MINISTRY OF EDUCATION & TRAINING
HO CHI MINH CITY UNIVERSITY OF TECHNOLOGY & EDUCATION

UNDERGRADUATE PROGRAM

Major of
INFORMATION TECHNOLOGY

Ho Chi Minh City, May 2019

UNDERGRADUATE PROGRAM

Program's Name: INFORMATION TECHNOLOGY

Level: Undergraduate

Major: **INFORMATION TECHNOLOGY**   **Major's ID: 7480201**

Type of Program: Full Time

(Issued by decision No. ……dated….of Rector of………)

Apply from 2019 courses onward

1. Duration of study: 4 years

2. Student Enrollment: High-school graduates

3. Grading system, Curriculum and Graduation Requirements

Grading system: 10

Curriculum: Based on regulations issued by decision No. 17/VBHN-BGDĐT

Graduation requirements:

- *General conditions***:** Based on regulations issued by decision No. 17/VBHN-BGDĐT
- *Major conditions***:** Fulfil the internship
- *Requirements of High-Quality Training education*: Circular No. *23/2014/TT-BGDĐT dated on 18-07-2014*

4. Program Objectives and Expected Learning Outcomes

Goals

The High-Quality Training program majored in Information Technology is developed based on the IT Training program that has been approved by the President of UTE (2018) in accordance with the requirements from circular no. 23/2014/TT-BGDDT about high-quality training.

The program aimed at building up learners with strong personal competency, foster soft skills like teamwork, presentation, problem-solving, analysis, substantial foundational-understanding of Information Technology and related areas, and ability a adapt him/herself to the continuous changes of the working environment and the ever growing feature of

Objectives

1. To provide students with fundamental knowledge of social and natural sciences and Information Technology (IT).
2. To develop student's ability to discover knowledge, to solve problems, to think systematically, the personal and professional skills are shaped as well.
3. To develop students' ability to work effectively in team, especially multidisciplinary teams.
4. To develop student's ability to generate ideas, design, deployment, and operating IT systems along with running IT business in the real world.

Program outcomes

1. To provide students with fundamental knowledge of social and natural sciences and Information Technology (IT). Students will have:

1.1. Ability to present principles in social and natural sciences (such as Maths, Physics);

1.2. Ability to apply general principles and core technical basics to the IT field.

1.3. Ability to demonstrate solid knowledge in application to practice with areas of concentration: Computer networks (CN), Information systems (IS), and Software engineering (SE).

2. To develop student's ability in discovering knowledge, solving problems, systematically thinking, as well as forming personal and professional skills. Students will have:

   2.1. Ability to analyze and solve IT problems;

   2.2. Ability to perform survey and experiments relating to solutions for IT problems;

   2.3. Ability to think systematically things that are IT-related;

   2.4. personal skills to help improving their work performance: creativity, flexibility, learning skills, time management, etc.;

   2.5. professional skills to help improve their work performance: ethics, integrity, career planning;

3. To develop students' ability to work effectively in teams, especially multidisciplinary teams. Students will have:

   3.1. Ability to work effectively in teams and leadership skills;

   3.2. Ability to perform effective communication in text, email, graphics, oral presentation;

   3.3. Ability to communicate in foreign languages.

4. To develop student's ability to generate ideas, design, deployment, and operating IT systems in the real world. Students will have:

   4.1. Awareness of the important role of the social environment to IT systems' operation.

   4.2. Ability to judge correctly the differences in corporate cultures and to work effectively in different cultural environments.;

   4.3. Ability to generate ideas, create requirement specification, identify features, and model IT systems;

   4.4. Ability to design IT systems;

   4.5. Ability to deploy hardware and software for IT systems;

   4.6. Ability to operate IT systems.

5. **Studying condition:**
   - Well-equipped classrooms with modern Teaching and Learning facilities to match international standard.
   - The students are taken privilege to use the most modern labs of the University.
   - Class size is small and most suitable for a best teaching/learning environment.
   - The faculty are among the most experienced Professors, Ass. Professors, Senior lecturers from UTE or the Universities around the area.

What makes this program differs from the other programs:

   - Honor training programs that are taken from the advanced higher education of G7 countries.
   - More than 75% of faculty are PhDs, Senior lectures who are graduated from spoken English

countries.
- The curriculum is project-based.
- English competency of graduates are qualified at B2 or EILTS ≥ 5.5 equivalent.
- Strong soft-skills established.
- Strong ability to research and innovate.
- The Teaching Assistance (TA) policy proves to efficiently support the weak students.
- The family-connected policy to inform the academic status of the students proved to leverage the students' studying progress.

6. Total program credits: 147 credits (130 credits + 17 English language credits)

7. Allocation of credits

Name	Credits		
	Total	Compulsory	Elective
Foundation science (I)	**46**	**42**	**4**
Political theory	10	10	0
Social sciences and humanities	6	2	4
Mathematics & Natural sciences	21	21	0
Introduction to Information Technology	9	9	0
English Language (II)	**17**	**17**	0
Academic	12	12	
Technical	5	5	
IT-specialized Courses (III)	**75**	**54**	**19**
Core courses	48	36	12
Specialized courses	27	18	9
	19	**9**	**0**
Information Technology Enterprise	2	0	0
Internship	2	2	0
Capstone projects	7	7	0
Total (I+II+III+IV)	**147**	**122**	**25**
Physical Education	**5**		
Physical Education 1	1		
Physical Education 2	1		
Physical Education 3	3		
Military Education	**165 Hours**		

7. Content of the program

A. Compulsory courses

A.1. Foundation science courses (46 credits)

No	Course ID	Course name	Credits	Notes
1	LLCT130105E	Philosophy of Marxism and Leninism	3	Political science
2	LLCT120205E	Political Economics of Marxism and Leninism	2	

3	LLCT220514E	History of Vietnamese Communist Party	2	
4	LLCT120314E	Ho Chi Minh's Ideology	2	
5	LLCT120405E	Scientific Socialism	2	
4	GELA220405E	General Law	2	General law
7	MATH132901E	Probability and application	3	
8	MATH132401E	Calculus 1	3	
9	MATH132501E	Calculus 2	3	
10	MATH143001E	Linear Algebra and Algebraic Structure	4	Maths & Natural Science
11	PHYS130502E	Physics 1	3	
13	EEEN231780E	Basic Electronics	3	
14	PRBE214262E	Practice Basic Electronics	1	
15	INIT130185E	Introduction to Information Technology	3 (2+1)	
16	INPR130285E	Introduction to programming	3 (2+1)	Information Technology
17	PRTE230385E	Programming techniques	3 (2+1)	
18	PHED110513E	Physical Education 1	0	
19	PHED110613E	Physical Education 2	0	
20	PHED130715E	Physical Education 3	0	
21	GDQP008031E	Military Education	0	**165**
		Total	**46**	

