

BS Cyber Security Curriculum (Fall 2023 onwards)

Revision Date: 9th August 2023

Program Overview

| Area | No. of Courses | Credit Hours (Total) | Credit Hours (Theory) | Credit Hours (Lab) |
|-------------------------------|----------------|----------------------|-----------------------|--------------------|
| Computing Core | 15 | 46 | 30 | 16 |
| Domain Core | 6 | 19 | 14 | 5 |
| Domain Electives | 7 | 21 | 14 | 7 |
| Mathematics and Supporting | 4 | 12 | 12 | 0 |
| Elective Supporting | 1 | 3 | 3 | 0 |
| General Education Requirement | 12 | 30 | 28 | 2 |
| Internship | 01 | 03 | 0 | 3 |
| Total: | 46 | 134 | 101 | 33 |

Details of Courses

| Category | Course Code | Course Title | No. of Credit Hours |
|----------------|-------------|--------------------------------------|---------------------|
| Computing Core | CS111 | Programming Fundamentals | 3-0-3 |
| | CS111L | Programming Fundamentals Lab | 0-1-1 |
| | CS112 | Object Oriented Programming | 3-0-3 |
| | CS112L | Object Oriented Programming Lab | 0-1-1 |
| | CS216 | Data Structures | 3-0-3 |
| | CS216L | Data Structures Lab | 0-1-1 |
| | CS230 | Database Systems | 3-0-3 |
| | CS230L | Database Systems Lab | 0-1-1 |
| | EE123 | Digital Logic Design | 2-0-2 |
| | EE123L | Digital Logic Design Lab | 0-1-1 |
| | CS215 | Information Security | 2-0-2 |
| | CS215L | Information Security Lab | 0-1-1 |
| | CS344 | Artificial Intelligence | 2-0-2 |
| | CS344L | Artificial Intelligence Lab | 0-1-1 |
| | CS260 | Computer Networks | 2-0-2 |
| | CS260L | Computer Networks Lab | 0-1-1 |
| | SE101 | Introduction to Software Engineering | 3-0-3 |

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|------------------|--------------------|---|----------------------------|
| | CS226 | Computer Organization and Assembly Language | 2-0-2 |
| | CS226L | Computer Organization and Assembly Language Lab | 0-1-1 |
| | CS325 | Operating Systems | 2-0-2 |
| | CS325L | Operating Systems Lab | 0-1-1 |
| | CS332 | Design and Analysis of Algorithm | 3-0-3 |
| | CY494 | Final Year Project – I | 0-1-1 |
| | CY495 | Final Year Project – II | 0-2-2 |
| | CY496 | Final Year Project – III | 0-3-3 |
| Category | Course Code | Course Title | No. of Credit Hours |
| Domain Core | CY104 | Introduction to Cyber Security | 2-0-2 |
| | CY104L | Introduction to Cyber Security Lab | 0-1-1 |
| | CY103 | Information Assurance | 3-0-3 |
| | CY223 | Network Security | 3-0-3 |
| | CY223L | Network Security Lab | 0-1-1 |
| | CY256 | Secure Software Design and Development | 2-0-2 |
| | CY256L | Secure Software Design and Development Lab | 0-1-1 |
| | CY334 | Digital Forensics | 2-0-2 |
| | CY334L | Digital Forensics Lab | 0-1-1 |
| | CS426 | Parallel and Distributed Computing | 2-0-2 |
| | CS426L | Parallel and Distributed Computing Lab | 0-1-1 |
| Category | Course Code | Course Title | No. of Credit Hours |
| Domain Electives | CYXXX | Domain Elective I | 2-0-2 |
| | CYXXX | Domain Elective I Lab | 0-1-1 |
| | CYXXX | Domain Elective II | 2-0-2 |
| | CYXXX | Domain Elective II Lab | 0-1-1 |
| | CYXXX | Domain Elective III | 2-0-2 |
| | CYXXX | Domain Elective III Lab | 0-1-1 |
| | CYXXX | Domain Elective IV | 2-0-2 |
| | CYXXX | Domain Elective IV Lab | 0-1-1 |
| | CYXXX | Domain Elective V | 2-0-2 |
| | CYXXX | Domain Elective V Lab | 0-1-1 |
| | CYXXX | Domain Elective VI | 2-0-2 |
| | CYXXX | Domain Elective VI Lab | 0-1-1 |
| | CYXXX | Domain Elective VII | 2-0-2 |
| | CYXXX | Domain Elective VII Lab | 0-1-1 |


