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TRƯỜNG ĐẠI HỌC  
**SƯ PHẠM KỸ THUẬT TP. HỒ CHÍ MINH**

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**KHOA ĐÀO TẠO QUỐC TẾ**

**UNDERGRADUATE CURRICULUM MANUAL**

**INFORMATION TECHNOLOGY**

**2021**

## I. CURRICULUM

### 1<sup>st</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1	LLCT130105E	Philosophy of Marxism-Leninism	3	
2	MATH132401E	Calculus 1	3	
3	EHQT130137E	Academic English 1	3	
4	EHQT130237E	Academic English 2	3	
5	INIT130185E	Introduction to IT	3	
6	INPR130285E	Introduction to Programming	3	
7		Physical Education 1	0(1)	
<b>Total</b>			<b>18</b>	

### 2<sup>nd</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1	LLCT120205E	Political Economics of Marxism and	2	
2	LLCT120405E	Scientific socialism	2	
3	MATH132501E	Calculus 2	3	
4	MATH143001E	Linear Algebra and Algebraic Structure	4	
5	EHQT330337E	Academic English 3	3	
6	TEEN123785E	Technical English 1	2	
7		General knowledge Elective 1	2	
8	PRTE230385E	Programming techniques	3	
9	PHYS130902E	Physics 1	3	
10		Physical Education 2	0(1)	
<b>Total</b>			<b>24</b>	

### 3<sup>rd</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1	EHQT330437E	Academic English 4	3	
2	TEEN124785E	Technical English 2	3	
3	DIGR230485E	Discrete Mathematics & Graphs Theory	3	

4	DASA230179E	Data Structure and Algorithm	3	
5	OOPR230279E	Object-Oriented Programming	3	
6	EEEN231780E	Basic Electronics (IT)	3	
7	DBSY230184E	Database System	3	
8		Physic 1 - Laboratory	1	
9		General knowledge Elective 2	2	
10		Physical Education 3	0(3)	
<b>Total</b>			<b>24</b>	

#### 4<sup>th</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1	DBMS330284E	Database Management System	3	
2	WIPR230579E	Windows Programming	3	
3	OPSY330280E	Operating System	3	
4	CAAL230180E	Computer Architecture and Assembly Language	3	
5	NEES330380E	Networking Essentials	3	
6	PRBE214262E	Practice Basic Electronics	1	
7	MATH132901E	Probability and application	3	
8	LLCT120314E	Ho Chi Minh's Ideology	2	
<b>Total</b>			<b>21</b>	

#### 5<sup>th</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1	GELA220405E	General law (*)	3	
2	WEPR330479E	Web Programming	3	
3	ARIN330585E	Artificial Intelligence	3	
4	INSE330380E	Information Security	3	
5	PROJ215879E	IT Project	1	
6		IT Core elective 1	3	
7		IT Core elective 2	3	
8	LLCT230214E	History of Vietnamese Communist Party	2	
<b>Total</b>			<b>20</b>	

(\* ) will be studied in semester 1 for 2021 curriculum onward

### 6<sup>th</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
4		IT Core Elective 3	3	
4		IT Core Elective 4	3	
5		IT Specialized Elective 1	3	
		<b>Software Engineering Concentration</b>		
6	OOSE330679E	Object-Oriented Software Engineering	3	
7	DEPA330879E	Software Design Patterns	3	
8	MOPR331279E	Mobile Programming	3	
		<b>Networking and Network Security Concentration</b>		
6	INSE331980E	Cryptography	3	
7	ADNT330580E	Advanced Networking Technology	3	
8	ETHA332080E	Ethical Hacking	3	
		<b>Information System Concentration</b>		
6	ISAD330384E	Information System Analysis and Design	3	
7	BDES333877E	Big Data Essentials	3	
8	DAMI330484E	Data Mining	3	
<b>Total</b>			<b>18</b>	

### 7<sup>th</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1	ITEN420885E	Information Technology Enterprise	2	
2	ITIN441085E	Internship	4	
		<b>Software Engineering Concentration</b>		
3	SOTE431079E	Software Testing	3	
4	MTSE431179E	New Technologies in Software Engineering	3	
5	POSE431479E	Project in Software Engineering	3	
		<b>Networking and Network Security Concentration</b>		

