

COURSE SYLLABUS
(Training level: Undergraduate)

Vietnamese Course Title: Kỹ thuật truyền dẫn

English Course Title: Transmission engineering

Course Code: TTM331

Major: Electronics – Telecommunication Engineering Technology

Training program: Bachelor; Engineer

Version: 2021

1. General information

- Number of credits: 3 (Theory: 3; Practice: 0).

- Type of knowledge:

General Education		Base core courses		Major core courses		Concentration courses		Others
Required <input type="checkbox"/>	Optional <input type="checkbox"/>	Required <input type="checkbox"/>	Optional <input type="checkbox"/>	Required <input type="checkbox"/>	Optional <input type="checkbox"/>	Required <input checked="" type="checkbox"/>	Optional <input type="checkbox"/>	

- Required course: None

- Pre-requisite: Data Communications

- Co-requisite: None

2. Time Allocated

Total: 54 periods	Theory: 34 periods
	Group Discussion/Presentation: 18 periods.
	Assignments/Essays/Practices: 0 periods.
	Tests: 2 + <i>Theory: Number of Tests:2 Periods:2</i> + <i>Practice: Number of Tests:0 Periods:0</i>
	Self-study: 105 periods Other activities: 0

3. Departments in Charge: Department of Electronic and Telecommunication -
Faculty of Electronics and Communications Technology

4. Lecturer's Information

No.	Lecturer name	Phone number	Email	Note
1	MSc. Doan Thi Thanh Thao	0886613396	dtthao@ictu.edu.vn	Leader
2	MSc. Nguyen Thi Ngan	0923868884	ntngan@ictu.edu.vn	Member
3	MSc. Mac Thi Phuong	0888221882	mtphuong@ictu.edu.vn	Member

5. Facility Requirements: Having a projector in the classroom

6. Course Description:

Transmission engineering is a course in the Concentration courses block. The course provides students with basic knowledge about: basic concepts, system diagrams, digital transmission principles, signal digitalization and baseband signal processing, digital multiplexing techniques, copper and optical cable transmission network system.

7. Objectives

Objectives	Description	PLOs	Proficiency level
G1	Apply fundamental knowledge to solve problems involving line codes, bit rates, symbol rates, and minimizing jitter. Primary and high-order multiplexing techniques	1.5.2	3
G2	Analyze the problem of the actual wired transmission network system to detect and solve the problem related to the transmission line	4.1	4

8. Learning Outcomes

Objectives	CLOs	Description of CLOs	PLOs	Proficiency level
G1	G1.1	Apply basic knowledge about transmission system, knowledge of sampling theorem, pulse information system, digitization principle, phase jitter, phase wander, transmission line code to solve problems related to transmission. calculate bit rate, symbol rate, baseband processing	1.5.2	3
	G1.2	Apply knowledge of SDH and PDH multiplexing to explain the working principle of PDH/SDH transmission system	1.5.2	3
G2	G2.1	Analyze the structure of wired transmission network systems (ADSL system, optical transmission system)	4.1.1	4
	G2.2	Synthesize knowledge of SDH and WDM multiplexing to solve optical transmission network design problems	4.1.2	4

9. Scientific ethics

Actively attend theoretical classes in class, do exercises assigned by the lecturer, fully

participate in discussion hours in the spirit of improving self-discipline, self-control and completing regular tests. All acts of cheating in learning and assessment will be according to regulations.

