



Course Specification of Broadband Networks

I. Course Identification and General Information:						
1.	Course Title:	Broadband Networks				
2.	Course Code & Number:	CNE447				
3.	Credit hours:	C.H				Total
		Th.	Tu.	Pr.	Tr.	
		2	-	2	-	3
4.	Study level/ semester at which this course is offered:	5 th year / 1 st Semester				
5.	Pre –requisite (if any):	Communication Networks 2 (CNE343)				
6.	Co –requisite (if any):	Non				
7.	Program (s) in which the course is offered:	Communication Engineering and Networks				
8.	Language of teaching the course:	English				
9.	Location of teaching the course:	Department of Electrical Engineering				
10.	Prepared By:	Associate Prof. Naif Alsharabi				
11.	Date of Approval					

II. Course Description:
<p>This course gives an introduction to the fundamentals of broadband networks, It Introduce a definition and basic characteristics of ISDN, defining and distributing services, broadband aspects of ISDN, B-ISDN architecture, signaling, ATM, Intelligent networks (IN), VoIP and IPTV service. It also covers the Virtual Private Networks (VPN), VPN based on multiprotocol commutation over labels (MPLS VPN), QoS in packet networks, Internet, new generation Internet, Network architecture selection for IP traffic transmission, and optical network core architecture (IP over WDM, IP over OTN). The course also includes lab based sessions that enables students to use and apply the skills gained in implementing broadband networks simulation using the most common network simulator like OPNET, MATLAB.</p>

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III. Course Intended learning outcomes (CILOs) of the course		Referenced PILOs
a1	Define the architecture, protocols and services that are used in broadband networks	A2
a2	Define services and specify their applications in modern broadband networks.	A3
b1	Evaluate communication protocols	B2
b2	Compare the appropriate network architecture	B3
c1	Solve problems, related to communication protocols by choosing an engineering approach.	C2
c2	Design broadband networks	C3
d1	Work effectively within teams	D1
d2	Engage in independent lifelong learning	D2

(A) Alignment Course Intended Learning Outcomes of Knowledge and Understanding to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
a1- Define the architecture, protocols and services that are used in broadband networks.	<ul style="list-style-type: none"> ▪ Lectures ▪ Tutorials ▪ Presentation 	<ul style="list-style-type: none"> ▪ Written examinations ▪ Quizzes ▪ Home work
a2- Define services and specify their applications in modern broadband networks.	<ul style="list-style-type: none"> ▪ Lectures ▪ Tutorials ▪ Presentation 	<ul style="list-style-type: none"> ▪ Written examinations ▪ Quizzes ▪ Home work

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(B) Alignment Course Intended Learning Outcomes of Intellectual Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
b1- Evaluate communication protocols	<ul style="list-style-type: none"> ▪ Lecture ▪ Seminar Exercises 	<ul style="list-style-type: none"> ▪ Written examinations. ▪ Assignments including problem-solving exercises.
b2- Compare the appropriate network architecture	<ul style="list-style-type: none"> ▪ Interactive lecture ▪ Seminar ▪ Exercises ▪ Group discussions 	<ul style="list-style-type: none"> ▪ Written examinations ▪ Presentations ▪ Home work

(C) Alignment Course Intended Learning Outcomes of Professional and Practical Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
c1- Solve problems related to communication protocols by choose an engineering approach.	<ul style="list-style-type: none"> ▪ Lecture ▪ Lab sessions ▪ Exercises ▪ Group discussions work and Problem based learning 	<ul style="list-style-type: none"> ▪ Written assessments. ▪ Technical or practical reports /Presentations. ▪ Coursework Activities
c2- Design broadband networks	<ul style="list-style-type: none"> ▪ Lecture ▪ Lab sessions ▪ Exercises ▪ Group discussions work and problem-solving learning ▪ Directed self- study 	<ul style="list-style-type: none"> ▪ Written assessments ▪ Coursework Activities

(D) Alignment Course Intended Learning Outcomes of Transferable Skills to Teaching Strategies and Assessment Strategies:		
Course Intended Learning Outcomes	Teaching strategies	Assessment Strategies
d1- Work effectively within teams	<ul style="list-style-type: none"> ▪ Group discussions work 	<ul style="list-style-type: none"> ▪ Technical or

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	<ul style="list-style-type: none"> Problem-solving learning. 	<ul style="list-style-type: none"> Practical reports /Presentations.
d2- Engage in independent lifelong learning	<ul style="list-style-type: none"> Guided individual reading. Seminar/presentation 	<ul style="list-style-type: none"> Technical Practical reports /Presentations.

