HACKING

Pre-requisite: Essentials of Cyber Security

This course combines an ethical hacking methodology to better help students secure their systems. Introduced to common countermeasures that effectively reduce and/or mitigate attacks. The concept of ethical hacking explained with their importance in protecting corporate and government data from cyber-attacks. Trusted text features new computer security resources, coverage of emerging vulnerabilities and innovative methods to protect networks, a new discussion of mobile security, and information on current federal and state computer crime laws, including penalties for illegal computer hacking are covered in this course. This course helps you gain the knowledge and skills to protect networks using the tools and techniques of an ethical hacker.

DATA MINING AND KNOWLEDGE DISCOVERY

Data mining refers to extracting or mining knowledge from large amounts of data. It emphasizes various techniques and algorithms used to explore, analyze and leverage data and turn it into valuable and actionable information. It includes data warehousing and data mining functionalities such as association mining, classification, clustering and outlier analysis. The techniques are used to tackle data centric applications in various domains such as financial analysis, telecommunication industry, intrusion detection, and complex data mining applications in stream, web, text, spatial and other scientific applications.

WEB APPLICATION DEVELOPMENT

This course introduces students to create concurrently a web app and a native app (for Android and iOS) with React Native and React Native Web. It covers HTML5 for structuring and presenting content on the World Wide Web. CSS3 being used to format structured content. To create a dynamic and interactive experience for the user it covers JAVASCRIPT. How build the applications using React concepts such as JSX, REDUX.

ARTIFICIAL INTELLIGENCE

Applied Artificial Intelligence refers to the practical use and implementation of AI technologies to solve complex problems and enhance various applications across different domains. This course provides knowledge on the key aspects of applying artificial intelligence in identifying real-world problems through the applications of AI. It involves the integration of AI techniques and algorithms into existing systems or the development of new solutions to address specific challenges like creating recommendation systems, virtual assistants like chatbots etc.

INFORMATION SECURITY AND MANAGEMENT

This course introduces a variety of network security concepts. A fundamental grasp of objectives, dangers, assaults, and methods, as well as algorithms and their design decisions, is developed in this course. Additionally, the course introduces students to a few mathematical ideas that are relevant to cryptology. The focus of the course is on providing students with a fundamental grasp of cryptosystem assaults and information protection techniques. Moreover, information security and Security Management, digital signatures, and message authentication are covered.

NETWORK SECURITY / ADMINISTRATOR

The purpose of this course is to provide understanding of the main issues related to security in modern networked computer systems. This covers underlying concepts and foundations of computer security, basic knowledge about security-relevant decisions in designing IT infrastructures, techniques to secure complex systems and practical skills in managing a range of systems, from personal laptop to large-scale infrastructures.

THEORY OF COMPUTATION

This course focuses on infinite languages in finite ways, and classify machines by their power to recognize. It includes finite automata, regular grammar, push down automata ,context free grammars, and Turing machines It is applicable in designing phrasing and lexical analysis of a compiler, genetic programming and recursively enumerable languages.

PENETRATION TESTING AND CYBER OPERATIONS

Pre-requisite: Essentials of Cyber security

This course mainly focuses on port scanning and web application scanning. It also gives information about different attacks like password attacks and detection of vulnerabilities. This covers wireless security and penetration tools like Trace routes and Neo trace. Information about Database access and security at different levels is also defined.

SECURITY ARCHITECTURE AND PROTOCOLS

The aim of this course is to promote understanding of fundamental knowledge of the techniques and architectural components used to provide a secure computing environment. The concepts that are covered in the course are architecture concepts, techniques and protocols used in security architecture. This knowledge helps to develop the ability to solve security problems by understanding the impact on the network and using a risk-driven approach to prioritize and mitigate security risks.

CYBER CRIME INVESTIGATION AND DIGITAL FORENSICS

Pre-requisite: Foundations of Cyber Security This course introduces different forensic concepts in cyber security. In his course students are going to learn about different methods, processes and practices on forensics evidence and capture electronic evidence in systems and to processing evidence collection and report preparation.

PRINCIPLES OF INTERNET OF THINGS

The course should enable the students to understand the architecture of Internet of Things and connected world. It Explore on use of various hardware and sensing technologies to build IoT applications. Illustrates the real time IoT applications to make smart world. This course understand the available cloud services and communication APIs for developing smart cities

AGILE DEVELOPMENT AND SCRUM PRACTICES

The overall goal of the course is to provide learners with the fundamentals of what Agile and Scrum are, and how to effectively apply Agile methods in your projects. This course provides a high-level conceptual overview of the concepts, principles and practices that are the foundation of both Agile practices in general and Scrum in particular. The Agile mindset – the practices, thinking and perspectives brought to bear in an Agile approach – have consistently proven to be effective and efficient in responding to complex and changing challenges and situations. This course is a walkthrough of the SCRUM Agile methodology to provide students with an understanding of how Agile thinking is implemented in SCRUM as well as an understanding of how SCRUM is supposed to work.

MACHINE LEARNING

This course aims to provide a broad overview of modern algorithms in ML, so that engineers may apply these judiciously. Towards this end, the course will focus on broad heuristics governing basic ML algorithms in the context of specific engineering applications. This course provides an introduction to machine learning with a special focus on engineering applications. The course starts with a mathematical background required for machine learning and covers approaches for supervised learning (linear models, kernel methods, decision trees, neural networks) and unsupervised learning (clustering, dimensionality reduction), as well as theoretical foundations of machine learning (learning theory, optimization).

BLOCKCHAIN TECHNOLOGY

This course will introduce the technical foundations of blockchain and its applications to a wide range of industries including finance, computer science, supply chain, smart power grid and social networking. The Objective of this course is to provide students with the required knowledge to conduct research in blockchain and basic skills to design smart contracts and implement distributed applications

HUMAN COMPUTER INTERACTION

This course is an introduction to Human-Computer Interaction (HCI), a discipline concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. The course considers the inherently multi- and interdisciplinary nature of HCI and situates various HCI issues in the organizational and societal contexts. It introduces theories of human psychology, principles of computer systems and user interfaces designs, a methodology of developing effective HCI for information systems, and issues involved in using technologies for different purposes. This course will thus provide a background for students to practice system design, selection, installation, evaluation, and use with the knowledge of human characteristics, interaction styles, use context, task characteristics, and design processes.

 **Find out more:**
www.iare.ac.in

Institute of Aeronautical Engineering
(Autonomous)

Dundigal, Hyderabad - 500 043, Telangana, India

Ph - 040-29705852, 29705853, 29705854

Call +91 8886234501, 8886234502

Enquiries: support@iare.ac.in