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| Category | Course Code | Course Title | No. of Credit Hours |
|------------------------------------|------------------|---|---------------------|
| Mathematics and Supporting Courses | MA105 | Multivariable Calculus | 3-0-3 |
| | MA201 | Linear Algebra | 3-0-3 |
| | MA301 | Probability and Statistics | 3-0-3 |
| | EL400 | Technical and Business Writing | 3-0-3 |
| Elective Supporting | XXXXX | Social Sciences Elective** | 3-0-3 |
| General Education Requirement | CS181 | Application of Information and Communication Technologies | 2-0-2 |
| | CS181L | Application of Information and Communication Technologies Lab | 0-1-1 |
| | EL170 | Functional English | 3-0-3 |
| | EL271 | Expository Writing | 3-0-3 |
| | MA216 | Discrete Structure | 3-0-3 |
| | MA110 | Calculus and Analytical Geometry | 3-0-3 |
| | HU124 | Islamic Studies and Ethics | 2-0-2 |
| | HU405 | Ideology and Constitution of Pakistan | 2-0-2 |
| | BAXXX | Social Sciences Related Subject** | 2-0-2 |
| | PH111 | Applied Physics | 2-0-2 |
| | PH111L | Applied Physics Lab | 0-1-1 |
| | CS470 | Professional Practices | 2-0-2 |
| | HU411 | Civics and Community Engagements | 2-0-2 |
| BA353 | Entrepreneurship | 2-0-2 | |

****List of Social Science Elective Courses**

| S. No | Course Code | Course Title | Cr Hrs |
|-------|-------------|--------------------------------|--------|
| 1. | MK151 | Product Marketing | 3-0-3 |
| 2. | AF142 | Financial Accounting | 3-0-3 |
| 3. | HR472 | Enterprise Security Leadership | 2-0-2 |
| 4. | BA257 | Management Information Systems | 3-0-3 |
| 5. | EL300 | Interpersonal Skills | 3-0-3 |
| 6. | BA132 | Internet Economics | 2-0-2 |
| 7. | PM312 | Project Management & Practices | 3-0-3 |
| 8. | BA152 | Introduction to Management | 2-0-2 |
| 9. | MK101 | Principles of Marketing | 3-0-3 |
| 10. | PY317 | Cyber Psychology | 3-0-3 |


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DR. ZUNERA JALIL
Professor & Chair


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Salman Hasan Khan
Deputy Director Academics
Air University, Islamabad

BS Cyber Security

Semester-wise Scheme of Studies w.e.f Fall 2023

Revision Date: 9th August 2023

Semester I

| S No | Course Code | Course Title | Pre-requisite | Cr Hrs |
|-------------------------------|-------------|---|---------------|---------|
| 1. | EL170 | Functional English | - | 3-0-3 |
| 2. | CY104 | Introduction to Cyber Security | - | 2-0-2 |
| 3. | CY104L | Introduction to Cyber Security Lab | - | 0-1-1 |
| 4. | CS181 | Application of Information and Communication Technologies | - | 2-0-2 |
| 5. | CS181L | Application of Information and Communication Technologies Lab | - | 0-1-1 |
| 6. | CS111 | Programming Fundamentals | - | 3-0-3 |
| 7. | CS111L | Programming Fundamentals Lab | - | 0-1-1 |
| 8. | HU124 | Islamic Studies and Ethics | - | 2-0-2 |
| 9. | MA216 | Discrete Structures | - | 3-0-3 |
| 10. | *MA114 | Foundational Mathematics (non-credit hour) | - | 3-0-3 |
| Total Cr Hrs | | | | 15-3-18 |
| Total Contact Hours:24 | | | | |