3	CNDE430780E	Computer Network Design	3	
4	NSEC430880E	Network Security	3	
5	POCN431280E	Project on Networking & Network Security	3	
<b>Information System Concentration</b>				
3	BDAN333977E	Big Data Analysis	3	
4	DBSE431284E	Database Security	3	
5	POIS431184E	Project on Information System	3	
<b>Total</b>			<b>15</b>	

### 8<sup>th</sup> Semester

No.	Course ID	Course Title	Credits	Prerequisite
1		IT Specialized Elective 2	3	
2	GRPR471979E	Capstone Project	7	
<b>Total</b>			<b>10</b>	

### ELECTIVE COURSES

#### General Knowledge Courses (4 credits)

No.	Course ID	Course Title	Credits	Note
1	GEEC220105E	General Economics	2	Select 2 courses
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 the Vietnamese Culture	2	
8	INSO321005E	Introduction to Sociology	2	
9	ENPS220591E	Engineering Psychology	2	
10	WOPS120390E	Workplace Skills	2	
11	REME320690E	Research Methodology	2	

#### IT Core Elective Courses (12 credits)

No.	Course ID	Course Title	Credits	Note
1	ADPL331379E	Advanced Programming Language	3(2+1)	Select 4 courses
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)	

### Specialized Courses (9 credits)

No.	Course ID	Course Title	Credits	Note
1	SEEN431579E	Search Engine	3(2+1)	Select 3 courses
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)	

18	DLEA432085E	Deep Learning	3(2+1)	
19	SOPM431679E	Software project management	3(2+1)	

## II. COURSE DESCRIPTIONS

### Introduction to Information Technology

**Credits: 3**

*Prerequisites: None*

*Course Description:*

This course provides students with a broad range of introductory IT concepts; General knowledge of contemporary information technology and job skills required to enter the IT market, especially soft skills. An introduction Computational Thinking and Python programming are also included.

*Textbooks:*

This course has no textbook.

*References:*

- 1) Dawson, Michael. *Python Programming for the Absolute Beginner*. 3<sup>rd</sup> ed., Course Technology, 2010.
- 2) ITL ESL. *Introduction to Information Technology*. Pearson Education India, 2013.
- 3) <http://www.cs4fn.org/computationalthinking/>

### Introduction to Programming

**Credits: 3**

*Prerequisites: None*

*Course Description:*

This course provides students with 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 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.

*Textbooks:*

- 1) Kernighan, Brian W., and Dennis M. Ritchie. *The C Programming Language*. Prentice Hall International Editions, 1997.
- 2) King, K. N. *C Programming: A Modern Approach*. 2<sup>nd</sup> ed., W.W. Norton, 2008.

*References:*

- 1) Prinz, Peter, and Ulla Kirch-Prinz. *A Complete Guide to Programming in C++*. Jones and Bartlett Publishers, 2002.
- 2) Raman, Rajar. *Fundamentals of Computers*. Prentice Hall, 2002.
- 3) Shaw, Zed A. *Learn C The Hard Way*. Addison-Wesley, 2016.

### Programming Techniques

**Credits: 3**

*Prerequisites: None*

*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.

*Textbooks:*

1) Knuth, Donald E. *The Art of Computer Programming – Vol. 2.* 3<sup>rd</sup> ed., Addison Wesley, 1997.

*References:*

1) Cormen, Thomas H., et al. *Introduction to Algorithms.* 3<sup>rd</sup> ed., MIT Press, 2009.

2) Kernighan, Brian W., and Dennis M. Ritchie. *The C Programming Language.* Prentice Hall International Editions, 1997.

3) Lê Minh Hoàng. *Algorithms and Programming.* University of Pedagogy, Hanoi, 2006.

4) Skiena, Steven S., and Miguel A. Revilla. *Programming Challenges.* Springer, 2003.

### **Discrete Mathematics and Graph Theory**

**Credits: 3**

*Prerequisites: None*

*Course Description:*

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

*Textbooks:*

1) Rosen, Kenneth H. *Discrete Mathematics and Its Applications.* 7<sup>th</sup> ed., McGraw-Hill Companies, Inc, 2012.