IV. Course Content:					
A – Theoretical Aspect:					
Order	Units/Topics List	Learning Outcomes	Sub Topics List	Number of Weeks	Contact hours
1.	Introduction	a1,b1	<ul style="list-style-type: none"> Overview Components of the Telecommunications Networks Public-Switched Network Private Networks Hybrid Networks 	1	2
2.	Broadband ISDN	a1,b1, c1,c2,d1	<ul style="list-style-type: none"> Definition and basic characteristics of ISDN Physical Interface Defining and distributing services Broadband aspects of ISDN. B-ISDN architecture 	1	2
3.	Signaling	a2,b1,c1	<ul style="list-style-type: none"> Access signaling, toll signaling, SS7 signaling, H323 and SIP. 	1	2
4.	ATM Networks	a1,a2,b1,b2, c1,c2,d1	<ul style="list-style-type: none"> Introduction to Packet Switching ATM Layered Architecture 	2	4

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			<ul style="list-style-type: none"> ▪ ATM Protocols ▪ ATM Traffic Management ▪ Voice over DSL and over ATM (VoDSL and VoATM) ▪ ATM and Frame Relay Compared 		
5.	IP services and VPN	a1,a2,b1,b2, c1,c2,d1	<ul style="list-style-type: none"> ▪ Intelligent networks (IN). ▪ VoIP and IPTV services. Virtual private networks (VPN). VPN basic characteristics; technologies, components and services; VPN based on multiprotocol commutation over labels (MPLS VPN). 	2	4
6.	QoS	a1,a2,b1,b2, c1,c2,d1	<ul style="list-style-type: none"> ▪ QoS architecture, mechanisms and protocols ▪ Qos in Packet Switching and ATM ▪ QoS in Best Effort Internet 	1	2
7.	Internet Telephony	a1,a2,b1,b2, c1,c2,d1,d2	<ul style="list-style-type: none"> ▪ Internet architecture and protocol stack of the Internet, Internet physical and logical picture, addressing and routing, Internet protocols and services, new generation Internet. 	2	4
8.	Optical Communication Networks	a1,a2,b1,b2, c1,c2,d1,d2	<ul style="list-style-type: none"> ▪ Network architecture selection for IP traffic transmission: network architecture evolution, optical network core architecture (IP over WDM, IP over OTN), networks architecture analysis and 	2	4

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			comparison. Broadband networks economy.		
9.	Recent advance in Broad band network.	a1,a2,b1,b2, c1,c2,d1,d2	<ul style="list-style-type: none"> Recent advance in Broad band network. 	2	4
Number of Weeks /and Units Per Semester				14	28

B - Practical Aspect:				
Order	Tasks/ Experiments	Number of Weeks	Contact hours	Learning Outcomes
1.	<ul style="list-style-type: none"> Introduction to Switch Basic Switch IP Configuration 	1	2	b1,c1,d1
2.	<ul style="list-style-type: none"> Configuring ISDN using BRI Multiple Channels Signaling on the D Channel. 	2	4	b1,c2,d1
3.	<ul style="list-style-type: none"> Enabling the ATM Interface Configuring PVCs Configuring Classical IP and ARP over ATM Configuring site-to-site IPSEC VPN tunnel between routers 	3	6	b2,c1,c2,d1
4.	<ul style="list-style-type: none"> VoIP and IPTV over IP and ATM networks. 	1	2	b2,c1,c2,d1
5.	<ul style="list-style-type: none"> IP Addressing Subnetting 	1	2	b1,c1,d1
6.	<ul style="list-style-type: none"> Enabling MPLS Configuring MPLS using OSPF Configuring MPLS using EIGRP 	2	4	b2,c1,c2,d1

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7.	▪ Compare between QoS of IP, ATM and MPLS networks	2	4	b2,c1,c2,d1
8.	▪ Optical networks and WDM	1	2	b1,b2,c1,c2,d1,d2
9.	▪ Review	1	2	b1, b2, c1, c2, d1,d2
Number of Weeks /and Units Per Semester		14	28	