A.2. Information Technology Courses

A.2.1. IT Core courses (36 credits)

No	Course ID	Course name	Credits
1	DIGR230485E	Discrete Mathematics and Graph Theory	3(2+1)
2	DASA230179E	Data Structures and Algorithms	3(2+1)
3	OOPR230279E	Object-Oriented Programming	3(2+1)
4	WIPR230579E	Windows Programming	3(2+1)
5	INSE330380E	Information Security	3(2+1)
6	WEPR330479E	Web Programming	3(2+1)
7	CAAL230180E	Computer Architecture and Assembly Language	3(2+1)
8	OPSY330280E	Operating Systems	3(2+1)
9	NEES330380E	Networking Essentials	3(2+1)
10	DBSY230184E	Database Systems	3(2+1)
11	DBMS330284E	Database Management Systems	3(2+1)
12	ARIN330585E	Artificial Intelligence	3(2+1)
13	PROJ215879E	IT Project	1
		Total	**37**

A.2.2. Specialized courses *(Students choose one among the following areas of concentration)*

No	Course ID	Course name	Credits

		Software Engineering (SE)		
1	OOSE330679E	Object-Oriented Software Engineering	3(2+1)
2	DEPA330879E	Design Patterns	3(2+1)
3	MOPR331279E	Programming for Mobile Devices	3(2+1)
4	SOTE431079E	Software Testing	3(2+1)
5	MTSE431179E	Modern Technologies on Software Engineering	3
6	POSE431479E	Project on Software Engineering	3
		Computer network (CN)		
1	INSE331980E	Cryptography	3(2+1)
2	ADNT330580E	Advanced Networking Technology	3(2+1)
3	ETHA332080E	Ethical Hacking	3(2+1)
4	CNDE430780E	Computer Networks Design	3(2+1)
5	NSEC430880E	Networks Security	3(2+1)
6	POCN431280E	Project on Computer Network & Network Security	3
		Information system (IS)		
1	ISAD330384E	Information Systems Analysis and Design	3(2+1)
2	DAMI330484E	Data Mining	3(2+1)
3	SEOC431884E	Search Engine Optimization	3(2+1)
4	BDES333877E	Big Data Essentials	3(2+1)
5	ERPC431984E	Database security	3(2+1)
6	POIS431184E	Project on Information System	3
	Total per each specialization		**18**

A.2.3. Graduation (*Students select one of following options)*

No	Course ID	Course name	Credits
	GRPR401979E	Capstone project	7

B – Elective courses:

B.1. Foundation Science courses (Students choose 2 among below list = 4 credits)

No.	Course ID	Course Name	Credits
1	GEEC220105E	General Economics	2
2	INMA220305E	Introduction to Management	2
3	INLO220405E	Introduction to Logics	2
4	LESK120190E	Learning Skills	2
5	SYTH220491E	Systematic Thinking	2
6	PLSK120290E	Planning Skill	2
7	IVNC320905E	Introduction to Vietnamese Culture	2

8	INSO321005E	Introduction to Sociology	2
9	ENPS220591E	Engineering Psychology	2
10	WOPS120390E	Workplace Skills	2
11	REME320690E	Research Methodology	2

B.2. IT Core Elective courses (Students choose 4 among below list = 12 credits)

No	Course ID	Course name	Credits
1	ADPL331379E	Advanced Programming Language	3(2+1)
2	ESYS431080E	Embedded Systems	3(2+1)
3	ITPM430884E	Information Technology Project Management	3(2+1)
4	ECOM430984E	Electronic Commerce	3(2+1)
5	WESE431479E	Web Security	3(2+1)
6	CLCO332779E	Cloud computing	3(2+1)
7	INOT431780E	Internet of Things	3(2+1)
8	DIPR430685E	Digital Image Processing	3(2+1)
9	MALE431085E	Machine Learning	3(2+1)

B.3. Specialized courses (Students choose 3 courses among below list = 9 credits by the area of concentration)

No	Course ID	Course name	Credits
1	SEEN431579E	Search Engine	3(2+1)
2	ADMP431879E	Advanced Mobile Programming	3(2+1)
3	HCIN431979E	Human Computer Interaction	3(2+1)
4	ESDN432079E	Educational Software Design	3(2+1)
5	BDAN333977E	Big Data Analysis	3(2+1)
6	DAWH430784E	Data warehouse	3(2+1)
7	INRE431084E	Information Research	3(2+1)
8	DIFO432180E	Digital Forensics	3(2+1)
9	NSMS432280E	Network Security Monitoring System	3(2+1)
10	WISE432380E	Wireless and Mobile Security	3(2+1)
11	CLAD432480E	Cloud Computing Administration	3(2+1)
12	NPRO430980E	Network Programming	3(2+1)
13	MAAN431680E	Malware Analysis	3(2+1)
14	OOSD330879E	Object-Oriented Software Design	3(2+1)
15	WESE331479E	Web Security	3(2+1)
16	ADDB331784E	Advanced Database	3(2+1)
17	ERPC431984E	ERP	3(2+1)
19	DLEA432085E	Deep Learning	3(2+1)

C. Supplementary courses (17 credits)

No.	Course's ID	Course Name	Credits	Notes
1	EHQT130137E	Academic English 1	3	
2	EHQT230237E	Academic English 2	3	
3	EHQT230337E	Academic English 3	3	
4	EHQT230437E	Academic English 4	3	
6	TEEN123785E	Technical English 1	2	
7	TEEN233885E	Technical English 2	3	