* For Premedical students

Semester II

| S. No | Course Code | Course Title | Pre-requisite | Cr Hrs |
|--------------------------------|-------------|---------------------------------------|---------------|---------|
| 1. | SE101 | Introduction to Software Engineering | - | 3-0-3 |
| 2. | CS112 | Object Oriented Programming | CS111,CS111L | 3-0-3 |
| 3. | CS112L | Object Oriented Programming Lab | CS111,CS111L | 0-1-1 |
| 4. | EE123 | Digital Logic Design | - | 2-0-2 |
| 5. | EE123L | Digital Logic Design Lab | - | 0-1-1 |
| 6. | PH111 | Applied Physics | - | 2-0-2 |
| 7. | PH111L | Applied Physics Lab | - | 0-1-1 |
| 8. | MA201 | Linear Algebra | - | 3-0-3 |
| 9. | *MA118 | Pre-Calculus (non-credit hour) | - | 3-0-3 |
| Total Cr Hrs | | | | 13-3-16 |
| Total Contact Hours: 22 | | | | |

* For Premedical students


10/8/23

DR. ZUNERA JALIL
Professor & Chair
Department of Cyber Security


15/8/23


Salman Hasan Khan
Deputy Director Academics
Air University, Islamabad

Semester III

| S. No | Course Code | Course Title | Pre-requisite | Cr Hrs |
|--------------------------------|-------------|---|---------------|----------------|
| 1. | CY103 | Information Assurance | - | 3-0-3 |
| 2. | CS260 | Computer Networks | - | 2-0-2 |
| 3. | CS260L | Computer Networks Lab | - | 0-1-1 |
| 4. | CS216 | Data Structures | CS112,CS112L | 3-0-3 |
| 5. | CS216L | Data Structures Lab | CS112,CS112L | 0-1-1 |
| 6. | MA110 | Calculus and Analytical Geometry | | 3-0-3 |
| 7. | CS226 | Computer Organization and Assembly Language | EE123,EE123L | 2-0-2 |
| 8. | CS226L | Computer Organization and Assembly Language Lab | EE123,EE123L | 0-1-1 |
| 9. | SSXXX | Social Science Elective | - | 2-0-2 |
| Total Cr Hrs | | | | 15-3-18 |
| Total Contact Hours: 24 | | | | |

Semester IV

| S. No | Course Code | Course Title | Pre-requisite | Cr Hrs |
|--------------------------------|-------------|--|---------------|----------------|
| 1. | CS325 | Operating Systems | - | 2-0-2 |
| 2. | CS325L | Operating Systems Lab | - | 0-1-1 |
| 3. | CY256 | Secure Software Design and Development | SE101 | 2-0-2 |
| 4. | CY256L | Secure Software Design and Development Lab | SE101 | 0-1-1 |
| 5. | CY223 | Network Security | CS260,CS260L | 3-0-3 |
| 6. | CY223L | Network Security Lab | CS260,CS260L | 0-1-1 |
| 7. | CYXXX | Cyber Security Elective I | - | 2-0-2 |
| 8. | CYXXXL | Cyber Security Elective I Lab | - | 0-1-1 |
| 9. | MA105 | Multivariable Calculus | MA110 | 3-0-3 |
| Total Cr Hrs | | | | 12-4-16 |
| Total Contact Hours: 24 | | | | |


Summer Semester

| S. No | Course Code | Course Title | Pre-requisite | Cr Hrs |
|-------|-------------|-------------------------|---------------|--------|
| 1. | CY490 | Internship (6-8 weeks)* | - | 3-0-3 |

*Under exceptional circumstances, a student can undertake the internship after 5th, 6th or 7th semester (with the approval by the Chair Dept.).