V. Teaching strategies of the course:

- Interactive lecture
- Exercises
- Tutorials
- Group discussions work and problem-solving learning.
- Lab sessions
- Guided individual reading.
- Directed self- study
- Seminar / Presentation

VI. Assignments:

No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Provide presentation and report on topics related to signaling in broadband networks	a1,a2,b2,d1	4 th	2.5
2.	Provide presentation or report IP, ATM and MPLS networks. Its advantages, disadvantage and QoS.	a1,a2,b2,d1	10 th	2.5
3.	Provide presentation or report on the recent advance of optical networks and its techniques	a1,a2,b2,d1	13 th	2.5
4.	Identify existing broadband networks problems and determine the appropriate broadband scenario model to resolve.(lab)	a2,c2,d1,d2	8 th – 13 th	15
Total				22.5

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VII. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes
1.	Assignment & Home works or Quiz	Once every 2-3 weeks	7.5	5%	a1,a2,b1,b2,c1,c2,d1,d2
2.	Participation	Weekly	7.5	5%	---
3.	Lab Assignment	Once a month	15	10%	a1,a2,b1,b2,c1,c2,d1,d2
4.	Midterm Exam (theoretical)	8 th week	15	10%	a1,a2,b1,b2,c1,c2,d1,d2
5.	Final Exam (practical)	15 th week	15	10%	a1,a2,b1,b2,c1,c2,d1,d2
6.	Final Exam (theoretical)	16 th week	90	60%	a1,a2,b1,b2,c1,c2,d1,d2
Total			150	100%	

VIII. Learning Resources:

- *Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).*

1- Required Textbook(s) (maximum two).

1. A.Haidine, A. Aqqal,2018, Broadband Communications Networks: Recent Advances and Lessons from Practice,1st , BoD – Books on Demand.
2. Egis J. Bates,2002, Broadband telecommunications handbook,2nd Edition, McGraw-Hill Professional

2- Essential References.

1. Tony H. Grubestic, Elizabeth A. Mack,2016, Broadband Telecommunications and Regional Developmen, Routledge
2. Martin Maier, Abdallah Shami,2010,Broadband Access Networks: Technologies and Deployments, series edition, Springer

3- Electronic Materials and Web Sites etc.

1. <https://nptel.ac.in/courses/117101050/>
2. www.isi.edu/nsnam/ns/

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	3. www.opnet.com
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IX. Course Policies:	
1.	<p>Class Attendance: A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic</p>
2.	<p>Tardy: For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.</p>
3.	<p>Exam Attendance/Punctuality: A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam-</p>
4.	<p>Assignments & Projects: The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time-</p>
5.	<p>Cheating: For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty-</p>
6.	<p>Plagiarism: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.</p>
7.	<p>Other policies:</p> <ul style="list-style-type: none"> - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination.

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Lecture notes and assignments my given directly to students using soft or hard copy

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Course Plan (Syllabus) of Broadband Networks

I. Information about Faculty Member Responsible for the Course:							
Name of Faculty Member	Associate Prof. Naif Alsharabi	Office Hours					
Location & Telephone No.		SAT	SUN	MON	TUE	WED	THU
E-mail							

II. Course Identification and General Information:						
1-	Course Title:	Broadband Networks				
2-	Course Number & Code:	CNE447				
3-	Credit hours:	C.H				Total
		Th.	Tu.	Pr.	Tr.	
		2	-	2	-	
4-	Study level/year at which this course is offered:	5 th Year / 1 st Semester				
5-	Pre –requisite (if any):	Communication Networks 2 (CNE343)				
6-	Co –requisite (if any):	Non				
7-	Program (s) in which the course is offered	Communication Engineering and Networks				
8-	Language of teaching the course:	English				
9-	System of Study:	Semesters				
10-	Mode of delivery:	Full Time Lectures and Labs				
11-	Location of teaching the course:	Department of Electrical Engineering				

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III. Course Description:

This course gives an introduction to the fundamentals of broadband networks, It Introduces a definition and basic characteristics of ISDN, defining and distributing services, broadband aspects of ISDN, B-ISDN architecture, signaling. ATM, Intelligent networks (IN), VoIP and IPTV services. It also covers the Virtual private networks (VPN), VPN based on multiprotocol commutation over labels (MPLS VPN), QoS and packet networks, Internet, new generation Internet, Network architecture selection for IP traffic transmission, and optical network core architecture (IP over WDM, IP over OTN). The course also includes lab based sessions that enables students to use and apply the skills gained in implementing broadband networks simulation using the most common network simulator like OPNET, MATLAB.