*References:*

1) Dang Truong Son, et al. *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., and Marc L. *Discrete Mathematics.* McGraw-Hill Companies, Inc, 2007

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

### **Artificial Intelligence**

**Credits: 3**

*Prerequisites: None*

*Course Description:*



This course aims to provide students with knowledge of AI applications; knowledge on search methods for solving problems (blind, experience, optimization, competition); knowledge of representation and argument, semantic network, expert system, machine learning; knowledge and skills relating to developing smart applications.

*References:*

<http://library.thinkquest.org/2705/>

### **Data Structures and Algorithms**

**Credits: 3**

*Prerequisites: Introduction to programming, Programming Techniques*

*Course Description:*

This course provides students with specialized knowledge in data structures and algorithms used for developing computer programs. Students are able to analyse 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.

*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*. NXB Đại Học Quốc Gia TP. Hồ Chí Minh, 2013.

2) Nguyễn Hồng Chương. *Cấu Trúc Dữ Liệu – Ứng Dụng Và Cài Đặt Bằng C*. NXB TP HCM, 2005.

3) Trần Hạnh Nhi. *Nhập Môn Cấu Trúc Dữ Liệu Và Giải Thuật*. Đại Học Khoa Học Tự Nhiên TP. HCM, 2000.

### **Object-Oriented Programming**

**Credits: 3**

*Prerequisites: Introduction to programming*

*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.

*Textbook:*

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

*References:*

- 1) Chiarelli, Andrea. *Mastering JavaScript Object-Oriented Programming*. 2<sup>nd</sup> ed., Packt Publishing Limited, 2016.
- 2) Lafore, Robert. *Object-Oriented Programming in C++*. 4<sup>th</sup> ed., SAMS Publishing, 2002.
- 3) Phillips, Dusty. *Python 3 Object-Oriented Programming*. 1<sup>st</sup> ed., Packt Publishing Limited, 2015.
- 4) Skrien, Dale. *Object-Oriented Design Using Java*. 1<sup>st</sup> ed., McGraw-Hill Companies Inc., 2009.

**Information Security**

**Credits: 3**

*Prerequisites: None*

*Course Description:*

This course provides students with a consideration of security problems in computing. Topics include: (1) Foundations: security mindset, essential concepts (Policy, CIA, etc.); (2) Software and OS security: vulnerabilities and protections, malware analysis; (3) Practical cryptography: encryption, authentication, hashing, symmetric and asymmetric crypto; (4) Networks: protocols, attacks and countermeasures

*Main textbook:*

- 1) William Stallings and Lawrie Brown (2014), *Computer Security, Principles and Practice*, Third Edition ISBN-10: 0-133-77392-2
- 2) Wenliang Du (2017), *Computer security a hands-on approach*, ISBN-10: 154836794X

*References:*

- 1) Mark Stamp (2011), *Information Security, Principle and Practices, 2<sup>nd</sup> Edition*, Wiley Inc. Publication
- 2) W. Stallings (2011), *Cryptography and Network Security - Principles and Practices*, 5th Edition, Pearson.
- 3) Matt Bishop (2004), *Introduction to Computer Security*, Prentice Hall, ISBN 0-321247442

**Web Programming**

**Credits: 3**

*Prerequisites: Introduction to programming*

*Course Description:*

This course provides students with fundamental knowledge used to develop web applications based on Servlet and JSP technology. The main contents include (1) Servlet; (2) JSP and JSTL (JSP Standard Tag Library - a collection of useful JSP tags that encapsulate core functionality common to many JSP applications); (3) JDBC; (4) some front-end technologies such as JavaScript and JQuery.

*Textbooks:*

- 1) Hall, Marty, and Larry Brown. *Core Servlets & JSP*. 2<sup>nd</sup> ed., Prentice Hall, 2003.

*References:*

- 1) Basham, Bryan, Kathy Sierra, and Bert Bates. *Headfirst Servlets and JSP*. 2<sup>nd</sup> ed., O'Reilly Media, 2008.
- 2) Murach, Joel, and Michael Urban. *Murach's Java Servlets and JSP*. 3<sup>rd</sup> ed., Murach, 2014.

**Windows Programming**

**Credits: 3**

*Prerequisites: Introduction to programming, OOP, DBMS*

*Course Description:*

This course provides students with specialized knowledge and methods in programming on Windows systems. Students are also provided with the 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.