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DR. ZUNERA JALIL


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Salman Hasan Khan
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Air University, Islamabad
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Semester V

| S. No | Course Code | Course Title | Pre-requisite | Cr Hrs |
|--------------------------------|-------------|--|---------------|---------|
| 1. | CY 334 | Digital Forensics | - | 2-0-2 |
| 2. | CY 334L | Digital Forensics Lab | - | 0-1-1 |
| 3. | CS426 | Parallel and Distributed Computing | CS325,CS325L | 2-0-2 |
| 4. | CS426L | Parallel and Distributed Computing Lab | CS325,CS325L | 0-1-1 |
| 5. | EL271 | Expository Writing | EL170 | 3-0-3 |
| 6. | CS344 | Artificial Intelligence | - | 2-0-2 |
| 7. | CS344L | Artificial Intelligence Lab | - | 0-1-1 |
| 8. | CYXXX | Cyber Security Elective II | - | 2-0-2 |
| 9. | CYXXX | Cyber Security Elective II Lab | - | 0-1-1 |
| 10. | HU411 | Civics and Community Engagements | - | 2-0-2 |
| Total Cr Hrs | | | | 13-4-17 |
| Total Contact Hours: 25 | | | | |

Semester VI

| S. No | Course Code | Course Title | Pre-requisite | Cr Hrs |
|--------------------------------|-------------|---------------------------------|---------------|---------|
| 1. | CS230 | Database Systems | | 3-0-3 |
| 2. | CS230L | Database Systems Lab | | 0-1-1 |
| 3. | CYXXX | Cyber Security Elective III | | 2-0-2 |
| 4. | CYXXXL | Cyber Security Elective III Lab | | 0-1-1 |
| 5. | CYXXX | Cyber Security Elective IV | | 2-0-2 |
| 6. | CYXXXL | Cyber Security Elective IV Lab | | 0-1-1 |
| 7. | EL400 | Technical and Business Writing | | 3-0-3 |
| 8. | BA353 | Entrepreneurship | | 2-0-2 |
| 9. | CY491 | Final Year Project-I | List A* | 0-1-1 |
| Total Cr Hrs | | | | 12-4-16 |
| Total Contact Hours: 24 | | | | |

Semester VII

| S. No | Course Code | Course Title | Pre-requisite | Cr Hrs |
|--------------------------------|-------------|-----------------------------------|---------------|---------|
| 1. | MA301 | Probability and Statistics | - | 3-0-3 |
| 2. | XXXXX | Elective Supporting | - | 3-0-3 |
| 3. | CS332 | Design and Analysis of Algorithms | CS216,CS216L | 3-0-3 |
| 4. | CYXXX | Cyber Security Elective V | - | 2-0-2 |
| 5. | CYXXXL | Cyber Security Elective V Lab | - | 0-1-1 |
| 6. | CYXXX | Cyber Security Elective VI | - | 2-0-2 |
| 7. | CYXXXL | Cyber Security Elective VI Lab | - | 0-1-1 |
| 8. | CY492 | Final Year Project -II | CY491 | 0-2-2 |
| Total Cr Hrs | | | | 13-4-17 |
| Total Contact Hours: 25 | | | | |

