

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

| Module Information                 |                                              |                               |                                                                                                                                                                                                                                                                |
|------------------------------------|----------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| معلومات المادة الدراسية            |                                              |                               |                                                                                                                                                                                                                                                                |
| Module Title                       | <b>Computer Networks Fundamentals</b>        |                               | Module Delivery                                                                                                                                                                                                                                                |
| Module Type                        | Core                                         |                               | <input checked="" type="checkbox"/> Theory<br><input type="checkbox"/> Lecture<br><input checked="" type="checkbox"/> Lab<br><input checked="" type="checkbox"/> Tutorial<br><input checked="" type="checkbox"/> Practical<br><input type="checkbox"/> Seminar |
| Module Code                        | <b>CONF215</b>                               |                               |                                                                                                                                                                                                                                                                |
| ECTS Credits                       | 6                                            |                               |                                                                                                                                                                                                                                                                |
| SWL (hr/sem)                       | 150                                          |                               |                                                                                                                                                                                                                                                                |
| Module Level                       | 2                                            | Semester of Delivery          | 1                                                                                                                                                                                                                                                              |
| Administering Department           | Type Dept. Code                              | College                       | Type College Code                                                                                                                                                                                                                                              |
| Module Leader                      | Dr.Saman Hameed Amin                         |                               | e-mail 120108@uotechnology.edu.iq                                                                                                                                                                                                                              |
| Module Leader's Acad. Title        | Lecturer                                     | Module Leader's Qualification | Ph.D.                                                                                                                                                                                                                                                          |
| Module Tutor                       | None                                         |                               | e-mail None                                                                                                                                                                                                                                                    |
| Peer Reviewer Name                 | 1. Dr. Dhari Ali<br>2. Dr. Ammar Abdul Ameer | e-mail                        | 1. Dhari.a.mahmood@uotechnology.edu.iq<br>2. 120016@uotechnology.edu.iq                                                                                                                                                                                        |
| Scientific Committee Approval Date | 1/4/2026                                     | Version Number                | 1.0                                                                                                                                                                                                                                                            |
| Relation with other Modules        |                                              |                               |                                                                                                                                                                                                                                                                |
| العلاقة مع المواد الدراسية الأخرى  |                                              |                               |                                                                                                                                                                                                                                                                |
| Prerequisite module                | None                                         |                               | Semester                                                                                                                                                                                                                                                       |
| Co-requisites module               | None                                         |                               | Semester                                                                                                                                                                                                                                                       |

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

|                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| <b>Module Objectives</b><br>أهداف المادة الدراسية                | <ol style="list-style-type: none"> <li>1- Understand the basic principles and architectures of communication networks.</li> <li>2- Learn and apply different network topologies and their characteristics.</li> <li>3- Understand the structure and function of TCP/IP networks, Ethernet, and WLAN/Wi-Fi.</li> <li>4- Acquire skills in IP addressing, subnetting, and advanced IP addressing techniques.</li> <li>5- Understand the principles and technologies behind network security and management.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Module Learning Outcomes</b><br>مخرجات التعلم للمادة الدراسية | <ol style="list-style-type: none"> <li>1- Understand the basic principles and architectures of communication networks.</li> <li>2- Comprehend the different types of network topologies and their characteristics.</li> <li>3- Explain the structure and function of TCP/IP networks, Ethernet, and WLAN/Wi-Fi.</li> <li>4- Understand the role and operation of various network devices such as routers, switches, and intermediary devices.</li> <li>5- Describe the OSI and TCP/IP models and the functions of each layer.</li> <li>6- Understand the concepts of multiplexing, encapsulation, port numbers, and the Domain Name System (DNS).</li> <li>7- Comprehend the basics of IP addressing, including IPv4 and IPv6.</li> <li>8- Explain the principles of subnetting and perform subnetting calculations.</li> <li>9- Understand the significance of broadcast, multicast, and IPv4 multicast addresses.</li> <li>10- Explain the operation and benefits of Network Address Translation (NAT) and Virtual Private Networks (VPNs).</li> <li>11- Understand the factors affecting network performance and the importance of Quality of Service (QoS).</li> <li>12- Comprehend advanced IP addressing techniques such as Variable Length Subnet Masking (VLSM), Classless Inter-Domain Routing (CIDR), and IP address aggregation.</li> <li>13- Understand the principles and technologies of wireless networks.</li> <li>14- Identify common network security threats and best practices for securing network infrastructure.</li> <li>15- Explain the infrastructure and tools required for effective network management, including the Internet-standard management framework.</li> </ol> |
| <b>Indicative Contents</b><br>المحتويات الإرشادية                | <p><b><u>Introduction to Networking</u></b></p> <ul style="list-style-type: none"> <li>• Overview of networking concepts and terminology.</li> <li>• Different types of network topologies (star, ring, bus, mesh).</li> <li>• Basic network components and devices (routers, switches, hubs).</li> <li>• Ethernet and Link-Layer Technologies <b>[6 hrs]</b></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