D. Plan

No.	Course id	Course name	Credits	Semester							
				1	2	3	4	5	6	7	8
			147	20	22	22	21	20	20	13	9
1	LLCT230214E	Philosophy of Marxism-Leninism	3	3							
2	LLCT120205E	Political Economics of Marxism and Leninism	2	2							
3	MATH132401E	Calculus 1	3	3							
4	EHQT130137E	Academic English 1	3	3							
5	EHQT130237E	Academic English 2	3	3							
6	INIT130185E	Introduction to IT	3	3							
7	INPR130285E	Introduction to Programming	3	3							
8		Physical Education 1									
1	LLCT120314E	Ho Chi Minh's Ideology	2		2						
2	LLCT120405E	Scientific socialism	2		2						
3	MATH132501E	Calculus 2	3		3						
4	MATH143001E	Linear Algebra and Algebraic Structure	4		4						
5	EHQT330337E	Academic English 3	3		3						
6	TEEN123785E	Technical English 1	2		2						
7	PRTE230385E	Programming techniques	3		3						
8	PHYS130902E	Physics 1	3		3						
9		Physical Education 2									
1	EHQT330437E	Academic English 4	3			3					
2	TEEN124785E	Technical English 2	3			3					
3	DIGR230485E	Discrete Mathematics & Graphs	3			3					

4	DASA230179E	Data Structure and Algorithm	3		3						
5	OOPR230279E	Object-Oriented Programming	3		3						
6	EEEN231780E	Basic Electronics	3		3						
7	DBSY230184E	Database System	3		3						
		Physic 1 Experiment	1		1						
8		Physical Education 3									
1	DBMS330284E	Database Management System	3			3					
2	WIPR230579E	Windows Programming	3			3					
3	OPSY330280E	Operating System	3			3					
4	CAAL230180E	Computer Architecture and Assembly Language	3			3					
5	NEES330380E	Networking Essentials	3			3					
6	PRBE214262E	Practice Basic Electronics	1			1					
7		Foundation knowledge Elective 1	2			2					
8	MATH132901E	Probability and application	3			3					
1		Foundation knowledge Elective 2	2				2				
2	GELA220405E	General law	2				2				
3	WEPR330479E	Web Programming	3				3				
4	ARIN330585E	Artificial Intelligence	3				3				
5	INSE330380E	Information Security	3				3				
6		IT Core elective 1	3				3				
7		IT Core elective 2	3				3				
8	PROJ215879E	IT Project	1				1				
1	LLCT230214E	History of Vietnamese Communist Party	2					2			
2		IT Core elective 3	3					3			
3		IT Core elective 4	3					3			
4		IT Specialized Elective 1	3					3			
	Software Engineering concentration							9			
5	OOSE330679E	Object-Oriented Software Engineering	3					3			
6	DEPA330879E	Design Pattern	3					3			
7	MOPR331279E	Mobile programming	3					3			
	Networking and Network security concentration							9			
5	INSE331980E	Cryptography	3					3			
6	ADNT330580E	Advanced Networking Technology	3					3			
7	ETHA332080E	Ethical Hacking	3					3			
	Information System concentration							9			

#	Course ID	Course name	Crts							
5	ISAD330384E	Information System Analysis and Design	3					3		
6	BDES333877E	Big data Essentials	3					3		
7	DAMI330484E	Data Mining	3					3		
1	ITEN420885E	Information Technology Enterprise	2						2	
2	ITIN421085E	Internship	2						2	
		Software Engineering concentration								
3	SOTE431079E	Software Testing	3						3	
4	MTSE431179E	Modern Techniques in Software Engineering	3						3	
5	POSE431479E	Project in Software Engineering	3						3	
		Networking and Network security concentration								
3	CNDE430780E	Computer Network Design	3						3	
4	NSEC430880E	Network Security	3						3	
5	POCN431280E	Project in Networking & Network Security	3						3	
		Information System concentration								
3	SEO431884E	Search Engine Optimization	3						3	
4	DBSE431284E	Database security	3						3	
5	POIS431184E	Project on Information System	3						3	
1		IT Specialized Elective 2	3							3
2	GRPR461979E	Capstone project	7							6

E. Massive Open Online Courses

Aimed to leverage the students'competency to quickly adapt themselves to higher education of advanced countries, the following courses may be taken in place of aformentioned courses.

#	Course ID	Course name	Crts	Equivalent MOOC	Equivalent percentage
1.	DIPR330685	Digital Image Processing	3	Fundamentals of Digital Image and Video Processing https://www.coursera.org/learn/digital	100
2.	MALE431984	Machine Learning	3	https://www.coursera.org/learn/machine-learning	50
3.	BDES233877	Big Data Essentials	3	https://www.coursera.org/learn/big-data-essentials	100
4.	INSE330380	Information Security	3	https://classroom.udacity.com/courses/ud459	100

9. Course descriptions and credits

1   Course name: Introduction to Information Technology   **Credits: 3**

Course description:

This course provides students with following areas of knowledge and skills:

- The general knowledge of contemporary Information Technology areas and job skills required to enter the IT market, especially soft skills;
- Introduction to the university's organization as well as skills and strategies for effective learning at university;
- A broad range of introductory Information Technology concepts, especially computational thinking. To help students gradually develop the computational thinking skill, this course provides them with basic knowledge of the Python programming language and then guides them to use this language to implement solutions for several given problems.

Main textbooks:

This course has no textbook.

References:

[1] ITL ESL, *Introduction to Information Technology*, Pearson Education India, 2013.

[2] Michael Dawson, *Python Programming for the Absolute Beginner, 3rd Edition*. Course Technology, 2010.

[3] http://www.cs4fn.org/computationalthinking/

2   Course name: Introduction to Programming   **Credits: 3**

Course description:

This course provides basic programming concepts using C/C++ programming language, knowledge of data presentation in computing, numeric systems, and methods to solve a programming problem. Moreover, this course also presents computational thinking, programming styles, approaches to problem-solving and instructions to create console applications using the standard I/O routines in C/C++ with MS Visual Studio.

Main textbooks:

[1] Brian W. Kernighan, Dennis M. Ritchie, *The C programming language*, Prentice Hall International Editions, 1997.

[2] K.N.King, *C Programming: A Modern Approach, 2nd Edition*, W.W. Norton, 2008.

References:

[1] Peter Prinz, Ulla Kirch-Prinz*, A Complete Guide to Programming in C++,* Jones and Bartlett Publishers, 2002.

[2] Rajar Raman*, Fundamentals of Computers,* Prentice Hall, 2002.

[3] Zed A. Shaw, *Learn C The Hard Way*, Addison - Wesley, 2016.

3   Course name: Programming Techniques   **Credits: 3**

Course description:

This is an intermediate course with an emphasis on specialized knowledge in the design and analysis of efficient algorithms. Students are exposed to various algorithm design paradigms. The module serves two purposes: to improve students' ability to design algorithms in different areas and to prepare students for the study of more advanced algorithms. The module covers lower and upper bounds, recurrences, basic algorithm paradigms such as prune-and-search, dynamic programming, recursion, big-numbers, divide and conquer, greedy algorithms and some selected advanced topics.

