

# C S 52A: ADVANCED IP ROUTING PROTOCOLS & SERVICES (CCNP)

## Foothill College Course Outline of Record

Heading	Value
Effective Term:	Summer 2021
Units:	4.5
Hours:	4 lecture, 2 laboratory per week (72 total per quarter)
Advisory:	C S 50B or equivalent experience.
Degree & Credit Status:	Degree-Applicable Credit Course
Foothill GE:	Non-GE
Transferable:	CSU
Grade Type:	Letter Grade (Request for Pass/No Pass)
Repeatability:	Not Repeatable

## Student Learning Outcomes

- The student will demonstrate knowledge of the Border Gateway Protocol
- The student will demonstrate the use of route maps.

## Description

The ROUTE course is designed to help students advance their knowledge and skills and work independently on complex network solutions. Students will plan, configure and verify the implementation of secure enterprise LAN and WAN routing solutions using a range of routing protocols. Configuration of solutions to support branch offices and mobile workers will be presented. This course uses the official Cisco Academy CCNP ROUTE curriculum and is designed to provide preparation for the CCNP ROUTE certification exam.

## Course Objectives

The student will be able to:

- Implement an EIGRP based solution, given a network design and a set of requirements
- Implement a multi-area OSPF Network, given a network design and a set of requirements
- Implement an eBGP based solution, given a network design and a set of requirements
- Implement an IPv6 based solution, given a network design and a set of requirements
- Implement an IPv4 or IPv6 based redistribution solution, given a network design and a set of requirements
- Implement Layer 3 path control solution
- Implement basic teleworker and branch services

## Course Content

- Implement an EIGRP based solution, given a network design and a set of requirements
  - Determine network resources needed for implementing EIGRP in a network
  - Create an EIGRP implementation plan

- Create an EIGRP verification plan
  - Configure EIGRP routing
  - Verify an EIGRP solution was implemented properly using show and debug commands
  - Document the verification results for an EIGRP implementation
- Implement a multi-area OSPF Network, given a network design and a set of requirements
    - Determine network resources needed for implementing OSPF on a network
    - Create an OSPF implementation plan
    - Create an OSPF verification plan
    - Configure OSPF routing
    - Verify OSPF solution was implemented properly using show and debug commands
    - Document the verification results for an OSPF implementation plan
  - Implement an eBGP based solution, given a network design and a set of requirements
    - Determine network resources needed for implementing eBGP on a network
    - Create an eBGP implementation plan
    - Create an eBGP verification plan
    - Configure eBGP routing
    - Verify eBGP solution was implemented properly using show and debug commands
    - Document verification results for an eBGP implementation plan
  - Implement an IPv6 based solution, given a network design and a set of requirements
    - Determine network resources needed for implementing IPv6 on a network
    - Create an IPv6 implementation plan
    - Create an IPv6 verification plan
    - Configure IPv6 routing
    - Configure IPv6 interoperability with IPv4
    - Verify IPv6 solution was implemented properly using show and debug commands
    - Document verification results for an IPv6 implementation plan
  - Implement an IPv4 or IPv6 based redistribution solution, given a network design and a set of requirements
    - Create a redistribution implementation plan based upon the results from a redistribution analysis
    - Create a redistribution verification plan
    - Configure a redistribution solution
    - Verify that a redistribution was implemented
    - Document results of a redistribution implementation and verification plan
    - Identify the differences between implementing an IPv4 and IPv6 redistribution solution
  - Implement Layer 3 path control solution
    - Create a Layer 3 path control implementation plan based upon the results of the redistribution analysis
    - Create a Layer 3 path control verification plan
    - Configure Layer 3 path control
    - Verify that a Layer 3 path control was implemented
    - Document results of a Layer 3 path control implementation and verification plan
    - Implement basic teleworker and branch services
      - Describe broadband technologies
      - Configure basic broadband connections
      - Describe basic VPN technologies
      - Configure GRE
      - Describe branch access technologies