10. Detailed Contents

Period	Contents	References	CLOs	Competency Level	Teaching Methodology	Assessment Methodology
1,2,3	Chapter 1: Overview					
	A/In-class teaching content: (3) 1.1. Development history 1.2. General introduction to digital transmission system 1.3. Transmission medium 1.4. Analogue transmission and digital transmission 1.5. Configuration of the transmission system 1.6. Basic quality parameters of digital transmission system 1.7. Several transmission standards organizations	[2] [5]	G1.1	3	Present; Raise and solve problems	Evaluation by comments
	B/ Self-study content:(6) Read the content of chapter 1 in the main textbook and reference materials	[2] [5]	G1.1	3	Guided self-study	question
4,5,6	CHAPTER 2: DIGITALIZING SIGNALS					
	A/In-class teaching content: (3) 2.1 Sampling theorem and pulse information system 2.1.1 Sampling theorem 2.1.2 Signal Recovery 2.1.3 Pulse information system	[2] [5]	G1.1	3	Present; Raise and solve problems	Evaluation by commenting on the level of participation in the lesson

Period	Contents	References	CLOs	Competency Level	Teaching Methodology	Assessment Methodology
	2.2. Continuous signal digitization 2.2.1. PCM 2.2.2. DPCM 2.2.3. Some other signal digitization					
	B/ Self-study content:(6) Review sampling theorems, how to digitize and recover signals	[2] [5]	G1.1	3	Guided self-study	question
	CHAPTER 2: DIGITALIZING SIGNALS (next content)					
7,8,9	A/In-class teaching content: (3) Discussion 1: - Solve problems related to calculating bit rate, symbol rate - Compare the differences of digitization terms, advantages and disadvantages	[2] [5]	G1.1	3	Student groups present and discuss according to the plan under the supervision of the lecturer	Evaluation by commenting on the level of participation in the lesson and completion of discussion questions
	B/ Self-study content:(6) Re-read the contents discussed in the references [2], [5]	[2] [5]	G1.1	3	Guided self-study	question
	CHAPTER 2: DIGITALIZING SIGNALS (next content)					
10,11,12	A/In-class teaching content: (3) 2.3. Baseband signal processing 2.3.1. The problem of phase jitter and wander 2.3.2. Minimizing phase jitter	[2] [5]	G1.1	3	Present; Raise and solve problems	Evaluation by commenting on the level of participation in the lesson
	B/ Self-study content:(6)	[2]	G1.1	3	Guided self-study	question

Period	Contents	References	CLOs	Competency Level	Teaching Methodology	Assessment Methodology
	Re-read the contents discussed of Baseband signal processing in the references [2], [5]	[5]				
13,14,15	CHAPTER 2: DIGITALIZING SIGNALS (next content)					
	A/In-class teaching content: (3) 2.3.3. Digital signal regeneration 2.3.4. Line code	[2] [5]	G1.1	3	Present; Raise and solve problems	Evaluation by commenting on the level of participation in the lesson
	B/ Self-study content:(6) Re-read the contents discussed of line code in the references [2], [5]	[2] [5]	G1.1	3	Guided self-study	question
16,17,18	CHAPTER 2: DIGITALIZING SIGNALS (next content)					
	A/In-class teaching content: (3) Discussion 2: - Solve problems involving line codes and shuffling - Compare the different types of line codes (code rules, advantages and disadvantages, applications)	[2] [5]	G1.1	3	Student groups present and discuss according to the plan under the supervision of the lecturer	Evaluation by commenting on the level of participation in the lesson and completion of discussion questions
	B/ Self-study content:(6) Re-read the contents discussed in the references [2], [5]	[2] [5]	G1.1	3	Guided self-study	question
19,20,21	CHAPTER 3: DIGITAL MULTIPLEXING TECHNIQUES					