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Semester VIII

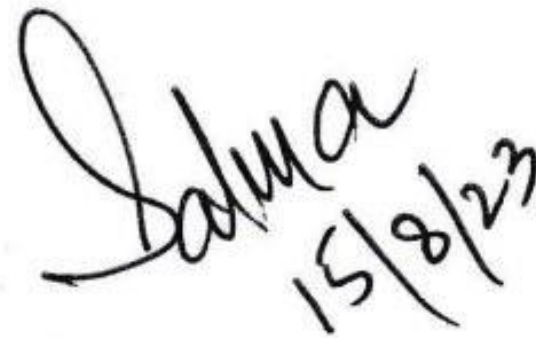
| S. No | Course Code | Course Title | Pre-requisite | Cr Hrs |
|--------------------------------|-------------|---------------------------------------|---------------------|---------------|
| 1. | CS470 | Professional Practices | - | 2-0-2 |
| 2. | CYXXX | Cyber Security Elective VII | - | 2-0-2 |
| 3. | CYXXXL | Cyber Security Elective VII Lab | - | 0-1-1 |
| 4. | HU405 | Ideology and Constitution of Pakistan | - | 2-0-2 |
| 5. | CS215 | Information Security | - | 2-0-2 |
| 6. | CS215L | Information Security Lab | - | 0-1-1 |
| 7. | CY493 | Final Year Project – III | CY492 | 0-3-3 |
| | | | Total Cr Hrs | 8-5-13 |
| Total Contact Hours: 23 | | | | |

Total No. of Credit Hours: 134

Total No. of Courses: 46


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Deputy Director Academics
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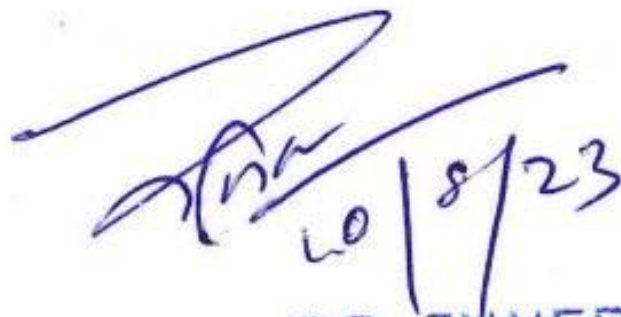

10/8/23
DR. ZUNERA JALIL
Professor & Chair
Department of Cyber Security
Air University, Islamabad


15/8/23

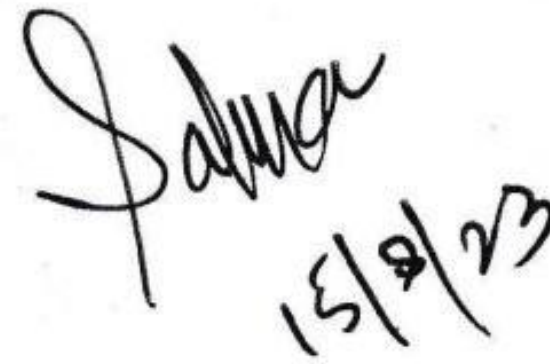
***List A**

Pre-requisites for CY-494 Final Year Project-I

| S.No. | Course Code | Course Title | Pre-requisite | Cr Hrs |
|-------|-------------|------------------------------------|---------------|--------|
| 1 | CS111 | Programming Fundamentals | - | 3-0-3 |
| 2 | CS111L | Programming Fundamentals Lab | - | 0-1-1 |
| 3 | CS112 | Object Oriented Programming | CS111,CS111L | 3-0-3 |
| 4 | CS112L | Object Oriented Programming Lab | CS111,CS111L | 0-1-1 |
| 5 | CS216 | Data Structures | CS112,CS112L | 3-0-3 |
| 6 | CS216L | Data Structures Lab | CS112,CS112L | 0-1-1 |
| 7 | CS325 | Operating Systems | - | 2-0-2 |
| 8 | CS325L | Operating Systems Lab | - | 0-1-1 |
| 9 | CY104 | Introduction to Cyber Security | - | 2-0-2 |
| 10 | CY104L | Introduction to Cyber Security Lab | - | 0-1-1 |
| 11 | CS260 | Computer Networks | - | 2-0-2 |
| 12 | CS260L | Computer Networks Lab | - | 0-1-1 |
| 13 | CY223 | Network Security | CS260,CS260L | 3-0-3 |
| 14 | CY223L | Network Security Lab | CS260,CS260L | 0-1-1 |


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Professor & Chair
Department of Cyber Security
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Salman Hasan Khan
Deputy Director Academics
Air University, Islamabad