*Textbooks:*

- 1) Brown, Erik. *Windows Form Programming with C Sharp*. Manning, 2002.
- 2) Sells, Chris. *Windows Form Programming in C Sharp*. Addison-Wesley Professional, 2003.
- 3) Troelsen, Andrew. *C# 5.0 and the .NET 4.5 Framework*. Apress, 2012.

**Software Engineering**

**Credits: 3**

*Prerequisites:*

*Course Description:*

This course aims to provide knowledge and skills related to software engineering, such as receiving requests, modelling the requirement, analysing the requirements, designing the requirements, building software and testing software.

*Textbooks:*

- 1) Roger S. Pressman. *Software Engineering*. Education Publisher, 2001.

*References:*

- 1) Brooks, Frederick P. *The Mythical Man-Month: Essays on Software Engineering*. 20<sup>th</sup> Anniversary Edition, Addison-Wesley, 1995.
- 2) Dương Anh Đức. *Object-Oriented Analysis and Design with UML*. Statistical Publisher, 2002.
- 3) Larman, Craig. *Applying UML and Pattern*. Prentice Hall, 1998.
- 4) Nguyễn Minh Đạo. Education Publisher. FIT - HCMUTE, 2004.
- 5) Pressman, Roger S. *Software Engineering: A Practitioner's Approach*. 4<sup>th</sup> ed., McGraw-Hill, 1997.
- 6) Sommerville, Ian. *Software Engineering*. 9<sup>th</sup> ed., Addison-Wesley, 2011.

**Object-Oriented Software Design**

**Credits: 3**

*Prerequisites: OOP*

### *Course Description:*

This course provides students with fundamental knowledge about software analysis and design using object-oriented techniques, Unified Modelling Language (UML) and UML tools, as well as design patterns and their applications in software development. By the end of the course, students will be equipped with analysis and design skills, such as the ability to use UML tools to create software design components and 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 developed during the course.

### *Textbooks:*

- 1) Gamma, E., et al. *Design Patterns - Elements of Reusable Object-Oriented Software*. Addison-Wesley, 2005.
- 2) Hamilton, Kim, and Russell Miles. *Learning UML 2.0*. O'Reilly, 2006.

### *References:*

- 1) Cooper, James W. *The Design Patterns Java Companion*. Addison-Wesley, 1998.
- 2) Horstmann, Cay. *Object-Oriented Design & Patterns*. 2<sup>nd</sup> ed., John Wiley & Sons, 2006.
- 3) Larman, Craig. *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/>

## **Software Testing**

**Credits: 3**

*Prerequisites: Software Engineering*

### *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 the course, students will be able to understand terms, definitions, and concepts in software testing and they will be able to apply knowledge to design, execute, analyse and evaluate software quality. Besides that, students will have the opportunity to do practical work using bug management tools and automation testing tools.

### *Textbooks:*

- 1) Ammann, Paul, and Jeff Offutt. *Introduction to Software Testing*. Cambridge University Press, 2008.

### *References:*

- 1) Dustin, Elfriede. *Effective Software Testing: 50 Specific Ways to Improve Your Testing*. Wiley Publishing, 2002.
- 2) Myers, Glenford J. *The Art of Software Testing*. John Wiley & Sons, 2004.
- 3) Nguyen, Hung Q. *Testing Application on the Web: Testing Planning for Mobile and Internet-Based System*. Wiley Publishing, 2003.

## **Modern Technologies on Software Engineering**

**Credits: 3**

*Prerequisites: Web programming*

### *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. The students will use as many abstractions and templates as possible.

MEAN is an acronym for the four main technologies (1) MongoDB: A non-relational database; (2) ExpressJS: A node framework that has powerful middleware features; (3) AngularJS: A frontend JavaScript library created and maintained by Google that is used to create single-page applications; (4) Node.JS: A server-side JavaScript environment based on V8.

### *Textbook:*

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

### *References:*

- 1) Haviv, Amos Q. *MEAN Web Development*. Packt Publishing, 2014.

## **Programming for Mobile Devices**

**Credits: 3**

*Prerequisites: Web programming*

### *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, and Android User Interface Design. After finishing this course, students will be able to analyse, design and choose appropriate libraries for developing full-stack Android Applications.

### *Textbooks:*

- 1) Darwin, Ian F. *Android Cookbook*. O'Reilly Media, 2012.
- 2) Lee, Wei-Meng. *Beginning Android Development*. Wrox, 2012.