Period	Contents	References	CLOs	Competency Level	Teaching Methodology	Assessment Methodology
	A/In-class teaching content: (3) 3.1. Concepts and classifications 3.2. Principle of time multiplexing	[2] [4] [5]	G1.2	3	Present; Raise and solve problems	Evaluation by commenting on the level of participation in the lesson
	B/ Self-study content:(6) Re-read the contents on the principle of time multiplexing in the references [2], [4], [5]	[2] [4] [5]	G1.2	3	Guided self-study	question
22,23,24	CHAPTER 3: DIGITAL MULTIPLEXING TECHNIQUES (next content)					
	A/In-class teaching content: (3) 3.2.1 PDH Multiplexing 3.2.2. SDH Multiplexing	[2] [4] [5]	G1.2	3	Present; Raise and solve problems	Evaluation by commenting on the level of participation in the lesson
	B/ Self-study content:(6) Re-read the contents on the principle of PDH/SDH multiplexing in the references [2], [4], [5]	[2] [4] [5]	G1.2	3	Guided self-study	question
25,26,27	CHAPTER 3: DIGITAL MULTIPLEXING TECHNIQUES (next content)					
	A/In-class teaching content: (3) Discussion 3: Solve questions, discussions related to digital multiplexing techniques: - The difference between analog and digital TDM	[2] [4] [5]	G1.2	3	Student groups present and discuss according to the plan under the supervision of the lecturer	Evaluation by commenting on the level of participation in the lesson and completion of discussion questions

Period	Contents	References	CLOs	Competency Level	Teaching Methodology	Assessment Methodology
	<ul style="list-style-type: none"> - The difference between statistical TDM and synchronous TDM - The difference between PCM24 and PSM30 - The difference between SDH and PDH 					
	<p>B/ Self-study content:(6)</p> <p>Re-read the contents on the principle of digital multiplexing in the references [2], [4], [5]</p>	[2] [4] [5]	G1.2	3	Guided self-study	question
	CHAPTER 4: SOME WIRED TRANSMISSION NETWORKS					
28,29,30	<p>A/In-class teaching content: (3)</p> <p>4.1. Overview of ADSL</p> <p>4.2. ADSL model and working mechanism</p> <p>4.3. Techniques in ADSL</p> <p>4.4. Equipment components in ADSL network</p>	[3]	G2.1 G2.2	4 4	Present; Raise and solve problems	Evaluation by commenting on the level of participation in the lesson
	Periodic Test No.1	[3]	G1.1 G1.2	3	Written test	Evaluation by score
	<p>B/ Self-study content:(6)</p> <p>Read documents [3] about ADSL network: structure, techniques, how to deploy in practice</p>	[3]	G2.1 G2.2	4 4	Guided self-study	question
	CHAPTER 4: SOME WIRED TRANSMISSION NETWORKS (next content)					
31,32,33	<p>A/In-class teaching content: (3)</p> <p>Discussion 4:</p> <ul style="list-style-type: none"> - Specification and technology of ADSL: spread spectrum 	[3]	G2.1 G2.2	4 4	Student groups present and discuss according to the plan under	Evaluation by commenting on the level of participation in the lesson

Period	Contents	References	CLOs	Competency Level	Teaching Methodology	Assessment Methodology
	signal, system reference model, transmission capacity - Learn types of network cables: twisted pair cable, coaxial cable (construction, how to identify parameters, application scope...)				the supervision of the lecturer	and completion of discussion questions
	B/ Self-study content:(6) Read documents [3] about ADSL network: twisted pair cable, coaxial cable	[3]	G2.1 G2.2	4 4	Guided self-study	question
	CHAPTER 4: SOME WIRED TRANSMISSION NETWORKS (next content)					
34,35,36	A/In-class teaching content: (3) 4.1. Overview 4.1.1. Block diagram and operation of optical transmission line 4.1.2. Applications and development trends of optical communication 4.2. Optical fiber properties	[1]	G2.1 G2.2	4 4	Present; Raise and solve problems	Evaluation by commenting on the level of participation in the lesson
	B/ Self-study content:(6) Do exercises on the properties of optical fibers	[1]	G2.1 G2.2	4 4	Guided self-study	question
	CHAPTER 4: SOME WIRED TRANSMISSION NETWORKS (next content)					
37,38,39	A/In-class teaching content: (3) 4.3. Light emitter 4.3.1.LED 4.3.2. Laser diode (LD) 4.4. Optical receiver	[1]	G2.1 G2.2	4 4	Present; Raise and solve problems	Evaluation by commenting on the level of participation in the lesson

