Amrita Vishwa Vidyapeetham

Amrita School of Engineering, Coimbatore

Department of Electronics and Communication Engineering

1. Course Code : 19CCE431

2. Course Title : Software Defined Networks

3. Course Type (Core Course/Elective) : Elective

4. Course Mentor : R.Gandhiraj

5. Course Instructor(s) : R.Gandhiraj

6. Academic year : 2025-26– ODD Semester

7. Course Objectives and Course Summary

- To learn about Software Defined Networking (SDN) foundations and emerging Internet architectural framework
- To explore the SDN concepts, architectures, algorithms, protocols and applications related topics including Data Center Networks
- To study and experience about Network Function Virtualization (NFV) and SDN ECO systems

8. Course Outcomes(COs)

CO1: Able to understand Networking basics and necessity and genesis of Software defined Networking

CO2: Able to understand various SDN Architectures and Network Function Virtualization

CO3: Able to explore emerging SDN models

CO4: Able to implement simple SDN protocols using programming language

9. Mapping/Alignment of COs with Program Outcomes(POs)

CO – PO Mapping

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	2	-	-	-	2	2	2	3	3
CO2	3	2	1	-	-	2	-	-	-	2	2	2	3	3
CO3	3	2	1	-	-	2	-	-	-	2	2	2	3	3
CO4	3	2	3	3	-	2	-	-	3	2	2	2	3	3

10. Comments from previous course offering

- A simulation-based assignment has to be implemented in the area of SDN.

11. Reflection by the current course instructor(s)

- Planned to give simulation assignments.
- Since, the current networking industries are in need of more skilled engineers in the domain of Wireless Networking and to develop their skills, it is planned to give Term Project work, using industry grade simulation tool "NetSim" which is available in CEL lab.

12. Class Schedule/Lesson Plan/Weekly plan

Topics	Lecture(s)	Specific Outcome	Teaching Strategies & Suggested Activities	Teaching / Reading Materials	Assessment Technique	Alignment to COs
Unit 1						
Networking Basics	1 - 3	Switching, Addressing, Routing	Power Point, Reading	[1] Chap -1 , [6] – Recap 4, 5	Mid Term, Assignment 1, TA1	CO1
Switching Architecture	4 – 8	Data – Control, and Management Planes - Forwarding Rules -Autonomous Switches and Routers.	Power Point, Reading	[1] – Chap. -1	Mid Term Assignment 1, TA1	CO2
Why SDN?	9 - 12	Evolution of Switches and ControlPlanes - Cost – Data Center Innovation - Data Center Needs.	Power Point, Reading	[1] – Ch - 2	Mid Term Assignment 1, TA1	CO1
Genesis of SDN	13 - 15	Forerunners of SDN - Open Source Contributions	Power Point, Reading	[1] – Chap 3	Mid Term, Assignment 1, TA1	CO1
Unit 2						
SDN Architecture	16 - 19	Fundamental Characteristics of SDN – Operation – Devices -	Power Point, Reading	[1] – Chap 4	Mid Term, Assignment 1, TA1	CO1, CO2
SDN Controllers	20 - 22	Open Daylight and ONOS - SDN Applications - Northbound and Southbound APIs	Power Point, Reading, Hands On	[1] – Chap 4	Mid Term, Assignment 1, TA1	CO2, CO3
Open Flow	23 - 25	Switch -	Power	[1] – Chap 5	Mid Term,	CO2, CO3

		Controller Interaction - Flow Table - Packet Matching - Actions and Packet Forwarding - Extensions and Limitations	Point, Reading, Hands On		Assignment 1, TA1	
Network Function Virtualization (NFV)	26 - 28	SDN vs. NFV – OPNFV - Inline Network Functions - NFV Orchestration.	Power Point, Reading, Hands On	[1] – Chap 6	End sem, Assignment 2, TA2	CO2, CO3
Unit 3						
Emerging SDN Models	29 - 31	Protocol Models - NETCONF, BGP, MPLS, Controller Models	Power Point, Reading, Hands On	[1] – Chap 6	End sem, Assignment 2, TA2	CO1, CO3
Application Models	32 - 33	Proactive – Declarative – External	Power Point, Reading	[1] – Chap 10	End sem, Assignment 2, TA2	CO1, CO3
SDN in Datacenters	34 - 36	Multitenancy - Failure Recovery theoretical concepts listed above.	Power Point, Reading	[1] – Chap 7	End sem, Assignment 2, TA2	CO3
SDN in Internet exchange Points (IXPs)	37 - 40	SDN Ecosystem - White-box switching - Open Sourcing SDN - Open Networking Foundation -Open Daylight – ONOS – OpenStack - OpenSwitch	Power Point, Reading, Hands On	[1] – Chap 9	End sem, Assignment 2, TA2	CO2, CO3
Programming Assignments	41 - 45	Programming Assignments for implementing some of the theoretical concepts listed above.	Power Point, Hands on	[7] – Chap 1, 2, 3, 4	End sem, Assignment 2, TA2	CO4

Text Book(s)

[1] Goransson P, Black C, Culver T, "Software Defined Networks: A Comprehensive Approaches", 1: ElsevierScience; 2016.

[2] Gray K, Nadeau TD, Amsterdam Boston Heidelberg, Morgan Kaufmann, "Network Function Virtualization"2016.

[3] Nadeau TD, Gray K. SDN: "Software Defined Networks ; [an Authoritative Review of Network Programmability *Technologies]", 1. ed. Beijing: O'Reilly; 2013.*

Reference(s)

[4] Hu F, ed. "Network Innovation through OpenFlow and SDN: Principles and Design". Boca Raton London NewYork: CRC Press, Taylor & Francis Group, 2014.