### *References:*

- 1) Lee, Wei-Meng. *Beginning Android Development*. Wrox, 2012.

## **Web Security**

**Credits: 3**

*Prerequisites: Information security, Web programming*

### *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 attacks. 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.

### *Textbooks:*

- 1) Bryan, S., and 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) Stuttard, Dafydd, and Marcus Pinto. *The Web Application Hacker's Handbook*. Wiley, 2011.
- 2) OWASP Top 10 - 2013.

## **Software Project Management**

**Credits: 3**

*Prerequisites: none*

*Course Description:*

This course provides students with basic terminology 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. In this course, students are also equipped with basic skills in project planning and various project management activities.

*Textbooks:*

- 1) Project Management Institute. *A Guide to Project Management Body of Knowledge* 5<sup>th</sup> ed., PMI, 2013.

*References:*

- 1) Chemuturi, Murali K., and Thomas M. Cagley Jr. *Software Project Management: Best Practices, Tools, and Techniques*. J. Ross Publishing, 2010.
- 2) Hughes, Bob, and Mile Cotterell. *Software Project Management*. 5<sup>th</sup> ed., McGraw-Hill, 2009.
- 3) Jalote, Pankaj. *Software Project Management in Practice*. Addison-Wesley, 2002.

## **Advanced Programming for Mobile Devices**

**Credits: 3**

*Prerequisites: Mobile programming*

*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.

*Textbooks:*

- 1) Ravulavaru, Arvind. *Learning Ionic*. Packt Publishing, 2015.

*References:*

- 1) Bohner, Michael. *Building Mobile Apps with Ionic Framework*. Michael Bohner, 2015.
- 2) Wilken, Jeremy. *Ionic in Action*. Manning Publications Co, 2016.

## **Database Systems**

**Credits: 3**

*Prerequisites: Database*

*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.

*Textbook:*

- 1) Elmasri, Ramez, and Shamkant Navathe. *Fundamentals of Database System*. 7<sup>th</sup> ed., Texas, Addison-Wesley, 2015.

*References:*

- 1) Garcia-Molina, H., J. D. Ullman, and J. Widom. *Database Systems - The Complete Book*. 2<sup>nd</sup> ed., New Jersey, Pearson Prentice Hall, 2008.
- 2) Silberschatz, A., H. Korth, and S. Sudarshan. *Database System Concepts*. 6<sup>th</sup> ed., New York, McGraw-Hill, 2010.

**Database Management Systems**

**Credits: 3**

*Prerequisites: Database*

*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. The relational database management system is the main focus of the course alongside the practical design of databases and developing database applications.

*Textbooks:*

- 1) Ramakrishnan, Raghu, and Johannes Gehrke. *Database Management Systems*. 3<sup>rd</sup> ed., McGraw Hill, 2003.
- 2) Tutorials Point, Database Management System, [www.tutorialspoint.com](http://www.tutorialspoint.com), 2015.
- 3) <https://docs.microsoft.com/en-us/sql/t-sql/statements/statements>

*References:*

- 1) Elmasri, Ramez, and Shamkant Navathe. *Fundamentals of Database System*. 7<sup>th</sup> ed., Texas, Addison-Wesley, 2015.
- 2) Garcia-Molina, H., J. D. Ullman, and J. Widom. *Database Systems - The Complete Book*. 2<sup>nd</sup> ed., New Jersey, Pearson Prentice Hall, 2008.
- 3) Silberschatz, A., H. Korth, and S. Sudarshan. *Database System Concepts*. 6<sup>th</sup> ed., New York, McGraw-Hill, 2010.

**Data Warehouse**

**Credits: 3**

*Prerequisites: Database systems*

*Course Description:*

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

*Textbooks:*

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

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

*References:*

- 1) Casters, Matt, et al. *Pentaho Kettle Solutions: Building Open Source ETL Solutions with Pentaho Data Integration*. Wiley, 2010.
- 2) Elmasri, Ramez, and Shamkant Navathe. *Fundamentals of Database Systems*. 6<sup>th</sup> ed., Addison-Wesley, 2011.
- 3) Kimball, Ralph, and Margy Ross. *The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling*. 3<sup>rd</sup> ed., Wiley, 2013.
- 4) Microsoft. *SQL Server 2012 Tutorials: Analysis Services - Multidimensional Modeling*. SQL Server 2012 Books Online, 2012.