Period	Contents	References	CLOs	Competency Level	Teaching Methodology	Assessment Methodology
	4.4.1. PIN 4.4.2. APD					
	B/ Self-study content:(6) Read about the specifications of optical transmitters, optical receivers	[1]	G2.1 G2.2	4 4	Guided self-study	question
40,41,42	CHAPTER 4: SOME WIRED TRANSMISSION NETWORKS (next content)					
	A/In-class teaching content: (3) Discussion 5: - Structure of fiber optic cable, types of fiber optic cables in practice. - Color law of fiber optic cable - Solutions to overcome factors affecting optical transmission quality: DCF, optical amplification...	[1]	G2.1 G2.2	4 4	Student groups present and discuss according to the plan under the supervision of the lecturer	Evaluation by commenting on the level of participation in the lesson and completion of discussion questions
	B/ Self-study content:(6) Do exercises on how to calculate the distance of amplifiers, DCF fiber length, gain factor	[1]	G2.1 G2.2	4 4	Guided self-study	question
43,44,45	CHAPTER 4: SOME WIRED TRANSMISSION NETWORKS (next content)					
	A/In-class teaching content: (3) 4.5. Optical access network technologies 4.5.1. Active Optical Access Network (AON)	[1]	G2.1 G2.2	4 4	Present; Raise and solve problems	Evaluation by commenting on the level of participation in the lesson

Period	Contents	References	CLOs	Competency Level	Teaching Methodology	Assessment Methodology
	4.5.2. Passive Optical Access Network (PON)					
	B/ Self-study content:(6) Learn the AON, PON network structure and actual deployed devices	[1]	G2.1 G2.2	4 4	Guided self-study	question
46,47,48	CHAPTER 4: SOME WIRED TRANSMISSION NETWORKS (next content)					
	A/In-class teaching content: (3) 4.6. Multi-channel optical communication system 4.6.1. WDM Optical Communication System 4.6.2. Components in the WDM system 4.6.3. Factors affecting the quality of the system	[1]	G2.1 G2.2	4 4	Present; Raise and solve problems	Evaluation by commenting on the level of participation in the lesson
	Periodic Test No.2	[1]	G2.1 G2.2	4 4	Written test	Evaluation by score
	B/ Self-study content:(6) Read documentation about WDM AND DWDM systems	[1]	G2.1 G2.2	4 4	Guided self-study	question
49,50,51	CHAPTER 4: SOME WIRED TRANSMISSION NETWORKS (next content)					
	A/In-class teaching content: (3) Discussion 6: - Design a typical optical communication link: calculate the power budget, attenuation, gain loop... - System analysis	[1]	G2.1 G2.2	4 4	Student groups present and discuss according to the plan under the supervision of the lecturer	Evaluation by commenting on the level of participation in the lesson and completion of discussion questions

Period	Contents	References	CLOs	Competency Level	Teaching Methodology	Assessment Methodology
	B/ Self-study content:(6) Review chapter 4, analyze and design a optical path	[1]	G2.1 G2.2	4 4	Guided self-study	question
52,53,54	FINAL REVIEW OF COURSE					
	A/In-class teaching content: (3) Study guide from chapter 1 to chapter 4	[1] [2] [3] [4] [5]	G1.1 G1.2 G2.1 G2.2	3 3 4 4	Present	Evaluation by commenting on the level of participation in the lesson
	B/ Self-study content:(6) Review all the knowledge learned	[1] [2] [3] [4] [5]	G1.1 G1.2 G2.1 G2.2	3 3 4 4	Guided self-study	question

11. Student Assessment: 10 Score Scale.

11.1. Test plan:

No.	Content	Time (Period)	CLOs	Proficiency level	Assessment methods	Assessment tools	Weight %
Attendance						Rubric 1	6
Discussion			G1.1 G1.2 G2.1 G2.2	3 3 4 4	Comment and mark	Rubric 2	6
Regular Test Score							18
1	Chapter 2,3	30	G1.1 G1.2	3 3	Written test	Rubric 3	9
2	Chapter 4	48	G2.1 G2.2	4 4	Written test	Rubric 4	9
Final exam							70