Main textbooks:

[1] Donald E. Knuth, *The Art of Computer Programming – Vol. 2*, 3rd Edition, Addison Wesley, 1997.

References:

[1] Thomas H. Cormen et al., *Introduction to Algorithms (3rd Edition),* The MIT Press, 2009.

[2] Steven S. Skiena, Miguel A. Revilla, *Programming Challenges*, Springer, 2003.

[3] Brian W. Kernighan, Dennis M. Ritchie, *The C programming language*, Prentice Hall International Editions, 1997.

[4] Lê Minh Hoàng, *Algorithms and Programming*, University of Pedagogy, Hanoi, 2006.

4   Course name: Discrete Mathematics and Graph Theory   Credits: 3

Course description:

The discrete math part provides students with the basic knowledge of sets, propositional logic, predicates and quantifiers, rules of inference, equivalence relations, partial orderings, Boolean functions, representing Boolean functions, logic gates, minimization of circuits.

The graph theory part provides students with the basic knowledge of graphs and graph models, graph terminologies, representing graphs, graph isomorphism, connectivity, Euler and Hamilton paths, shortest-path problems, introduction to trees, tree traversal, spanning trees and minimum spanning trees.

Main textbooks:

[1] Kenneth H. Rosen, *Discrete Mathematics, And Its Applications, Seventh Edition*, The McGraw-Hill Companies, Inc, 2012.

References:

[1] Dang Truong Son, Le Van Vinh, Tran Cong Tu, Nguyen Quang Ngoc, Nguyen Thanh Son, Nguyen Phuong, *Discrete Mathematics And Graph Theory*, Vietnam National University, Ho Chi Minh City Publishing Company, 2016.

[2] Nguyen Huu Anh, *Discrete Mathematics, Vietnam National University,* Ho Chi Minh City Publishing Company, 2003.

[3] Seymour L., Marc L., *Discrete Mathematics*, The McGraw-Hill Companies, Inc, 2007.

[4] Tran Ngoc Danh, *Advanced Discrete Mathematics*, Vietnam National University, Ho Chi Minh City Publishing Company, 2004.

5   Course name: Artificial Intelligence   Credits: 3

Course description:
- Provide students with knowledge of AI applications.
- Provide students with knowledge on search methods for solving problems (blind, experience, optimization, competition)
- Provide students with knowledge on knowledge representation and argument, semantic network, expert system, machine learning.
- Provide students with knowledge and skills relating to develop smart applications.

References: *http://library.thinkquest.org/2705/*

6   **Course name: Data Structures and Algorithms**   **Credits: 3**

Course description:

This course provides students with specialized knowledge in data structures and algorithms used for developing computer programs. Students are able to analyze and describe algorithms using pseudocodes as well as develop the algorithms on a computer using C/C++ programming language. Furthermore, this course also provides students with the ability to apply data structures and algorithms to solve real-world problems. Besides, students can work in groups and develop their presentation skills through seminars.

Main textbooks:

[1] Kruse, R.L, *Data structures and Program Design in C++*, Prentice-Hall Inc, 1999.

References:

[1] Lê Văn Vinh, *Giáo trình Cấu trúc dữ liệu và giải thuật*, 2013. NXB Đại học Quốc gia TP. Hồ Chí Minh.

[2] Trần Hạnh Nhi, *Nhập môn cấu trúc dữ liệu và giải thuật*, Đại học Khoa học Tự nhiên TP. HCM, 2000.

[3] Nguyễn Hồng Chương, *Cấu trúc dữ liệu – Ứng dụng và cài đặt bằng C*, NXB TP HCM, 2005.

7   **Course name: Object-Oriented Programming**   **Credits: 3**

Course description:

Object-oriented programming (OOP) is a programming paradigm based on the concept of "objects", which may contain data, in the form of fields, often known as attributes; and code, in the form of procedures, often known as methods. A feature of objects is that an object's procedures can access and often modify the data fields of the object with which they are associated (objects have a notion of "this" or "self"). In OOP, computer programs are designed by making them out of objects that interact with one another.

This course provides students with specialized knowledge in OOP used for developing application programs. Students are able to write and run programs using C++/C#/Java/Python programming language or JavaScript. Furthermore, this course also provides students with the ability to apply OOP to solve real-world problems. Besides, students can develop their teamwork and presentation skills through seminars.

Main Textbook:

[1] B. M. Harwani, *Learning Object-Oriented Programming in C# 5.0*, Cengage Learning PTR, 2015.

References:

[1] Dale Skrien, *Object-Oriented Design Using Java,* 1st edition, The McGraw-Hill Companies, Inc, 2009.

[2] Dusty Phillips, *Python 3 Object-oriented Programming*, 1st edition, Packt Publishing Limited, 2015.

[3] Andrea Chiarelli, *Mastering JavaScript Object-Oriented Programming*, 2nd edition, Packt Publishing Limited, 2016.

[4] Robert Lafore, *Object-Oriented Programming in C++*, 4th edition, SAMS Publishing, 2002.

8   Course name: Information Security   Credits: 3

Course description:

This course provides students with a consideration of security problems in computing. Topics include: security mindset, essential concepts (policy, CIA, etc.); Software security: vulnerabilities and protections, malware, program analysis; Practical cryptography: encryption, authentication, hashing, symmetric and asymmetric crypto; Networks: wired and wireless networks, protocols, attacks and countermeasures; Applications and special topics: databases, web apps, privacy and anonymity, voting, public policy.

Main textbook:

[1] Matt Bishop, I*ntroduction to Computer Security*, Prentice Hall, 2004.

References:

[1] W. Stallings, *Cryptography and Network Security - Principles and Practices.* 5th edition, Pearson, 2011

[2] Michael E Whitman, Herbert J Mattord, *Principles of information security* - Course Technology, CENGAGE Learning, 2012.

9   Course name: Web Programming   Credits: 3

Course description:

This course provides students with fundamental knowledge used to develop web applications based on the Servlet and JSP technology. The main content includes:

- Servlet;
- JSP and JSTL (JSP Standard Tag Library - a collection of useful JSP tags that encapsulate core functionality common to many JSP applications);
- JDBC;
- Some front-end technologies such as JavaScript, JQuery.