### **Ethernet standards and protocols.**

- MAC addresses and their role in network communication.
- IEEE 802 standards and services (framing, error detection, FEC).
- Client/Server communication models and intermediary network devices.
- Network Models and Protocols [6 hrs]

### **OSI and TCP/IP models: layers and their functions.**

- Application layer protocols (HTTP, FTP, DNS).
- Transport layer protocols (TCP, UDP).
- Network layer protocols and IP addressing.
- Data link layer protocols and physical layer transmission techniques.
- IP Addressing and Subnetting [18 hrs]

### **Fundamentals of IP addressing (IPv4 and IPv6).**

- Classful addressing and subnetting.
- Advanced IP addressing techniques (VLSM, CIDR).
- IP address aggregation and planning.
- Network Services and Performance
- Multicasting [30 hrs]

### **Networking technologies and performance.**

- Network Address Translation (NAT) and Virtual Private Networks (VPNs).
- Factors affecting network performance and Quality of Service (QoS).
- Techniques for improving network performance and managing QoS. [12 hrs]

### **Principles and technologies of wireless networking.**

- Wireless Networks and Security
- Security threats and vulnerabilities in network environments.
- Basic network security measures and best practices.
- Network management frameworks and tools. [18 hrs]

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

#### Strategies

1. **Lectures:** Instructors will deliver in-class lectures to introduce and explain key networking concepts, architectures, and protocols. These presentations will cover theoretical foundations and practical applications.
2. **Interactive Discussions:** Students will be encouraged to participate in discussions that foster critical thinking and problem-solving skills. These discussions will revolve around case studies, hypothetical scenarios, and current events in networking.
3. **Hands-on Laboratory Work:** Practical lab sessions will allow students to apply theoretical knowledge by working with networking hardware and simulation software. This includes setting up networks, configuring routers and switches, and analyzing network traffic with tools like Wireshark and Cisco Packet tracer.
4. **Group Projects:** Students will collaborate on projects that involve designing and implementing network solutions for simulated environments. This promotes teamwork and the practical application of learned concepts, including network planning, security measures, and troubleshooting.
5. **Simulations and Virtual Labs:** Utilizing advanced simulation tools and virtual lab environments to provide students with hands-on experience, especially when physical resources or access to actual networking equipment is limited.
6. **Use of Visuals and Multimedia:** Integration of visual aids such as diagrams, flowcharts, and multimedia content to enhance understanding of complex network structures and data flow mechanisms.
7. **Assessment and Feedback:** Regular assessments through quizzes,