[5] Qi H, Li K. "Software Defined Networking Applications in Distributed Datacenters", Cham: SpringerInternational Publishing; 2016. doi:10.1007/978-3-319-33135-5.

[6] Kurose, James F., and Keith W. Ross. "Computer Networking: A Top-Down Approach Edition." *Addision Wesley* (2007).

[7] Azodolmolky, Siamak. *Software defined networking with OpenFlow*. Vol. 153. Packt Publishing, 2013.

13. Teaching-Learning Strategies

- Offline mode – Power point-based teaching
- Theory with hands-on session for simulation.
- Assignments and term assignment evaluation

14. Assessment Strategy (Bloom's Taxonomy and Rubric based, Quiz, Periodicals, Mid Term, Assignment, Project, Report, Class Test, Presentation, Semester Final)

- Periodicals : Mid Term: BTL 1,2,3
- Assignment and Term assignment : BTL 4,5
- End Sem : BTL 1,2,3

15. Evaluation Policy (Grading System)

- Mid Term : 30%
- Continuous Assessment : 30%
- End Sem : 40%

16. Make-up Procedures

- Missed Mid-term Exam

R.Gandhiraj

17. Name & Signature of Course Instructor(s)

19CCE431 Software Defined Networking – S7 ECE, CCE, CSE [AY-2025-26-ODD Sem]

Evaluation Policy (Grading System): Rubric based and Letter grading

Internal and External marks splitup

Exam	Component	Rubrics	Max. marks	Component marks	Weightage (%)
Internal (60)	Continuous Assessment	Pre Mid-Term (CA) • Assignment 1 • Term Assignment (Review1) Post Mid-Term (CA) • Assignment 2 • Term Assignment (Review2)	 30 40 30 40	 10 5 10 5	30
	Midterm	Written Exam	50	50	30
External (40)	End sem	Written Exam	100	40	40

Letter grading

Rubric	Notation to be used	Weightage
Excellent	O	1
Good	A	0.8
Average	B	0.6
Below Average	C	0.4
Poor	P	0.2
Fail	F	0

Rubrics for Assignment

Component	O	A	B	C	P	F
Preparation (10)	Title of the work, Tools required, Theory, Flow chart, Algorithm	Any one component missing from above list.	Any two component missing from above list.	Any three component missing from above list.	Any four component missing from above list.	Blank record.
Experiment (20)	Completed experiment on time with clear and complete output	Completed the experiment on time with slightly distorted output..	Completed only one part of the output.	Completed coding but partial output with distortions	Completed coding but no output.	Incorrect Not able to show the output.
Record (0)	Neat report with all relevant observations and plots	Neat report with all relevant observations and plots (80% completion)	Neat report with all relevant observations and plots (60% completion)	Neat report with all relevant observations and plots (40% completion)	Neat report with all relevant observations and plots (20% completion)	Neat report with all relevant observations and plots (0% completion)

Rubrics for Term Assignment Review 1

Component	O	A	B	C	P	F
Design (10)	Title of the work, Tools required, Theory, Flow chart, Algorithm, Design	Title of the work, Tools required, Theory, Flow chart, Algorithm, Design (80% completion).	Title of the work, Tools required, Theory, Flow chart, Algorithm, Design (60% completion).	Title of the work, Tools required, Theory, Flow chart, Algorithm, Design (40% completion).	Title of the work, Tools required, Theory, Flow chart, Algorithm, Design (20% completion).	Title of the work, Tools required, Theory, Flow chart, Algorithm, Design (0% completion).
Experiment (20)	Completed experiment on time with clear and complete output [50% completion]	Completed experiment on time with clear and complete output [40% completion]	Completed experiment on time with clear and complete output [30% completion]	Completed experiment on time with clear and complete output [20% completion]	Completed experiment on time with clear and complete output [10% completion]	Completed experiment on time with clear and complete output [0% completion]
Viva (10)	Answering questions relevant to the experiment [100% correct]	Answering questions relevant to the experiment [80% correct]	Answering questions relevant to the experiment [60% correct]	Answering questions relevant to the experiment [40% correct]	Answering questions relevant to the experiment [20% correct]	Answering questions relevant to the experiment [0% correct]

Rubrics for Term Assignment Review 2

Component	O	A	B	C	P	F
Design (10)	Title of the work, Tools required, Theory, Flow chart, Algorithm, Design	Title of the work, Tools required, Theory, Flow chart, Algorithm, Design (80% completion).	Title of the work, Tools required, Theory, Flow chart, Algorithm, Design (60% completion).	Title of the work, Tools required, Theory, Flow chart, Algorithm, Design (40% completion).	Title of the work, Tools required, Theory, Flow chart, Algorithm, Design (20% completion).	Title of the work, Tools required, Theory, Flow chart, Algorithm, Design (0% completion).
Experiment (20)	Completed experiment on time with clear and complete output [100% completion]	Completed experiment on time with clear and complete output [80% completion]	Completed experiment on time with clear and complete output [60% completion]	Completed experiment on time with clear and complete output [40% completion]	Completed experiment on time with clear and complete output [20% completion]	Completed experiment on time with clear and complete output [0% completion]
Viva (10)	Answering questions relevant to the experiment [100% correct]	Answering questions relevant to the experiment [80% correct]	Answering questions relevant to the experiment [60% correct]	Answering questions relevant to the experiment [40% correct]	Answering questions relevant to the experiment [20% correct]	Answering questions relevant to the experiment [0% correct]