Main textbooks:

[1] Marty Hall, Larry Brown. *Core Servlets & JSP, Second Edition*. Prentice Hall, 2003.

References:

[1] Bryan Basham, Kathy Sierra, Bert Bates. *Head First Servlets and JSP, 2nd Edition*. O'Reilly Media, 2008.

[2] Joel Murach and Michael Urban. *Murach's Java Servlets and JSP, 3rd Edition*. Murach, 2014.

| 10 | **Course name: Windows Programming** | **Credits: 3** |

Course description:

This course provides students with specialized knowledge and methods in programming on windows systems. Students are also provided with fundamentals of ADO.NET to work with different database management systems. Furthermore, students are able to develop different applications using .NET technologies, including windows form controls, graphics controls, LINQ to SQL, Entity framework, Microsoft report. This course also provides students with the ability to apply .NET technologies to solve real-world problems. Besides, students can work in groups and develop their presentation skills through seminars.

Main textbooks:

[1] Chris sells Windows Form programming in C Sharp, Addison-Wesley Professional, 2003.

[2] Erik brown, Windows Form programming with C Sharp, Manning, 2002.

[3] Andrew Troelsen, C# 5.0 and the .NET 4.5 Framework, apress, 2012.

| 11 | **Course name: Software Engineering** | **Credits: 3** |

Course description:

Provide the knowledge and skills about the processing of building software: Receiving requests, Modeling the requirement, Analyzing the requirements, Designing the requirements, Building a software, Testing a software.

Main textbooks:

[1] Roger S. Pressman, *Software Engineering*, Education publisher, 2001.

References:

[1] Dương Anh Đức, *Object-oriented analysis and design with UML*, Statistical publisher, 2002.

[2] Nguyễn Tiến Huy, *Introductory syllabus for software engineering*, HCMUS, 2002.

[3] Nguyễn Minh Đạo, *Education publisher*, FIT - HCMUTE, 2004.

[4] Craig Larman, *Applying UML and Pattern*, Prentice Hall, 1998.

[5] *Software Engineering: A Practitioner's Approach,* Author: Roger S. Pressman, Publication Information: Fourth Edition, McGraw-Hill, 1997

[6] *The Mythical Man-Month: Essays on Software Engineering,* Author: Frederick P. Brooks Publication Information: 20th Anniversary Edition, Addison-Wesley, 1995

[7] *Software Engineering*, Ian Sommerville, Ninth Edition, Addison-Wesley 2011.

12   Course name: Object-Oriented Software Design   Credits: 3

Course description:

This course provides students with fundamental knowledge about software analysis and design using object-oriented techniques, Unified Modeling Language (UML) and UML tools, as well as design patterns and their applications in software development. After the course, students are equipped with analysis and design skills; the ability to use UML tools to create software design components; together with the ability to apply appropriate design patterns in various situations to improve software resilience and extensibility. Moreover, soft skills such as teamwork and public presentation are also focused.

Main textbooks:

[1] Kim Hamilton, Russell Miles, *Learning UML 2.0*, O'Reilly, 2006.

[2] E. Gamma, R. Helm, R. Johnson, J. Vlissides, *Design Patterns - Elements of Reusable Object-Oriented Software*, Addison-Wesley, 2005.

References:

[1] James W. Cooper, *The Design Patterns Java Companion*, Addison-Wesley, 1998.

[2] Horstmann, Cay, *Object-Oriented Design & Patterns*, Second Edition, John Wiley & Sons, 2006.

[3] Craig Larman, *Applying UML and Patterns: An Introduction to Object-oriented Analysis and Design and Iterative Development,* Pearson, 2008.

[4] http://www.omg.org/spec/UML/2.3/

13   Course name: Software Testing   Credits: 3

Course description:

This course provides students with specialized knowledge in Software Development Life Cycles, Software Development Models, software testing, software testing processes, fundamental designing and implementing testing techniques. After finishing course, the student can understand terms, definitions, concepts in Software testing and they can apply knowledge to design, execute, analyze and evaluate software quality. Besides that, students will practice using bug management tools and automation testing tools.

Main textbooks:

[1] Paul Ammann, Jeff Offutt, Introduction to Software Testing, Cambridge University Press, 2008.

References:

[1] Hung Q.Nguyen, Testing Application on the Web: Testing planning for mobile and Internet-based System, Wiley publishing, 2003.

[2] Glenford J.Myers, the art of Software Testing, John Wiley & Sons, 2004.

[3] Elfriede Dustin, Effective Software Testing: 50 specific ways to improve your testing, Wiley publishing, 2002.

14   Course name: Modern Technologies on Software Engineering   Credits: 3

Course description:

This course provides students with the ability to build an application using the **MEAN stack** by writing as little code as possible and taking a high-level view of the key components along the way. They're going to stand on the shoulders of giants and use as many abstractions and templates as possible.

MEAN is an acronym for the four main technologies that it is comprised of:

- MongoDB: A non-relational database
- ExpressJS: A node framework that has powerful middleware features
- AngularJS: A frontend JavaScript library created and maintained by Google that is used to create single page applications
- Node.JS: A server-side JavaScript environment based on V8

Main Textbook:

[1] Simon Holmes, *Getting MEAN with Mongo, Express, Angular, and Node*, Manning Publications Co, 2016.

References:

[1] Amos Q. Haviv, *MEAN Web Development*, 1st Edition, Packt Publishing, 2014.

15   Course name: Programming for Mobile Devices   **Credits: 3**

Course description:

This course provides students with fundamentals used to develop Android Applications. The main contents include Java concepts, Android Platform concepts, Android Application Structures, Android Libraries, Android User Interface Design. After finishing this course, the student can analyze, design and choose appropriate libraries for developing full - stack Android Applications.

Main textbooks:

[1] Ian F.Darwin, Android Cookbook, O'Reilly Media, 2012

[3] Wei Meng Lee, Beginning Android Development, Wrox, 2012.

References:

[1] Wei Meng Lee, Beginning Android Development, Wrox, 2012.

16   Course name: Web Security   **Credits: 3**

Course description:

This course provides students with knowledge about the major risks and basic popular attacking types into Web applications. This course also presents some defending methods against such types of attack. The course also equips students with the knowledge and the ability to identify threats and use appropriate tools and techniques to build a safe web application and protect it from attacks.