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|  | <p>tests, and exams to gauge students' understanding and mastery of course content. Feedback will be provided systematically to guide students' learning processes and adjustments.</p> <p>8. <b>Practice and Revision Sessions:</b> Dedicated sessions for practice and revision will be available to reinforce learning, address students' questions, and prepare them adequately for assessments.</p> |
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| Student Workload (SWL)                      |                 |             |                                          |            |                           |
|---------------------------------------------|-----------------|-------------|------------------------------------------|------------|---------------------------|
| الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا     |                 |             |                                          |            |                           |
| Structured SWL (h/sem)                      |                 | 93          | Structured SWL (h/w)                     |            | 7                         |
| الحمل الدراسي المنتظم للطالب خلال الفصل     |                 |             | الحمل الدراسي المنتظم للطالب أسبوعيا     |            |                           |
| Unstructured SWL (h/sem)                    |                 | 57          | Unstructured SWL (h/w)                   |            | 3                         |
| الحمل الدراسي غير المنتظم للطالب خلال الفصل |                 |             | الحمل الدراسي غير المنتظم للطالب أسبوعيا |            |                           |
| Total SWL (h/sem)                           |                 | 150         |                                          |            |                           |
| الحمل الدراسي الكلي للطالب خلال الفصل       |                 |             |                                          |            |                           |
| Module Evaluation                           |                 |             |                                          |            |                           |
| تقييم المادة الدراسية                       |                 |             |                                          |            |                           |
|                                             |                 | Time/Number | Weight (Marks)                           | Week Due   | Relevant Learning Outcome |
| Formative assessment                        | Quizzes         | 2           | 10% (10)                                 | 5 and 10   | LO #1- #5 and #6 - #11    |
|                                             | Assignments     | 2           | 10% (10)                                 | 3 and 12   | LO #2 and #5, #7, #11     |
|                                             | Projects / Lab. | 1           | 10% (10)                                 | Continuous | All                       |
|                                             | Report          | 1           | 10% (10)                                 | 13         | LO #5 - #12               |
| Summative assessment                        | Midterm Exam    | 2hr         | 10% (10)                                 | 8          | LO #1 - #10               |
|                                             | Final Exam      | 3hr         | 50% (50)                                 | 16         | All                       |

|                         |                  |  |  |
|-------------------------|------------------|--|--|
| <b>Total assessment</b> | 100% (100 Marks) |  |  |
|-------------------------|------------------|--|--|

| <b>Delivery Plan (Weekly Syllabus)</b><br>المنهاج الاسبوعي النظري |                                                                                                                                           |
|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                   | <b>Material Covered</b>                                                                                                                   |
| <b>Week 1</b>                                                     | Network Overview, Network Topologies                                                                                                      |
| <b>Week 2</b>                                                     | In-Depth Exploration of the OSI Model: Layers and Functions                                                                               |
| <b>Week 3</b>                                                     | Detailed Insights into the TCP/IP Model: Core Components and Functions, Comprehensive Guide to the TCP/IP Model, Protocols and Processes  |
| <b>Week 4</b>                                                     | Ethernet and Link-layer(MAC, IEEE 802 and services such as Framing and FEC), Client/Server Communication and Intermediary Network Devices |
| <b>Week 5</b>                                                     | Multiplexing, Encapsulation, Port Addressing                                                                                              |
| <b>Week 6</b>                                                     | The Internet Address Architecture (IP Addressing Basics)                                                                                  |
| <b>Week 7</b>                                                     | Classful Addressing and Subnetting                                                                                                        |
| <b>Week 8</b>                                                     | Mid-term Exam + Broadcast Addresses                                                                                                       |
| <b>Week 9</b>                                                     | Advanced IP Addressing (Variable Length Subnet Masking (VLSM), Classless Inter-Domain Routing (CIDR), IP Address Aggregation)             |
| <b>Week 10</b>                                                    | Multicast addresses and IPv4 Multicast Addresses                                                                                          |
| <b>Week 11</b>                                                    | NAT (Network Address Translation) VPN (Virtual Private Network)                                                                           |
| <b>Week 12</b>                                                    | Network Performance and QoS                                                                                                               |
| <b>Week 13</b>                                                    | Wireless Networks                                                                                                                         |
| <b>Week 14</b>                                                    | Network Security Basics                                                                                                                   |
| <b>Week 15</b>                                                    | Network Management(The Infrastructure for Network Management, the Internet-Standard Management Framework,...)                             |

