اعتماد
NCAAA

T4

2020

# Course Specifications

| Course Title: | Routing & Switching |
|---|---|
| Course Code: | 447 CNET-3 |
| Program: | Bachelor in Computer and Network Engineering |
| Department: | Computer and Network Engineering |
| College: | Computer Science and Information Technology |
| Institution: | Jazan University |

## Table of Contents

## A. Course Identification

| | |
|---|---|
| **1. Credit hours:**     03 | |

**2. Course type**

a.        University ☐        College ☐        Department ☑        Others ☐

b.                Required ☑                Elective ☐

**3.  Level/year at which this course is offered:**    Level 14 / Year 05

**4. Pre-requisites for this course** (if any)**:** 331 CNET-3

**5.  Co-requisites for this course** (if any)**:** None

### 6. Mode of Instruction (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | **Traditional classroom** | 52 | 100% |
| 2 | **Blended** | -- | -- |
| 3 | **E-learning** | -- | -- |
| 4 | **Distance learning** | -- | -- |
| 5 | **Other** | -- | -- |

### 7. Contact Hours (based on academic semester)

| No | Activity | Learning Hours |
|---|---|---|
| 1 | **Lecture** | 22 |
| 2 | **Laboratory/Studio** | 22 |
| 3 | **Tutorial** | -- |
| 4 | **Exams  and Revision** | 8 |
| | **Total** | 52 |

## B. Course Objectives and Learning Outcomes

### 1.  Course Description

This course focuses on providing the skills and knowledge required to install, operate, configure and verify a basic IPv4 and IPv6 network, including configuring a LAN switch, configuring a router, connecting to a WAN, and identifying basic security threats. At the end of this course students should be able to complete the configuration, implementation and troubleshooting of a small branch network under supervision.

### 2. Course Main Objective

***This course will develop the students' ability to learn:***
- Recognize the purpose and functions of various network devices such as Routers, Switches.
- Identify common applications and their impact on the network.
- Describe the purpose and basic operation of the protocols in the OSI and TCP/IP models.
- Predict the data flow between two hosts across a network.

- Analyze the use of different cables, ports and devices to connect network devices and hosts in a LAN.
- Describe and implement VLSM, routing protocols and switching technologies.
- Implement and integrate VLANs, WLANs, voice and video into campus networks.

### 3. Course Learning Outcomes

| | CLOs | Aligned-PLOs |
|---|---|---|
| 1 | **Knowledge and Understanding** | |
| 1.1 | **Explain** the various routing and switching techniques for communication systems. | K2 |
| 1.2 | **Describe** routing protocol types used with different WANs based on the latest trends. | K3 |
| **2** | **Skills :** | |
| 2.1 | **Design** network infrastructure with IPv4 and IPv6 addressing concepts. | S2 |
| 2.2 | **Analyze** routing protocol requirements for different networks. | S5 |
| 2.3 | **Apply** network technologies with its OSI standards. | S3 |
| **3** | **Values:** | |
| 3.1 | **Recognize** ethical and professional responsibilities in analyzing network protocols to make informed judgments. | V3 |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | Chapter:1- **Fundamental of WAN and IP Routing**<br>• Wide Area Network<br>• IP Routing<br>• Network Layer Routing<br>• Host Forwarding Logic: Send the Packet to the Default Router<br>• How IP Addressing Helps IP Routing<br>• Rules for Groups of IP Addresses<br>• The IP Header | 4T + 4P |
| 2 | Chapter 2: - **Fundamental of IPV4 and IPV6**<br>• **IPV4**<br>➢ Classful Network Concepts<br>➢ IPv4 Network Classes and Related Facts<br>➢ The Number and Size of the Class A, B, and C Networks<br>➢ IPv4 Addressing<br><br>• **IPV6**<br>➢ Introduction to IPv6<br>➢ IPv6 Routing Protocols<br>➢ IPv6 Addressing and Subnetting<br>➢ Global Unicast Addressing Concepts<br>➢ Public and Private IPv6 Addresses<br>➢ The IPv6 Global Routing Prefix<br>➢ Address Ranges for Global Unicast Addresses<br>➢ IPv6 Subnetting Using Global Unicast Addresses | 4T + 4P |