Main textbooks:

[1] Bryan, .S, Vincent, .L, *Web Application Security – A Beginner's Guide,* McGraw Hill,

2012.

[2] Ryan, .B, *Web Application Defender's Cookbook*. Wiley Publishing, Inc, 2013.

References:

[1] Dafydd Stuttard, Marcus Pinto. *The Web Application Hacker's Handbook*. Wiley. 2011.

[2] OWASP Top 10 - 2013.

17   Course name: Software project management   **Credits: 3**

Course description:

This course provides students with basic terminologies in Information Technology project management, especially software project management. The course focuses on major knowledge areas involved in the software management process, including project planning, scope management, requirement and change management, time and cost management, risk and human resource management. With this course, students are also equipped with basic skills in project planning and various project management activities.

Main textbooks:

[1] Project Management Institute, *A Guide to Project Management Body of Knowledge 5th Edition*, PMI, 2013.

References:

[1] Pankaj Jalote, *Software Project Management in Practice*, Addison-Wesley, 2002.

[2] Hughes Bob, Cotterell Mike, *Software Project Management 5th Edition*, McGraw-Hill, 2009.

[3] Murali Chemuturi, Thomas M. Cagley Jr., *Software Project Management: Best Practices, Tools, and Techniques*, J.Ross Publishing, 2010.

18   Course name: Advanced Programming for Mobile Devices   **Credits: 3**

Course description:

Ionic teaches web developers how to build cross-platform mobile apps for phones and tablets on iOS and Android. Students will learn how to extend their web development skills to build applications that are indistinguishable from native iOS or Android projects.

Main Textbook:

[1] Arvind Ravulavaru, *Learning Ionic*, FIRST EDITION, Packt Publishing, 2015.

References:

[1] Michael Bohner, *Building mobile apps with Ionic Framework*, Michael Bohner, 2015.

[2] Jeremy Wilken, *Ionic in Action*, Manning Publications Co, 2016

19   Course name: Database Systems   **Credits: 3**

Course description:

This course covers the fundamentals of database architectures and database systems, focusing on basics such as the data model, relational algebra, SQL and query optimization.

The course also features database design and relational design principles based on dependencies and normal forms. It is designed for undergraduate students; no prior database experience is assumed.

Main textbook:

[1] Ramez Elmasri, Shamkant Navathe, *Fundamentals of Database System, 7th Edition*, Texas. Addison-Wesley, 2015.

References:

[1] Silberschatz, Korth and Sudarshan, *Database System Concepts (6th Edition)*. New York. McGraw-Hill, 2010.

[2] Garcia-Molina, H., Ullman J.D., Widom J., *Database Systems - The Complete Book (2nd Edition)*. New Jersey, Pearson Prentice Hall, 2008.

20	**Course name: Database Management Systems**	**Credits: 3**

Course description:

This course covers the fundamentals of database management systems, database programming, and principles of database administration. This course emphasizes database concepts, developments, use and management in two main sections: database concepts and practice. Relational database management system is the main focus. The practical design of databases and developing database applications will be focused.

Main textbooks:

[1] Raghu Ramakrishnan and Johannes Gehrke, *Database Management Systems, 3rd Edition,* McGraw Hill, 2003.

[2] Tutorials Point, Database Management System, www.tutorialspoint.com, 2015.

[3] https://docs.microsoft.com/en-us/sql/t-sql/statements/statements

References:

[1] Ramez Elmasri, Shamkant Navathe, *Fundamentals of Database System, 7th Edition*, Texas. Addison-Wesley, 2015.

[2] Silberschatz, Korth and Sudarshan, *Database System Concepts (6th Edition)*. New York. McGraw-Hill, 2010.

[3] Garcia-Molina, H., Ullman J.D., Widom J., *Database Systems - The Complete Book (2nd Edition)*. New Jersey, Pearson Prentice Hall, 2008.

21	**Course name: Data Warehouse**	**Credits: 3**

Course description:

This course provides the basic knowledge of the data warehouse. In this course, the learners will learn the basic concepts of data warehouse, data warehouse architectures, and multidimensional models. They will have hands-on experience in data warehouse design and use open source products for manipulating pivot tables and creating data integration workflows. Besides, the learners will also learn how to use analytical elements of SQL supported by relational database management systems for answering business intelligence

questions.

Main textbooks:

[1] Christian S. Jensen et al., *Multidimensional Databases and Data Warehousing*, Morgan & Claypool, 2010.

[2] Paul Lane et al., *Oracle Database Data Warehousing Guide, 12c Release 1 (12.1)*, Oracle, 2014.

References:

[1] Ralph Kimball and Margy Ross, *The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling*, 3rd Edition, Wiley, 2013.

[2] Matt Casters et al., *Pentaho Kettle Solutions: Building Open Source ETL Solutions with Pentaho Data Integration*, Wiley, 2010.

[3] Microsoft, *SQL Server 2012 Tutorials: Analysis Services - Multidimensional Modeling*, SQL Server 2012 Books Online, 2012.

[4] Ramez Elmasri and Shamkant Navathe, *Fundamentals of Database Systems, 6th Edition*, Addison-Wesley, 2011.

| 22 | **Course name: Information Retrieval** | **Credits: 3** |

Course description:

This course provides basic knowledge in the field of information retrieval. It aims to help students understand how an information retrieval system (search engine) works and how to build an information retrieval system, especially a text retrieval system. It includes basic techniques used in text retrieval systems:

- The general architecture of an information retrieval system.
- Text pre-processing and indexing.
- Important information retrieval models: vector space models, probabilistic models, language models
- Methods to evaluate the accuracy of an information retrieval system.
- Relevance feedback and query expansion techniques.
- The mechanism in which a web search engine works and link analysis algorithms.

Main textbooks:

[1] ChengXiang Zhai and Sean Massung, *Text Data Management and Analysis: A Practical Introduction to Information Retrieval and Text Mining*, ACM Books, 2016.