## **Information Retrieval**

**Credits: 3**

*Prerequisites: None*

*Course Description:*

This course provides students with 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: (1) The general architecture of an information retrieval system; (2) Text pre-processing and indexing; (3) Important information retrieval models: vector space models, probabilistic models, language models; (4) Methods to evaluate the accuracy of an information retrieval system; (5) Relevance feedback and query expansion techniques; (6) The mechanism in which a web search engine works and links analysis algorithms.

*Textbooks:*

- 1) Manning, Christopher D., et al. *Introduction to Information Retrieval*. Cambridge University Press, 2008.
- 2) Zhai, ChengXiang, and Sean Massung. *Text Data Management and Analysis: A Practical Introduction to Information Retrieval and Text Mining*. ACM Books, 2016.

*References:*

- 1) Baeza-Yates, Ricardo A., and Berthier A. Ribeiro-Neto. *Modern Information Retrieval*. 2<sup>nd</sup> ed., Addison-Wesley, 2010.
- 2) Büttcher, Stefan, and Charles L. A. Clarke, *Information Retrieval: Implementing and Evaluating Search Engines*. 2010.
- 3) Croft, Bruce, et al. *Search Engine: Information Retrieval in Practice*. Pearson, 2009.

## **Data Mining**

**Credits: 3**

*Prerequisites: None*

*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.

*Textbook:*

- 1) Han, Jiawei. *Data Mining: Concepts and Techniques*. 3<sup>rd</sup> ed., Morgan Kaufmann, 2011.

*References:*

- 1) Kantardzic, Mehmed. *Data Mining: Concepts, Models, Methods, and Algorithms*. John Wiley & Sons, 2003.
- 2) Larose, Daniel T. *Data Mining Methods and Models*. John Wiley & Sons, 2006.
- 3) Wu, X., et al. "Top 10 Algorithms in Data Mining". *Knowl Inf Syst* **14**, 1–37, 2008.

### **Information Systems Analysis and Design**

**Credits: 3**

*Prerequisites: None*

*Course Description:*

System analysis and design deals 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.

*Textbook:*

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

*References:*

- 1) Bennett, S., S. McRobb, and R. Farmer. *Object-Oriented Systems Analysis And Design Using UML*. 4<sup>th</sup> ed., McGraw Hill, 2010.
- 2) Booch, G., I. Jacobson, and J. Rumbaugh. *The Unified Modeling Language for Object-Oriented Development*. Documentation set, version 1.0, Rational Software Corporation, 1997.
- 3) Dennis, A., B. H. Wixom, and D. Tegarden. *Systems Analysis and Design with UML Version 2.0*. John Wiley & Sons, 2005.

### **Database Security**

**Credits: 3**

*Prerequisites: Database system, Information Security*

*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. By the end of this course, students will be able to implement security

mechanisms in database management systems. Moreover, the course offers students the opportunity to develop soft skills such as teamwork and public presentation.

*Textbooks:*

- 1) Ben-Natan, Ron. *Implementing Database Security, and Auditing*. Elsevier, 2005.
- 2) Bishop, Matt. *Computer Security: Art and Science*. Addison-Wesley, 2002.

*References:*

- 1) Afyouni, Sam. *Database Security and Auditing: Protecting Data Integrity and Accessibility*. Boston, Course Technology Press, 2005.
- 2) Ben-Natan, Ron. *How To Secure and Audit Oracle 10g & 11g*. CRC Press, 2009.
- 3) Bertino, Elisa, Gabriel Ghinita, and Ashish Kamra. *Access Control for Databases: Concepts and Systems*. Now Publishers, 2011.
- 4) Clarke, Justin. *SQL Injection Attacks, and Defense*. Syngress, 2012.
- 5) Gertz, Michael, and Sushil Jajodia. *Handbook of Database Security: Applications and Trends*. Springer, 2009.
- 6) Walters, R., and G. Fritchey. *Beginning SQL Server 2012 Administration*. Apress, 2012.

### **Computer Architecture and Assembly Languages**

**Credits: 3**

*Prerequisites: None*

*Course Description:*

This course provides students with basic knowledge in computer architecture and 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, how to assemble a program with assembly language and debug low-level language program.