List of Cyber Security Domain Elective Courses

Note: A student has to choose seven elective courses from the list given below. A student is allowed to choose one elective course from the domain core or domain elective courses offered by any other computing program offered at Air University.

| S. No | Course Code | Course Title | Cr Hrs |
|---|-------------|--|--------|
| Group A: Software Security and Information Assurance | | | |
| 1. | CY300 | Cyber Security Management | 2-0-2 |
| | CY300L | Cyber Security Management Lab | 0-1-1 |
| 2. | CY301 | Cyber Ethics | 3-0-3 |
| 3. | CY302 | Human Behaviors in Cyber Security | 3-0-3 |
| 4. | CY303 | Cyber Security and Governance | 3-0-3 |
| 5. | CY404 | Cyber Warfare | 3-0-3 |
| 6. | CY405 | Operating System Security | 2-0-2 |
| | CY405L | Operating System Security Lab | 0-1-1 |
| 7. | CY306 | Secure Web Development | 2-0-2 |
| | CY306L | Secure Web Development Lab | 0-1-1 |
| 8. | CY307 | Compliance and Auditing in Defense Systems | 2-0-2 |
| | CY307L | Compliance and Auditing in Defense Systems Lab | 0-1-1 |
| 9. | CY308 | Generating Software Security Tests | 2-0-2 |
| | CY308L | Generating Software Security Tests Lab | 0-1-1 |
| 10. | CY409 | Automated Debugging | 2-0-2 |
| | CY409L | Automated Debugging Lab | 0-1-1 |
| Group B: Cryptography | | | |
| 1. | CY210 | Number Theory | 2-0-2 |
| | CY210L | Number Theory Lab | 0-1-1 |
| 2. | CY212 | Cryptography | 2-0-2 |
| | CY212L | Cryptography Lab | 0-1-1 |
| 3. | CY313 | Cryptanalysis | 2-0-2 |
| | CY313L | Cryptanalysis Lab | 0-1-1 |
| 4. | CY314 | Cryptomining | 2-0-2 |
| | CY314L | Cryptomining Lab | 0-1-1 |
| 5. | CY414 | Blockchain Security | 2-0-2 |
| | CY414L | Blockchain Security Lab | 0-1-1 |
| 6. | CY415 | Steganography | 2-0-2 |
| | CY415L | Steganography Lab | 0-1-1 |
| 7. | CY416 | Quantum Cryptography | 2-0-2 |
| | CY416L | Quantum Cryptography Lab | 0-1-1 |
| 8. | CY317 | Applied Cryptography | 2-0-2 |
| | CY317L | Applied Cryptography Lab | 0-1-1 |