	Chapter 1, 2, 3, 4		G1.1 G1.2 G2.1 G2.2	3 3 4 4	Multiple choice question	Rubric 5	
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CLOs	Contents				Test Method		
	Periods 1-18	Periods 19-27	Periods 28-51	Periods 52-54	Written Assessment I	Written Assessment II	Final exam Multiple choice question
G1.1	x			x	x		x
G1.2		x		x	x		x
G2.1			x	x		x	x
G2.2			x	x		x	x

11.2 Assessment Rubrics

* Rubric 1: Attendance

Criteria assessment	Weight (%)	Very good (8.5-10)	Good (7.0-8.4)	Average (5.5-6.9)	Below average (4.0-5.4)	Poor (0-3.9)
Level of participation in classes.	70	Full attendance	Missing from 1-9% of the periods	Missing from 10-15% of the periods	Missing from 16-20% of the periods	Missing from 20% of periods (ban from taking a test)
Activeness in lessons, self-study	30	Very actively participating in asking question, Complete the homework fully	Quite actively participating in asking questions and doing homework	Less actively participating in asking questions and doing homework	The teacher's Influence is required to ask questions, discuss, and do homework.	Only attend classes but do not actively participate in asking questions, discussing, doing homework

* Rubric 2: Group Discussion

Groups are assigned topics and present their results in groups.

Evaluation criteria		Weight (%)	Quality Level Description				
Criteria	CLOs		Very Good (8,5-10 point)	Good (7,0-8,4 point)	Average (5,5-6,9 point)	Below Average (4,0-5,4 point)	Poor (0-3.9 point)
Reporting contents of topics in the field of mobile communication	G1.1 G1.2 G2.1 G2.2	50	Meet 90-100% of the requirements, including extensions and references	Meet 80-90% of the requirement, including extensions and references	Meet 70-80% of the requirements	Meet 50-60% of the requirements	Meet below 50% of the requirements
Answer questions about the content of the report	G1.1 G1.2 G2.1 G2.2	50	Answer all the questions correctly	Answer 2/3 the questions correctly	Answer 1/2 the questions correctly	Answer more 1/3 the questions correctly	Answer below 1/3 the questions correctly

*** Rubric 3: Periodic Test No.1** (Allotted time: 1 period; Form: Written; Total of questions:2; Score Scale: 10)

Evaluation criteria		Weight (%)	Quality Level Description				
Question	CLOs		Very Good (8,5-10 point)	Good (7,0-8,4 point)	Average (5,5-6,9 point)	Below Average (4,0-5,4 point)	Poor (0-3.9 point)
1	G1.1	50	Beautiful and clear presentation Content that solves 90-100% about problems relating to cell, interference, frequency reuse	Clearly presented. Content that addresses 70 to less than 90% about problems relating to cell, interference, frequency reuse	The presentation is relatively clear. Content that addresses between 50 and less than 70% about problems relating to cell, interference,	The presentation is not clear. Content that addresses between 40 and less than 50% about problems relating to cell, interference, frequency reuse	The presentation is not clear. Content that resolves less than 40% about problems relating to cell, interference, frequency reuse

Evaluation criteria		Weight (%)	Quality Level Description				
Question	CLOs		Very Good (8,5-10 point)	Good (7,0-8,4 point)	Average (5,5-6,9 point)	Below Average (4,0-5,4 point)	Poor (0-3.9 point)
					frequency reuse		
2	G1.2	50	Beautiful and clear presentation Content that solves 90-100% about system capacity, trunking and service level issues...	Clearly presented. Content that addresses 70 to less than 90% about system capacity, trunking and service level issues...	The presentation is relatively clear. Content that addresses between 50 and less than 70% about system capacity, trunking and service level issues...	The presentation is not clear. Content that addresses between 40 and less than 50% about system capacity, trunking and service level issues...	The presentation is not clear. Content that resolves less than 40% about system capacity, trunking and service level issues...