## Lab Content

- A. Tcl scripts for use in verification and troubleshooting
  1. Use Tcl scripts to verify full connectivity
  2. Identify causes of failures
- B. EIGRP configuration, bandwidth, and adjacencies
  1. Configure EIGRP on multiple routers
  2. Configure the bandwidth command to modify the EIGRP metric
  3. Verify EIGRP adjacencies
  4. Verify EIGRP routing information exchange
  5. Use debugging commands for troubleshooting EIGRP
  6. (Challenge) Test convergence for EIGRP when a topology change occurs
- C. Multi-area OSPF with stub areas and authentication
  1. Configure multiple-area OSPF on a router
  2. Verify multiple-area behavior
  3. Configure OSPF stub, totally stubby, and not-so-stubby areas
  4. Configure OSPF authentication
- D. Redistribution between EIGRP and OSPF
  1. Review EIGRP and OSPF configuration
  2. Redistribute into EIGRP
  3. Redistribute into OSPF
  4. Summarize routes in EIGRP
  5. Filter routes using route maps
  6. Modify EIGRP distances
  7. Modify OSPF distances
  8. Create passive interfaces in EIGRP
  9. Summarize in OSPF at an ABR and an ASBR
- E. Configure and verify path control
  1. Configure and verify policy-based routing
  2. Select the required tools and commands to configure policy-based routing operations
  3. Verify the configuration and operation by using the proper show and debug commands
- F. BGP case study
  1. Plan, design, and implement the International Travel Agency core network
  2. Plan, design, and implement the Travel Data Providers network
  3. Allow the networks to communicate via BGP
  4. Verify that all implementations are operational and functional according to the guidelines
- G. Configure routing facilities to the branch office
  1. Configure NAT
  2. Configure an IPsec VPN
  3. Configure a GRE tunnel over IPsec
  4. Enable dynamic routing over a GRE tunnel
  5. Verify the configuration and operation using show and debug commands
- H. Configuring OSPF for IPv6
  1. Configure a static IPv6 address on an interface
  2. Change the default link-local address on an interface
  3. Configure an EUI-64 IPv6 address on an interface
  4. Enable IPv6 routing and CEF
  5. Configure and verify single-area OSPFv3 operation

## Special Facilities and/or Equipment

- A. Access to a network laboratory with current Cisco network equipment host computers required to support the class.
- B. Website or course management system with an assignment posting component (through which all lab assignments are to be submitted) and

a forum component (where students can discuss course material and receive help from the instructor).

C. When taught via Foothill Global Access on the Internet, the college will provide a fully functional and maintained course management system through which the instructor and students can interact.

D. When taught via Foothill Global Access on the Internet, students must have currently existing email accounts and ongoing access to computers with internet capabilities.

## Method(s) of Evaluation

Methods of Evaluation may include but are not limited to the following:

- Tests and quizzes
- Written laboratory assignments
- Final examination

## Method(s) of Instruction

Methods of Instruction may include but are not limited to the following:

Lectures which include motivation for the architecture of the specific topics being discussed

In-person or online labs (for all sections, including those meeting face-to-face/on-campus), consisting of:

1. An assignment webpage located on a college-hosted course management system or other department-approved internet environment. Here, the students will review the specification of each assignment and submit their completed lab work
2. A discussion webpage located on a college-hosted course management system or other department-approved internet environment. Here, students can request assistance from the instructor and interact publicly with other class members

Detailed review of laboratory assignments which includes model solutions and specific comments on the student submissions

In-person or online discussion which engages students and instructor in an ongoing dialog pertaining to all aspects of designing, implementing and analyzing programs

When course is taught fully online:

1. Instructor-authored lecture materials, handouts, syllabus, assignments, tests, and other relevant course material will be delivered through a college-hosted course management system or other department-approved internet environment
2. Additional instructional guidelines for this course are listed in the attached addendum of CS department online practices

## Representative Text(s) and Other Materials

Lacoste, Raymond. [CCNP Enterprise Advanced Routing ENARSI 300-410 Official Cert Guide](#). 2020.

## Types and/or Examples of Required Reading, Writing, and Outside of Class Assignments

- A. Reading
  1. Textbook assigned reading averaging 30 pages per week.
  2. Online curriculum averaging 20 pages per week.
  3. Online resources as directed by instructor though links pertinent to networking.

4. Library and reference material directed by instructor through course handouts.

B. Writing

1. Technical prose documentation that supports and describes the laboratory exercises that are submitted for grades.

## **Discipline(s)**

Computer Science