IV. Intended learning outcomes (ILOs) of the course:

- Brief summary of the knowledge or skill the course is intended to develop:
 1. Define the architecture, protocols and services that are used in broadband networks
 2. Define services and specify their applications in modern broadband networks.
 3. Evaluate communication protocols
 4. Compare the appropriate network architecture
 5. Solve problems, related to communication protocols by choosing an engineering approach.
 6. Design broadband networks
 7. Work effectively within teams
 8. Engage in independent lifelong learning

V. Course Content:

A – Theoretical Aspect:

Order	Units/Topics List	Sub Topics List	Number of Weeks	Contact hours
1.	Introduction	▪ Overview	1 st	2

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		<ul style="list-style-type: none"> ▪ Components of the Telecommunications Networks ▪ Public-Switched Network ▪ Private Networks ▪ Hybrid Networks 		
2.	Broadband ISDN	<ul style="list-style-type: none"> ▪ Definition and basic characteristics of ISDN ▪ Physical Interface ▪ Defining and distributing services ▪ Broadband aspects of ISDN. ▪ B-ISDN architecture 	2 nd	2
3.	Signaling	<ul style="list-style-type: none"> ▪ Access signaling, ▪ toll signaling, ▪ SS7 signaling, ▪ H323 and SIP. 	3 rd	2
4.	ATM Networks	<ul style="list-style-type: none"> ▪ Introduction to Packet Switching ▪ ATM Layered Architecture ▪ ATM Protocols ▪ ATM Traffic Management ▪ Voice over DSL and over ATM (VoDSL and VoATM) ▪ ATM and Frame Relay Compared 	4 th ,5 th	4
5.	IP services and VPN	<ul style="list-style-type: none"> ▪ Intelligent networks (IN). ▪ VoIP and IPTV services. Virtual private networks (VPN). VPN basic characteristics; technologies, components and services; VPN based on multiprotocol commutation over labels (MPLS VPN). 	6 th ,7 th	4
6.	Med-exam		8 th	2

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7.	QoS	<ul style="list-style-type: none"> QoS architecture, mechanisms and protocols QoS in Packet Switching and ATM QoS in Best Effort Internet 	9 th	2
8.	Internet Telephony	<ul style="list-style-type: none"> Internet architecture and protocol stack of the Internet, Internet physical and logical picture, addressing and routing, Internet protocols and services, new generation Internet. 	10 th , 11 th	4
9.	Optical Communication Networks	<ul style="list-style-type: none"> Network architecture selection for IP traffic transmission: network architecture evolution, optical network core architecture (IP over WDM, IP over OTN), networks architecture analysis and comparison. Broadband networks economy. 	12 th , 13 th	4
10.	Recent advance in Broad band network.	<ul style="list-style-type: none"> Recent advance in Broad band network. 	14 th , 15 th	4
11.	Final Exam		16 th	2
Number of Weeks /and Units Per Semester			16	32

B - Practical Aspect:

Order	Tasks/ Experiments	Number of Weeks	Contact hours
1.	<ul style="list-style-type: none"> Introduction to Switch Basic Switch IP Configuration 	1 st	2
2.	<ul style="list-style-type: none"> Configuring ISDN using BRI Multiple Channels Signaling on the D Channel. 	2 nd , 3 rd	4

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3.	<ul style="list-style-type: none"> ▪ Enabling the ATM Interface ▪ Configuring PVCs ▪ Configuring Classical IP and ARP over ATM ▪ Configuring site-to-site IPSEC VPN tunnel between routers 	4 th ,5 th ,6 th	6
4.	<ul style="list-style-type: none"> ▪ VoIP and IPTV over IP and ATM networks. 	7 th	2
5.	<ul style="list-style-type: none"> ▪ IP Addressing ▪ Subnetting 	8 th	2
6.	<ul style="list-style-type: none"> ▪ Enabling MPLS ▪ Configuring MPLS using OSPF ▪ Configuring MPLS using EIGRP 	9 th ,10 th	4
7.	<ul style="list-style-type: none"> ▪ Compare between QoS of IP, ATM and MPLS networks 	11 th ,12 th	4
8.	<ul style="list-style-type: none"> ▪ Optical networks and WDM 	13 th	2
9.	<ul style="list-style-type: none"> ▪ Review 	14 th	2
10.	<ul style="list-style-type: none"> ▪ Final Exam 	15 th	2
Number of Weeks /and Units Per Semester		15	30