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ZUNERA JALIL

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| Group C: Digital Forensics and Incident Response | | | |
|---|---------|--|-------|
| 1. | CY220 | Reverse Engineering and Vulnerability Assessment | 2-0-2 |
| | CY220L | Reverse Engineering and Vulnerability Assessment Lab | 0-1-1 |
| 2. | CY321 | Computer Forensics | 2-0-2 |
| | CY321L | Computer Forensics Lab | 0-1-1 |
| 3. | CY322 | Network Forensics | 2-0-2 |
| | CY322L | Network Forensics Lab | 0-1-1 |
| 4. | CY323 | Smart Devices Forensics | 2-0-2 |
| | CY323L | Smart Devices Forensics Lab | 0-1-1 |
| 5. | CY326 | Social Media Forensics | 2-0-2 |
| | CY326L | Social Media Forensics Lab | 0-1-1 |
| 6. | CY327 | Database Security | 2-0-2 |
| | CY327L | Database Security Lab | 0-1-1 |
| 7. | CY328 | Malware Analysis | 2-0-2 |
| | CY328L | Malware Analysis Lab | 0-1-1 |
| 8. | CY429 | Cyber Threat Intelligence | 2-0-2 |
| | CY429L | Cyber Threat Intelligence Lab | 0-1-1 |
| Group D: Network and Infrastructure Security | | | |
| 1. | CY330 | Ethical Hacking and Defense | 2-0-2 |
| | CY330L | Ethical Hacking and Defense Lab | 0-1-1 |
| 2. | CY331 | Wireless Networks Security | 2-0-2 |
| | CY331L | Wireless Networks Security Lab | 0-1-1 |
| 3. | CY332 | Linux Fundamentals | 2-0-2 |
| | CY332L | Linux Fundamentals Lab | 0-1-1 |
| 4. | CY433 | Penetration Testing | 2-0-2 |
| | CY433L | Penetration Testing Lab | 0-1-1 |
| 5. | CY434 | Business Infrastructure and Security | 2-0-2 |
| | CY434L | Business Infrastructure and Security Lab | 0-1-1 |
| 6. | CY435 | Internet Security | 2-0-2 |
| | CY435L | Internet Security Lab | 0-1-1 |
| 7. | CY437 | Privacy-Enhancing Technologies | 2-0-2 |
| | CY437L | Privacy-Enhancing Technologies Lab | 0-1-1 |
| Group E: Cyber Physical and Embedded System Security | | | |
| 1. | CY340 | Embedded System Security | 2-0-2 |
| | CY340LL | Embedded System Security Lab | 0-1-1 |
| 2. | CY341 | Smart and Autonomous Vehicle Security | 2-0-2 |
| | CY341L | Smart and Autonomous Vehicle Security Lab | 0-1-1 |
| 3. | CY342 | OT Security | 2-0-2 |
| | CY342L | OT Security Lab | 0-1-1 |
| 4. | CY443 | Cyber Physical System Security | 2-0-2 |
| | CY443L | Cyber Physical System Security Lab | 0-1-1 |
| 5. | CY444 | UAV Security | 2-0-2 |
| | CY444L | UAV Security Lab | 0-1-1 |
| 6. | CY445 | Distributed Control System Security | 2-0-2 |

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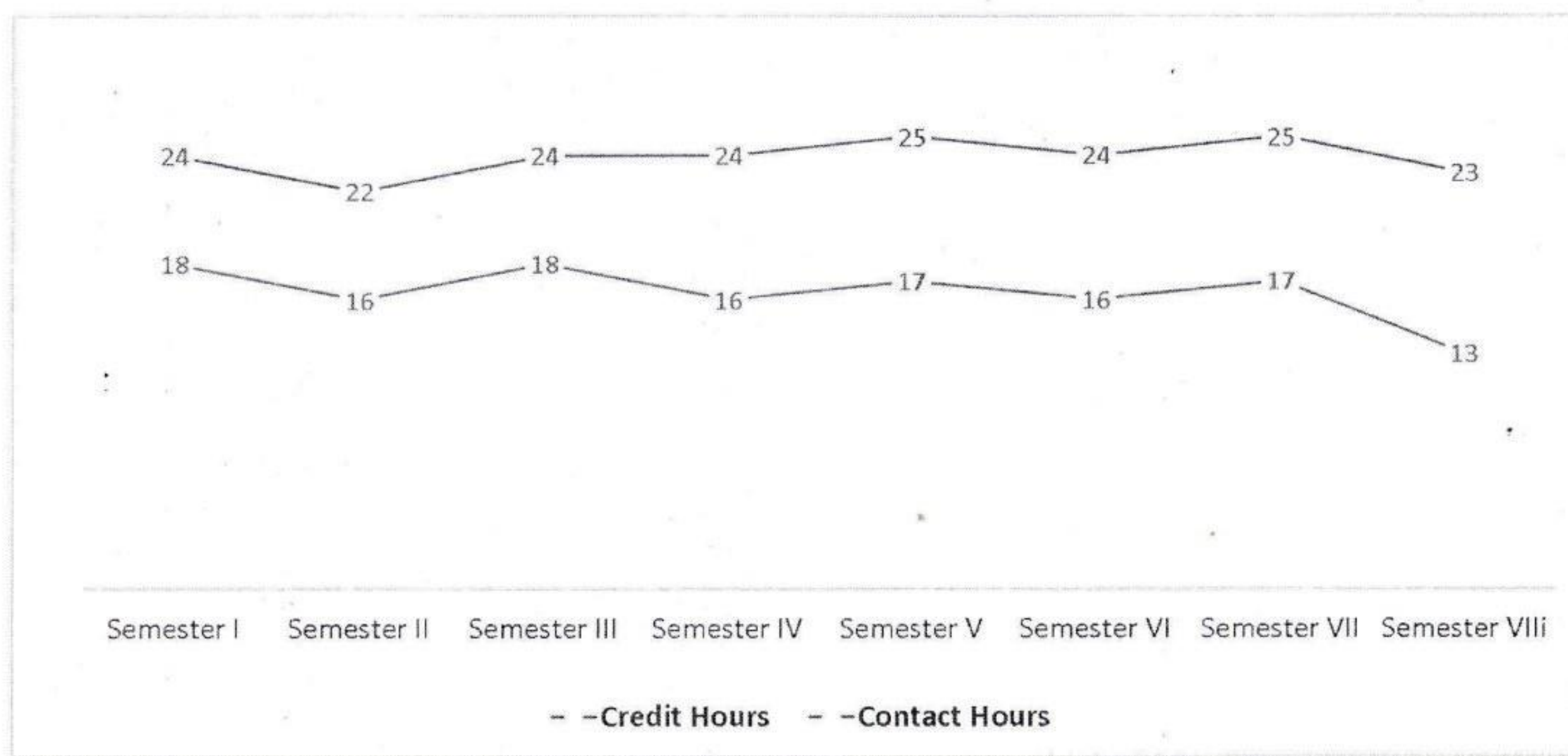
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Deputy Director Academic