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| Week 16                                                                 | Preparatory week before the final Exam                                      |
| <b>Delivery Plan (Weekly Lab. Syllabus)</b><br>المنهاج الاسبوعي للمختبر |                                                                             |
|                                                                         | <b>Material Covered</b>                                                     |
| Week 1                                                                  | Lab 1: Network Overview and Topologies (2 Experiments)                      |
| Week 2                                                                  | Lab 2: OSI and TCP/IP Models (2 Experiments)                                |
| Week 3                                                                  | Lab 3: OSI and TCP/IP Models (2 Experiments)                                |
| Week 4                                                                  | Lab 4: Ethernet and Link-layer (2 Experiments)                              |
| Week 5                                                                  | Lab 5: Multiplexing, Encapsulation, Port Addressing (2 Experiments)         |
| Week 6                                                                  | Lab 6: Internet Address Architecture (IP Addressing Basics) (2 Experiments) |
| Week 7                                                                  | Lab 7: Classful Addressing and Subnetting (2 Experiments)                   |
| Week 8                                                                  | Lab 8: Broadcast and Multicast Addresses (2 Experiments)                    |
| Week 9                                                                  | Lab 9: NAT and VPN (2 Experiments)                                          |
| Week 10                                                                 | Lab 10: Network Performance and QoS (2 Experiments)                         |
| Week 11                                                                 | Lab 11: Advanced IP Addressing (2 Experiments)                              |
| Week 12                                                                 | Lab 12: Wireless Networks (2 Experiments)                                   |
| Week 13                                                                 | Lab 13: Network Security Basics (2 Experiments)                             |
| Week 14                                                                 | Lab 14: Network Management (1 Experiments)                                  |
| Week 15                                                                 | Lab 15: Network Management (1 Experiments)                                  |

| Learning and Teaching Resources |                                                                                                                                                                                                                                      |                           |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| مصادر التعلم والتدريس           |                                                                                                                                                                                                                                      |                           |
|                                 | Text                                                                                                                                                                                                                                 | Available in the Library? |
| Required Texts                  | 1- Computer Networking: A Top-Down Approach" by James Kurose and Keith Ross<br>2- Networking Essentials: A CompTIA Network by Jeffrey S. Beasley and Piyasat Nilkaew<br>3- Data Communications and Networking by Behrouz a. Forouzan |                           |
| Recommended Texts               | 1- Data and Computer Communications" by William Stallings                                                                                                                                                                            | Yes                       |
| Websites                        | Cisco Networking Academy ( <a href="https://www.netacad.com">https://www.netacad.com</a> )                                                                                                                                           |                           |

| Grading Scheme                                                                                                                                                                                                                                                                                                                                                                       |                  |                     |          |                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------|----------|---------------------------------------|
| مخطط الدرجات                                                                                                                                                                                                                                                                                                                                                                         |                  |                     |          |                                       |
| Group                                                                                                                                                                                                                                                                                                                                                                                | Grade            | التقدير             | Marks %  | Definition                            |
| Success Group<br>(50 - 100)                                                                                                                                                                                                                                                                                                                                                          | A - Excellent    | امتياز              | 90 - 100 | Outstanding Performance               |
|                                                                                                                                                                                                                                                                                                                                                                                      | B - Very Good    | جيد جدا             | 80 - 89  | Above average with some errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | C - Good         | جيد                 | 70 - 79  | Sound work with notable errors        |
|                                                                                                                                                                                                                                                                                                                                                                                      | D - Satisfactory | متوسط               | 60 - 69  | Fair but with major shortcomings      |
|                                                                                                                                                                                                                                                                                                                                                                                      | E - Sufficient   | مقبول               | 50 - 59  | Work meets minimum criteria           |
| Fail Group<br>(0 – 49)                                                                                                                                                                                                                                                                                                                                                               | FX – Fail        | راسب (قيد المعالجة) | (45-49)  | More work required but credit awarded |
|                                                                                                                                                                                                                                                                                                                                                                                      | F – Fail         | راسب                | (0-44)   | Considerable amount of work required  |
|                                                                                                                                                                                                                                                                                                                                                                                      |                  |                     |          |                                       |
| <b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above. |                  |                     |          |                                       |