*** Rubric 4: Periodic Test No.2** (Allotted time: 1 period; Form: Written; Total of questions:2; Score Scale: 10)

Evaluation criteria		Weight (%)	Quality Level Description				
Question	CLOs		Very Good (8,5-10 point)	Good (7,0-8,4 point)	Average (5,5-6,9 point)	Below Average (4,0-5,4 point)	Poor (0-3.9 point)
1	G2.1	50	Beautiful and clear presentatio. Content that solves 90-100% about problems relating to cell, interference, frequency reuse	Clearly presented. Content that addresses 70 to less than 90% about problems relating to cell, interference, frequency reuse	The presentation is relatively clear. Content that addresses between 50 and less than 70% about problems relating to cell, interference,	The presentation is not clear. Content that addresses between 40 and less than 50% about problems relating to cell, interference,	The presentation is not clear. Content that resolves less than 40% about problems relating to cell, interference, frequency reuse

Evaluation criteria		Weight (%)	Quality Level Description				
Question	CLOs		Very Good (8,5-10 point)	Good (7,0-8,4 point)	Average (5,5-6,9 point)	Below Average (4,0-5,4 point)	Poor (0-3.9 point)
					frequency reuse	frequency reuse	
2	G2.2	50	Beautiful and clear presentation Content that solves 90-100% about system capacity, trunking and service level issues...	Clearly presented. Content that addresses 70 to less than 90% about system capacity, trunking and service level issues...	The presentation is relatively clear. Content that addresses between 50 and less than 70% about system capacity, trunking and service level issues...	The presentation is not clear. Content that addresses between 40 and less than 50% about system capacity, trunking and service level issues...	The presentation is not clear. Content that resolves less than 40% about system capacity, trunking and service level issues...

***Rubric 5: Final Examination** (Allotted time: 60 minutes; Form: Multiple choice question; Total of questions: 50; Score Scale: 10)

No.	Contents	CLOs	Ability scale			Number of questions
			Understand	Apply	Analyze	
1	Chapter 1: Overview	G1.1	4	5	0	9
2	Chapter 2: Digitalizing signals	G1.1	4	5	0	9
3	Chapter 3: Digital multiplexing techniques	G1.2	4	8	0	12
4	Chapter 4: Some wired transmission networks	G2.1	5	5	4	14
		G2.2	2	2	2	6
Tổng			19	25	6	50
Tỉ lệ %			38%	50%	12%	100%

12. Reading List

A. Main Syllabus

- [1]. Nguyen Anh Tuan, Doan Thi Thanh Thao, Le Anh Tu (2017), Textbook of optical information, Thai Nguyen University Publishing House.

[2]. Dr. Nguyen Quoc Binh (2001), Digital transmission engineering, Military Technical Academy.

B. References

[3]. Nguyen Quy Sy, Nguyen Viet Cuong (2003), Teaching materials on ADSL Technology and Networking, Institute of Postal Science and Technology.

[4]. Nguyen Thi Ngan, Hoang Van Thuc, Nguyen Thi Thu Hang (2020), Transmission Engineering, Transport Publishing House

[5]. Sarah Katie Wilson, Stephen G. Wilson, Ezio Biglieri (2016), *Transmission Techniques for Digital Communications*, Academic Press Library in Mobile and Wireless Communications.

C. Software: None

13. First approval date: September 5th, 2021

14. Competent Authority Approval: University of Information and Communication Technology

Vice Rector

Dean

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Composer Team



Đoàn Thị Thanh Thảo



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13. First approval date: August 30th, 2021

14. Competent Authority Approval: University of Information and Communication Technology

Vice Rector



TS. Đỗ Đình Cường

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TS. Vũ Chiến Thắng

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