*Textbooks:*

- 1) Stallings, William. *Computer Organization and Architecture*. 9<sup>th</sup> ed., Pearson Education, Prentice-Hall, 2013.

*References:*

- 1) Nguyễn Đăng Quang. *Computer Organization and Architecture lecture notes*. 2015.
- 2) Đinh Công Đoàn. *Bài Giảng Cấu Trúc Máy Tính Và Hợp Ngữ*. Khoa CNTT Trường, ĐH. SPKT Tp. HCM, 2008.

### **Operating Systems**

**Credits: 3**

*Prerequisites: Computer Architecture and Assembly language*

*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, and basic principles for building operating systems. The students also get to know the structure and application of basic principles in specific operating systems, as well as research and simulate OS device drivers through system programming.

*Textbook:*

- 1) Silberschatz, Abraham, Peter Baer Galvin, and Greg Gagne. *Operating System Concepts*. 6<sup>th</sup> ed., Wiley, 2001.

*References:*

- 1) Stallings, William. *Operating Systems: Internals and Design Principles*. 8<sup>th</sup> ed., Pearson, 2014.

### **Networking Essentials**

**Credits: 3**

*Prerequisites: None*

*Course Description:*

This course provides students with knowledge of 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) Bresnahan, Christin, and Richard Blum. *LPIC-2 Linux Professional Institute Certification Study Guide*. 2<sup>nd</sup> ed., Sybex, 2016.
- 2) Odom, Wendell. *CCENT/CCNA ICND1 – Official Cert Guide*. Cisco Press, 2016.
- 3) Odom, Wendell. *CCNA Routing and Switching – Official Cert Guide*. Cisco Press, 2016.
- 4) Smith, Roderick W. *LPIC-1 Linux Professional Institute Certification Study Guide*. 3<sup>rd</sup> ed., Sybex, 2013.
- 5) Thomas, Orin. *Training Guide: Administering Windows Server 2012 R2*. Microsoft Press, 2014.
- 6) Tulloch, Mitch. *Training Guide: Installing and Configuring Windows Server 2012 R2*. Microsoft Press, 2014.

### **Data Communications**

**Credits: 3**

*Prerequisites: Networking Essentials*

*Course Description:*

This course will explore the various types of data communication systems, networks, and applications. Concept and terminologies like computer networks, layer architecture (OSI, TCP/IP), network hardware, network software, standardization, network medium, and IP addressing will be explored. The practical aspect will deal with building small to medium level networks including Cabling, Configuring TCP/IP, Peer to Peer networking, and sharing resources.

*Textbooks:*

- 1) Forouzan, Behrouz A. *Data Communication and Networking*. 5<sup>th</sup> ed., McGraw Hill International Edition, 2012.

*References:*

- 1) Halsall, Fred. *Data Communications, Computer Networks and Open Systems*. 4<sup>th</sup> ed., Addison-Wesley, 1995.
- 2) Stallings, William. *Data and Computer Communications*. 10<sup>th</sup> ed., Prentice Hall, 2014.

### **Advanced Networking Technology**

**Credits: 3**

*Prerequisites: Networking Essentials*

*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, this course provides students with an understanding of the core issues and awareness of proposed solutions so they can actively follow and participate in the development of network technologies. This course also offers students the opportunity to develop soft skills such as teamwork and public presentation

*References:*

- 1) Odom, Wendell. *CCENT/CCNA ICND1 – Official Cert Guide*. Cisco Press, 2016.
- 2) Odom, Wendell. *CCNA Routing and Switching – Official Cert Guide*. Cisco Press, 2016.

### **Unix Operating System**

**Credits: 3**

*Prerequisites: Networking essentials*

*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 introduced to 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 will discuss the various aspects of the problem, various possible solutions, and try them all.

*Textbooks:*

- 1) Nguyen Thi Thanh Van. *Unix Network Operation System*. 2008.

*References:*

- 1) Glass, Graham, and King Ables. *Linux for Programmers and Users*. Prentice Hall, 2006.
- 2) Nemeth, Evi, et al. *UNIX and Linux System Administration Handbook*. 4<sup>th</sup> ed., Pearson Education Inc., 2010.
- 3) Smith, Roderick W. *LPIC-1: Linux Professional Institute Certification Study Guide*. 3<sup>rd</sup> ed., SYBEX Inc., 2013.