[2] Christopher D. Manning et al., *Introduction to Information Retrieval*, Cambridge University Press, 2008. http://nlp.stanford.edu/IR-book/

References:

[1] Bruce Croft et al., *Search Engine: Information Retrieval in Practice*, Pearson, 2009. https://ciir.cs.umass.edu/irbook/

[2] Ricardo A. Baeza-Yates and Berthier A. Ribeiro-Neto, *Modern Information Retrieval, 2nd Edition*, Addison-Wesley, 2010. http://www.mir2ed.org/

[3] Stefan Büttcher and Charles L. A. Clarke, *Information Retrieval: Implementing and*

Evaluating Search Engines, 2010. http://www.ir.uwaterloo.ca/book/

23   Course name: Data Mining **Credits: 3**

Course description:

The course will cover various issues such as fundamental data mining concepts, algorithms, and computational paradigms. These algorithms and computational paradigms allow computers to find patterns and regularities in databases and generally improve their performance through interactions with data. Data mining is currently regarded as the key element of a more general process called Knowledge Discovery that deals with extracting useful knowledge from raw data. The knowledge discovery process includes data selection, cleaning, coding, using different statistical and machine learning techniques, and visualization of the generated structures.

Main textbook:

[1] Jiawei Han. *Data Mining: Concepts and Techniques (3rd edition)*, 2011.

References:

[1] Xindong, Wu et al, Knowl Inf Syst. *Top 10 algorithms in data mining*. Springer, 2008.

[2] Daniel T. Larose. *Data mining methods and models*. John Wiley & Sons, 2006.

[3] Mehmed Kantardzic. *Data Mining: Concepts, Models, Methods, and Algorithms*. John Wiley & Sons, 2003.

24   Course name: Information Systems Analysis and Design **Credits: 3**

Course description:

System analysis and design deal with planning the development of information systems through understanding and specifying in detail what a system should do and how the components of the system should be implemented and work together. This course provides the concepts, skills, methodologies, techniques, tools, and perspectives essential for systems analysts. It emphasizes the development of information systems based on object-oriented analysis and design methods. Students are required to go through the steps of the systems analysis and design process to solve real-life problems.

Main textbook:

[1] Fritz Solms. *Object-Oriented Analysis and Design using UML*. Solms Training, Consulting and Development (STCD), 2012.

References:

[1] A. Dennis, B. H. Wixom and D. Tegarden. *Systems Analysis and Design with UML* Version 2.0. John Wiley & Sons, 2005.

[2] S. Bennett, S. McRobb, and R. Farmer. *Object-Oriented Systems Analysis And Design using UML* (4th edition). McGraw Hill, 2010.

[3] G. Booch, I. Jacobson and J. Rumbaugh. *The Unified Modeling Language for Object-Oriented Development.* Documentation set, version 1.0, Rational Software Corporation, 1997.

25   **Course name: Database Security**   **Credits: 3**

Course description:

This course provides fundamental knowledge about data and database security. It also presents models as well as basic approaches and methods to implement database security: data encryption, access control, etc. After this course, students are able to implement security mechanisms in database management systems. Moreover, the course offers students with such soft skills as teamwork and public presentation.

Main textbooks:

[1] Matt B., *Computer Security: Art and Science*, Addison Wesley, 2002.

[2] Ron B. N., *Implementing Database Security, and Auditing*, Elsevier, 2005.

References:

[1] Justin C., *SQL Injection Attacks, and Defense,* Syngress, 2012.

[2] Robert W., Grant F., *Beginning SQL Server 2012 Administration*, Apress, 2012.

[3] Ron B., *How To Secure and Audit Oracle 10g & 11g,* CRC Press, 2009.

[4] Sam Afyouni, *Database Security and Auditing: Protecting Data Integrity and Accessibility*, Course Technology Press Boston, 2005.

[5] Michael Gertz, Sushil Jajodia, *Handbook of Database Security: Applications and Trends*, Springer, 2009.

[6] Elisa Bertino, Gabriel Ghinita, Ashish Kamra, *Access Control for Databases: Concepts and Systems*, Now Publishers, 2011.

26   **Course name: Computer Architecture and Assembly Languages**   **Credits: 3**

Course description:

This course provides students with basic knowledge in Computer Architecture, those attributes that have a direct impact on the logical execution of a program, the operational units and their interconnection that realize the architectural specifications. The students also get to know x86 processor organization, instruction set, memory segmentation, addressing modes; assembling a program with assembly language and debug low-level language program.

Main textbooks:

[1] William Stallings, Computer Organization, and Architecture, 9th Edition, Pearson Education, Prentice-Hall, 2013, ISBN-13: 978-0-13-293633-0

References:

[1] Nguyễn Đăng Quang, Computer Organization and Architecture, 2015

[2] Đinh Công Đoan, Bài giảng Cấu trúc máy tính và hợp ngữ, khoa CNTT trường, ĐH. SPKT Tp. HCM, 2008

27   **Course name: Operating Systems**   **Credits: 3**

Course description:

This course provides students with basic knowledge of the operating system, including the

general model, structure, functions, basic components of the operating system. Basic principles for building operating systems. The students also get to know the structure and application of basic principles in specific operating systems. Research and simulate OS device drivers through system programming.

Main textbooks:

[1] Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, *Operating System Concepts Sixth Edition*, Wiley, 2001.

References:

[1] William Stallings, *Operating Systems: Internals and Design Principles 8th Edition*, Pearson, 2014.

28   **Course name: Networking Essentials**   **Credits: 3**

Course description:

This course provides students with knowledge in basic network fundamentals, network topologies, networking operating systems and common network protocols. This course also provides knowledge and skills related to network administration for popular network operating systems such as Windows OS and Linux OS.

References:

[1] Wendell Odom*, CCENT/CCNA ICND1 – Official Cert Guide,* Cisco Press, 2016.

[2] Wendell Odom*, CCNA Routing and Switching – Official Cert Guide, Cisco Press, 2016*

[3] Mitch Tulloch*, Training Guide: Installing and Configuring Windows Server 2012 R2,* Microsoft Press, 2014

[4] Orin Thomas*, Training Guide: Administering Windows Server 2012 R2, Microsoft Press, 2014*

[5] Roderick W.Smith, *LPIC-1 Linux Professional Institute Certification Study Guide*, 3rd edition, Sybex, 2013

[6] Christin Bresnahan and Richard Blum, *LPIC-2 Linux Professional Institute Certification Study Guide, 2nd Edition*, Sybex, 2016.

29   **Course name: Data Communications**   **Credits: 3**

Course description:

This course introduces concepts, terminologies, and approaches used in data transmission systems. The course also helps students to comprehend the mechanism of data transfer between two devices via network protocols; multiplexing/demultiplexing techniques; methods of error detection and correction; and data-flow controls.

Main textbooks:

[1] Behrouz A. Forouzan, *Data Communication, and Networking 5th Edition,* McGraw Hill International Edition, 2012.