| | | ➢ Assign Subnets to the Internetwork Topology<br>➢ Assigning Addresses to Hosts in a Subnet | |
|---|---|---|---|
| 3 | **Chapter –3 : Network Address Translation (NAT)**<br><br>• When Do We Use NAT?<br>• Types of Network Address Translation<br>• NAT Names<br>• How NAT Works<br>    ▪ Static NAT Configuration<br>    ▪ Dynamic NAT Configuration<br>    ▪ PAT (Overloading) Configuration<br>    ▪ Simple Verification of NAT<br>• Testing and Troubleshooting NAT | | 4T + 4P |
| 4 | **Chapter - 4: Open Shortest Path First (OSPF)**<br>• Open shortest Path First (OSPF) Basics<br>• OSPF Terminology<br>• OSPF Operation<br>• Configuring OSPF<br>• Configuring OSPF Areas<br>• OSPF and Loopback Interfaces<br>• Verifying OSPF Configuration<br>➢ **Multi-Area OSPF**<br>  • OSPF Scalability<br>  • Categories of Multi-Area Components<br>  • Adjacency Requirements<br>  • OSPF Router Roles<br>  • Link State Advertisements<br>  • OSPF Hello Protocol<br>  • Basic Multi-area Configuration<br>  • Verifying and Troubleshooting OSPF<br>  • OSPF v3<br>  • Verifying OSPFv3<br>  • | | 6T + 6P |
| 5 | Chapter :5- **Network Automation**<br>• **Introduction to Controller-Based Network**<br>    ➢ SDN and Controller-Based Networks<br>    ➢ The Data, Control, and Management Planes<br>    ➢ The Data Plane<br>    ➢ The Control Plane<br>    ➢ The Management Plane<br>    ➢ Controllers and Software-Defined Architecture<br>    ➢ Controllers and Centralized Control<br>    ➢ The Southbound Interface<br>    ➢ The Northbound Interface<br>    ➢ OpenDaylight and OpenFlow<br>    ➢ The OpenDaylight Controller | | 4T + 4P |

| | | ➢ Summary of the SDN Examples | |
|---|---|---|---|
| 6 | Final Exam | | 4T + 4P |
| **Total** | | | 52 |

**Online Study Topics:**
- IPV4 Subnetting
- IPV4 VLSM
- IPV6 History
- IPV6 Subnetting
- SDN Examples
- Chapter Review Questions

## D. Teaching and Assessment

**1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods**

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| **1.0** | **Knowledge and Understanding** | | |
| 1.1 | **Explain** the various routing and switching techniques for communication systems. | ➢ Lectures<br>➢ Classroom Discussion<br>➢ Lab Exercises | ➢ Assignment<br>➢ Mid-Term Exam<br>➢ Final Exam<br>➢ Lab Exam |
| 1.2 | **Describe** routing protocol types used with different WANs based on the latest trends. | ➢ Lectures<br>➢ Classroom Discussion<br>➢ Lab Exercises | ➢ Assignment<br>➢ Mid-Term Exam<br>➢ Final Exam<br>➢ Lab Exam |
| **2.0** | **Skills** | | |
| 2.1 | **Design** network infrastructure with IPv4 and IPv6 addressing concepts. | ➢ Lectures<br>➢ Classroom Discussion<br>➢ Lab Exercises | ➢ Assignment<br>➢ Final Exam<br>➢ Lab Exam |
| 2.2 | **Analyze** routing protocol requirements for different networks. | ➢ Lectures<br>➢ Classroom Discussion<br>➢ Lab Exercises | ➢ Assignment<br>➢ Final Exam<br>➢ Lab Exam |
| 2.3 | **Apply** network technologies with its latest OSI standards. | ➢ Lectures<br>➢ Classroom Discussion<br>➢ Lab Exercises | ➢ Assignment<br>➢ Final Exam<br>➢ Lab Exam |
| **3.0** | **Values** | | |
| 3.1 | **Recognize** ethical and professional responsibilities in analyzing network protocols to make informed judgments. | ➢ Lectures<br>➢ Classroom discussion | ➢ Assignments<br>➢ LAB Exam |