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| | CY445L | Distributed Control System Security Lab | 0-1-1 |
| 7. | CY346 | Applied Physical Attacks and Hardware Pen testing | 2-0-2 |
| | CY346L | Applied Physical Attacks and Hardware Pen testing Lab | 0-1-1 |
| Group F: Applied Cyber Security | | | |
| 1. | CY350 | Machine Learning in Cyber Security | 2-0-2 |
| | CY350L | Machine Learning in Cyber Security Lab | 0-1-1 |
| 2. | CY351 | Web Application Security | 2-0-2 |
| | CY351L | Web Application Security Lab | 0-1-1 |
| 3. | CY352 | Cloud Computing Security | 2-0-2 |
| | CY352L | Cloud Computing Security Lab | 0-1-1 |
| 4. | CY353 | Cyber Security Tool Development | 2-0-2 |
| | CY353L | Cyber Security Tool Development Lab | 0-1-1 |
| 5. | CY454 | Cyber Security for AI and AI for Cyber Security | 2-0-2 |
| | CY454L | Cyber Security for AI and AI for Cyber Security Lab | 0-1-1 |
| 6. | CY455 | Usable Security and Privacy | 2-0-2 |
| | CY455L | Usable Security and Privacy Lab | 0-1-1 |
| 7. | CY356 | Cyber Security Analytics | 2-0-2 |
| | CY356L | Cyber Security Analytics Lab | 0-1-1 |
| 8. | CY358 | Financial Systems Security | 2-0-2 |
| | CY358L | Financial Systems Security Lab | 0-1-1 |
| 9. | CY359 | Space Systems Cyber Security | 2-0-2 |
| | Cy359L | Space Systems Cyber Security Lab | 0-1-1 |

Student Work Load (Semester-Wise)



[Signature]
10/8/23
DR. ZUNERA JALIL
Professor & Chair
Department of Cyber Security
University Islamabad

[Signature]
15/8/23

[Signature]
16-8-23
Salman Hasan Khan
Deputy Director Academics
Air University, Islamabad