References:

[1] Fred Halsall*, Data Communications, Computer Networks and Open Systems 4th*

Edition, Addison – Wesley, 1995.

[2] William Stallings, Data and Computer Communications, 10ᵗʰ Edition, Prentice Hall, 2014.

30   **Course name: Advanced Networking Technology**   **Credits: 3**

Course description:

This course provides students with knowledge in the routing technologies, characteristics of routing protocols, VLANs, VTP, STP, Inter-VLAN routing, ACL, NAT, WAN. Moreover, the course offers students to understand the core issues, be aware of proposed solutions so they can actively follow and participate in the development of the network technologies. This course also offers students with such soft skills as teamwork and public presentation

References:

[1] Wendell Odom*, CCENT/CCNA ICND1 – Official Cert Guide,* Cisco Press, 2016

[2] Wendell Odom*, CCNA Routing and Switching – Official Cert Guide, Cisco Press, 2016*

31   **Course name: Unix Operating System**   **Credits: 3**

Course description:

This course is designed to give experienced Unix/Linux users the skills and knowledge needed to be qualified system administrators. The students are supported specialized knowledge of the structure, operations of the Unix/Linux file system, Shell programming skills, Unix/Linux system and network services administration. The students will deal with and solve real-life problems in setting up, writing scripts and administrating system/ network services on Unix/Linux operation system. The students can discuss the various aspects of the problem, various possible solutions, and try them all.

Main textbooks:

[1] Nguyen Thi Thanh Van, Unix Network Operation System, 2008

References:

[1] Graham Glass, King Ables, 2006, *Linux for Programmers and Users,* Prentice Hall

[2] Roderick W. Smith, Third Edition, 2013, *LPIC-1: Linux Professional Institute Certification Study Guide*, SYBEX Inc

[3] Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, 4th Edition, 2010, *UNIX and Linux System Administration Handbook*. Pearson Education Inc

32   **Course name: Computer Networks Design**   **Credits: 3**

Course description:

This course provides students with knowledge in network design, processes, and phases in designing networks, designing networks with 3 class models; designing Local Area Network (LAN), Wireless LAN (WLAN), Wide Area Network (WAN); designing with High availability and Load balancing.

References:

[1] Anthony Bruno, *CCDA Official Cert Guide,* Cisco Press, 2016.

[2]Sean Wilkins, *Designing for Cisco Internetwork Solutions (DESIGN)* , Cisco Press 2011.

33   Course name: Networks Security   **Credits: 3**

Course description:

This course provides students with knowledge in network security technologies, network security analysis tools, Firewall, Intrusion Detection System/Intrusion Prevention System (IDS/IPS), Security Information and Event Management (SIEM).

References:

[1] William Stallings, *Network Security Essentials*, Prentice Hall, 4th Edition, 2011.

[2] Eric Maiwald, *Fundamentals of Network Security*, McGraw Hill, 2010.

[3] Chris McNab, *Network Security Assessment – 3rd Edition*, O'Reilly Media, 2016.

[4] Darryl Gibson, *CompTIA Security+: Get Certified Get Ahead*, CompTIA, 2014.

[5]Chris Chapman, *Network Performance and Security*, SynGress, 2016.

34   Course name: Networks Programming   **Credits: 3**

Course description:

The course is designed to provide knowledge and skills in analysis and design of computer networks by focusing on network programming. Through this course, students are equipped with basic knowledge about the Socket API library on Windows, object classes in System.NET or java.net. Students can build data transmission applications at the Network layer with UDP, TCP, ICMP protocols and distributed applications using RMI. They can also apply knowledge of the course to program network management applications.

Main textbooks:

[1] Elliotte Rusty Harold. *Java Network Programming.* 4th Edition, O'Reilly Media Inc, 2014.

[2] Richard Blum. *C# Network Programming*, SYBEX, 2003.

35   Course name: Embedded Systems   **Credits: 3**

Course description:

This course provides students with basic knowledge in embedded systems, including the basic concepts of embedded systems, the properties, embedded applications; basic components of an embedded system; embedded system design process; ARM microcontroller; ARM instruction set; C programming language for embedded system; and embedded programming for arm microcontroller.

Main textbooks:

[1] Edward A. Lee, Sanjit A. Seshia, "Introduction to embedded systems – A cyber-physical systems approach", 2014.

[2] Patrick Crowley, Peter Barry, "Modern Embedded Computing – Designing Connected,

Pervasive, Media-Rich Systems", 1st Edition, MORGAN KAUFMANN PUBLISHERS, INC. 2012.

References:

[1] Frank Vahid and Tony Givargis, Embedded System Design: A Unified Hardware/Software Approach, John Wiley & Sons, Inc. 2002

[2] Joseph Yiu, "The Definitive Guide to the ARM Cortex-M3", Elsevier Newnes, 2007

[3] Jonathan W Valvano, Embedded Systems: Introduction to Arm® Cortex(TM)-M Microcontrollers(Volume 1), 2012

[4] Jonathan W Valvano, Embedded Systems: Real-Time Interfacing to Arm® Cortex™-M Microcontroller, 2012

| 36 | **Course name: Network Monitoring Systems** | **Credits: 3** |

Course description:

This course provides students with knowledge in the components of a network monitoring system; knowledge in implementing a network monitoring system, network monitoring protocols, network monitoring tools, alert systems.

References:

[1] Richard Bejtlich, *The Practice of Network Security monitoring*, No Starch press, 2013

[2] Rihards Olups, *Zabbix Network Monitoring - Second Edition*, PACKT, 2016

[3] Dinangkur Kundu, S.M. Ibrahim Lavlu, *Cacti 0.8 Network Monitoring*, PACKT Publishing, 2009

[4] Tom Ryder, *Nagios Core Administration Cookbook - Second Edition*, PACKT, 2016

| 37 | **Course name: Wireless Networks** | **Credits: 3** |

Course description:

This course provides students with basic knowledge in Wireless and mobile network, including applications, history of the wireless network, Future wireless network applications; Features of wireless environment and signal modulation techniques; Multi-access methods; Cell phone network; Wireless LAN.

Main textbooks:

[1] Jochen H Schiller, *Mobile Communication Third Edition*, Prentice Hall, 2007.

References:

[1] William Stallings, *Wireless Communications and Networks*, Prentice Hall, 2005

[2] Theodore S.Rappaport, *Wireless communications: Principle and practice, 2nd*, Prentice Hall.

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