### **Computer Networks Design**

**Credits: 3**

*Prerequisites: Networking Essentials, Advanced Networking Technology*

*Course Description:*

This course provides students with knowledge in network design processes and phases; 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) Bruno, Anthony. *CCDA Official Cert Guide*. Cisco Press, 2016.
- 2) Wilkins, Sean. *Designing for Cisco Internetwork Solutions (DESIGN)*. Cisco Press, 2011.

### **Networks Security**

**Credits: 3**

*Prerequisites: Networking Essentials, Information Security*

*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) Chapman, Chris. *Network Performance and Security*. SynGress, 2016.
- 2) Gibson, Darryl. *CompTIA Security+: Get Certified Get Ahead*. CompTIA, 2014.
- 3) Maiwald, Eric. *Fundamentals of Network Security*. McGraw Hill, 2010.
- 4) McNab, Chris. *Network Security Assessment*. 3<sup>rd</sup> ed., O'Reilly Media, 2016.
- 5) Stallings, William. *Network Security Essentials*. 4<sup>th</sup> ed., Prentice Hall, 2011.

## **Networks Programming**

**Credits: 3**

*Prerequisites: Networking Essentials, Introduction to programming*

*Course Description:*

This course is designed to provide knowledge and skills in the 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.

*Textbooks:*

- 1) Blum, Richard. *C# Network Programming*. SYBEX, 2003.
- 2) Harold, Elliotte Rusty. *Java Network Programming*. 4<sup>th</sup> ed., O'Reilly Media Inc., 2014.

## **Embedded Systems**

**Credits: 3**

*Prerequisites: Computer Architecture*

*Course Description:*

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

*Textbooks:*

- 1) Crowley, Patrick, and Peter Barry. *Modern Embedded Computing – Designing Connected, Pervasive, Media-Rich Systems*. Morgan Kaufmann Publishers, Inc., 2012.
- 2) Lee, Edward A., and Sanjit A. Seshia. *Introduction to Embedded Systems – A Cyber-Physical Systems Approach*. MIT Press, 2014.

*References:*

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

- 2) Valvano, Jonathan W. *Embedded Systems: Introduction to Arm®. Cortex(TM)-M Microcontrollers (Volume 1)*. 5<sup>th</sup> ed., CreateSpace Independent Publishing Platform, 2012.
- 3) Valvano, Jonathan W. *Embedded Systems: Real-Time Interfacing to Arm®. Cortex™-M Microcontroller*. 2<sup>nd</sup> ed., CreateSpace Independent Publishing Platform, 2012.
- 4) Yiu, Joseph. *The Definitive Guide to the ARM Cortex-M3*. Elsevier Newnes, 2007.

### **Network Monitoring Systems**

**Credits: 3**

*Prerequisites: Networking Essentials, Advanced Networking*

*Course Description:*

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

*References:*

- 1) Bejtlich, Richard. *The Practice of Network Security Monitoring*. No Starch Press, 2013.
- 2) Kundu, Dinangkur, and S. M. Ibrahim Lavlu. *Cacti 0.8 Network Monitoring*. Packt Publishing, 2009.
- 3) Olups, Rihards. *Zabbix Network Monitoring*. 2<sup>nd</sup> ed., Packt Publishing, 2016.
- 4) Ryder, Tom. *Nagios Core Administration Cookbook*. 2<sup>nd</sup> ed., Packt Publishing, 2016.

### **Wireless Networks**

**Credits: 3**

*Prerequisites: Networking Essentials*

*Course Description:*

This course provides students with basic knowledge in wireless and mobile networks, including applications, history of the wireless networks, future wireless network applications, features of wireless environment and signal modulation techniques, multi-access methods, cell phone networks, and wireless LAN.

*Textbooks:*

- 1) Schiller, Jochen H. *Mobile Communication*. 3<sup>rd</sup> ed., Prentice Hall, 2007.

*References:*

- 1) Rappaport, Theodore S. *Wireless communications: Principle and practice*. 2<sup>nd</sup> ed., Prentice Hall.
- 2) Stallings, William. *Wireless Communications and Networks*. Prentice Hall, 2005.