VI. Teaching strategies of the course:

- Interactive lecture
- Exercises
- Tutorials
- Group discussions work and problem-solving learning.
- Lab sessions
- Guided individual reading.
- Directed self- study
- Seminar / Presentation

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VII. Assignments:				
No	Assignments	Aligned CILOs(symbols)	Week Due	Mark
1.	Provide presentation and report on topics related to signaling in broadband networks	a1,a2,b2,d1	4 th	2.5
2.	Provide presentation or report IP, ATM and MPLS networks. Its advantages, disadvantage and QoS.	a1,a2,b2,d1	10 th	2.5
3.	Provide presentation or report on the recent advance of optical networks and its techniques	a1,a2,b2,d1	13 th	2.5
4.	Identify existing broadband networks problems and determine the appropriate broadband scenario model to resolve.(lab)	a2,c2,d1,d2	8 th – 13 th	15
Total				22.5

VIII. Schedule of Assessment Tasks for Students During the Semester:				
No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment
1.	Assignment & Home works or Quiz	Once every 2-3 weeks	7.5	5%
2.	Participation	Weekly	7.5	5%
3.	Lab Assignment	Once a month	15	10%
4.	Midterm Exam (theoretical)	8 th week	15	10%
5.	Final Exam (practical)	15 th week	15	10%
6.	Final Exam (theoretical)	16 th week	90	60%
Total			150	100%

IX. Learning Resources:
• <i>Written in the following order: (Author - Year of publication – Title – Edition – Place of publication – Publisher).</i>
1- Required Textbook(s) (maximum two).

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 Naif Alsharabi Ahmed Al-Shakiri Mohammad Algorafi AL-Bukhaiti Assoc. Prof. Dr. Huda Al-Emad

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 Prof. Dr. Al-Qassim Mohammed Abbas



	<ol style="list-style-type: none"> 1. A.Haidine, A. Aqqal,2018, Broadband Communications Networks: Recent Advances and Lessons from Practice,1st , BoD – Books on Demand. 2. Egis J. Bates,2002, Broadband telecommunications handbook,2nd Edition, McGraw-Hill Professional
2- Essential References.	
	<ol style="list-style-type: none"> 1. Tony H. Grubestic, Elizabeth A. Mack,2016, Broadband Telecommunications and Regional Developmen, Routledge 2. Martin Maier, Abdallah Shami,2010,Broadband Access Networks: Technologies and Deployments, series edition, Springer
3- Electronic Materials and Web Sites etc.	
	<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/117101050/ 2. www.isi.edu/nsnam/ns/ 3. www.opnet.com

X. Course Policies:	
1.	Class Attendance: A student should attend not less than 75 % of total hours of the subject; otherwise he will not be able to take the exam and will be considered as exam failure. If the student is absent due to illness, he/she should bring a proof statement from university Clinic
2.	Tardy: For late in attending the class, the student will be initially notified. If he repeated lateness in attending class he will be considered as absent.
3.	Exam Attendance/Punctuality: A student should attend the exam on time. He is Permitted to attend an exam half one hour from exam beginning, after that he/she will not be permitted to take the exam and he/she will be considered as absent in exam-
4.	Assignments & Projects: The assignment is given to the students after each chapter; the student has to submit all the assignments for checking on time-

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5.	<p>Cheating: For cheating in exam, a student will be considered as fail. In case the cheating is repeated three times during his/her study the student will be disengaged from the Faculty-</p>
6.	<p>Plagiarism: Plagiarism is the attending of a student the exam of a course instead of another student. If the examination committee proofed a plagiarism of a student, he will be disengaged from the Faculty. The final disengagement of the student from the Faculty should be confirmed from the Student Council Affair of the university.</p>
7.	<p>Other policies:</p> <ul style="list-style-type: none"> - Mobile phones are not allowed to use during a class lecture. It must be closed, otherwise the student will be asked to leave the lecture room - Mobile phones are not allowed in class during the examination. <p>Lecture notes and assignments my given directly to students using soft or hard copy</p>

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