## 2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|---|---|---|
| 1 | Assignments / Mini Project | 4th Week | 20% |
| 2 | Midterm Exam | 6th Week | 20% |
| 3 | Lab Exam | 11th Week | 20% |
| 4 | Final Theory Exam | 12th Week | 40% |

**\*Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :**

Department have an arrangement for "Academic Counseling and Support" for each student by the department. The Department Coordinator nominates faculty members for "Student Academic Advisory Committee" every semester. These "Academic Advisors" are responsible for student counseling and advising to a group of fix number of students (around10-15 students) and maintaining students' files. At the beginning of semester and at time of course registration all students take counseling from Academic Advisor according to his previous grades and coverage of pre-requisite course and follow-up.

Also, students with GPA below than 2.00 are remained under deep observation and continuous meetings with respective course teachers about their performance are arranged to help and support the students. The course teacher is to be associated with this course provide a proper guidance for students who are looking to focus on their future career based on their intellectual interests, identify better opportunities related to this course and connections in their academic fields.

The course teacher will commit to a minimum scheduled time for student consultation equivalent to 3 Hours Per Week and will have prescribed times set aside for individual appointments with students. The students will be informed at the commencement of every semester for teacher consultation hours for seeking advice and support.

## F. Learning Resources and Facilities

### 1.Learning Resources

| Required Textbooks | CCNA Routing and Switching, Study guide,Todd Lammle; 2nd edition, sep 2016 Sybex.ISBN-13: 978-1118789704 |
|---|---|
| Essential References Materials | CCNA ICND1 100-105 Official Cert Guide 1st Edition, Wendell Odom, ISBN: 978-1-58720-425-8 |
| Electronic Materials | <ul><li>http://jump.jazanu.edu.sa/Pages/Guest.aspx</li><li>https://www.netacad.com/</li><li>http://www.ipv6forum.com/ipv6_enabled/approval_list.php</li><li>https://www.iana.org/numbers</li></ul> |

| | |
|---|---|
| | • http://www.protocols.com/index.htm<br>• https://scholar.google.com/ |
| **Other Learning Materials** | None |

## 2. Facilities Required

| Item | Resources |
|---|---|
| **Accommodation**<br>(Classrooms, laboratories, demonstration rooms/labs, etc.) | Classroom equipped with projector and whiteboard and sufficient seating arrangements.<br>Lab with software installed and individual computer terminal for each student. |
| **Technology Resources**<br>(AV, data show, Smart Board, software, etc.) | Whiteboards and projectors for classroom and lab<br>Following software for lab work:<br>• Cisco Packet Tracer 7.2<br>• GNS3 |
| **Other Resources**<br>(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | None |

## G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Sufficiency of resources and facilities for students | Students | Course evaluation survey form |
| Effectiveness of teaching / learning process | Students | Course evaluation survey form |
| Effectiveness of teaching / learning process | CRC / QAU / HoD | Course reports / result analysis |
| Quality of learning Resources | Track leaders / CRC | Review meetings and star rating with suggestions for further modification and improvements |
| Verifying standards of student achievement / evaluation | HoD / committee nominated by HoD | Random re-checking of evaluated answer sheets |
| Achievement of course learning outcomes | Course Teachers / QAU | CLO assessment template that is further verified at course coordinator, Track leader and QAU level. |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

| Council / Committee | DEPARTMENT COUNCIL |
|---|---|
| Reference No. | |
| Date | |