

# The Syllabus of Computer Sciences Department 2010-2011



المناهج الدراسية لقسم علوم الحاسوب

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Computer Sciences Department  
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## Software Branch

فرع البرمجيات

[www.uotechnology.edu.iq](http://www.uotechnology.edu.iq)



## First Year Syllabus

## منهج المرحلة الأولى

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
4	-	2	3	Structured Programming	البرمجة المهيكلية (لغة C++)	.1
2	1	-	2	Mathematics	الرياضيات	.2
2	-	-	2	Fundamental of Programming Technique	اساسيات تقنيات البرمجة	.3
2	1	-	2	Discrete Structures	الهياكل المتقطعة	.4
2	-	-	2	Computer Organization and Information Technology	تركيب الحاسبة وتكنولوجيا المعلومات	.5
3	1	2	2	Logic Design	التصميم المنطقي	.6
Pass	-	-	2	Human Rights	حقوق الإنسان	.7
Pass	-	-	2	English	اللغة الانكليزية	.8
15	3	4	17	<b>Total</b>		

Total No. of Unit for One Semester: (15)Units

مجموعة الوحدات للفصل الدراسي الواحد: ( 15 ) وحدة

Total No. of Unit for Year: ( 30 ) Units

مجموعة الوحدات لسنة دراسية: ( 30 ) وحدة

### 1- Structured Programming (with C++ Programming Language):

- ▶ Introduction,
- ▶ Procedural Programming Principles,
- ▶ Algorithm ,
- ▶ Algorithm properties ,  
Examples,
- ▶ Flowcharts,  
Flowchart Figure,  
Examples
- ▶ C++ Language Basics (Character set, Identifiers, Getting Started with C++, Variables Declaration, Variables, Constants, Arithmetic Operations,
- ▶ The “math.h” Library, Unary Minus, Increment and /decrement Operators, Operational Assignment Operators, Relational Operators, Logical Operators, Bitwise Operator),
- ▶ Selection Statements (Selection Statements, The Single If Statement Structure, The Single If Statement Structure (Blocks), The If/else Statement Structure, Nested If and If/else Statements, The Switch Selection Statement (Selector),
- ▶ Conditional Statement), Iteration Statements (Selection Statements, While Repetition Structure, Do/While Statement, For Statement, More about For Statement, Nested Loops, Break and Continue Control Statements),
- ▶ Functions (Function, Passing Parameters (Passing by Value, Passing by Reference)), Arrays (Array of One Dimension (Declaration of Arrays, Initializing Array Elements,



Accessing Array Elements, Read / Write / Process Array Elements), Array of Two Dimension (Declaration of 2D-Arrays, Initializing 2D-Array Elements, Read / Write / Process Array Elements)),

- ▶ String (Read / Write / Process Array Elements, Member Function of String, stdlib Library),
- ▶
- ▶ Structures (The Three Ways for Declare the Structure, Array of Structures).

**References:**

Mastering c++ by sorhan sami & oqeli saleh 2002

**2- Mathematics:**

Functions, Transcendental Function, Sequence and Series, Differentiation and Applications, Integration and Applications, Multiple Integrals, Polar Plane, Complex Numbers, Matrices, Vector Analysis.

**References:**

Thomas calculus , 1989

**3- Discrete Structures**

Set theory -sets & subsets - how to specify sets -, sequences -Operations on sets-, Algebra of sets & its proves, sets of numbers- Finite sets, Mathematical induction & recursion, Matrices, Logic and propositions- Equivalency, Tautology& Contradiction, Relations- Computer representation of relations & Digraph, Manipulation of relations, Properties of relations, Composition of relations (Functions-types of functions, Graphs-definition-graphs & multigraphs- subgraph – degree of graph), Walk –length of walk- trail- path- cycle- the bridges of konnissberg, Traversable multigraphs- Euler theorem- special graph- bipartite graph matrices & graph, Labeled graphs – trees- rooted tree- ordered rooted tree- polish notation, Spanning tree- directed graph- matrix of digraph, Minimal path, Finite state machines, Language & pattern recognition machines, Optimistic approach to construct FSM, Finite automata, Finite automata (Contd).

**References:**

1. Discrete mathematics by Seymour Lipschutz
2. Discrete mathematical structures for computer science by Bernard Kolman & Robert C. Busby 2004
- 3.

**4- Fundamental of Programming Technique**

- ▶ Programming Language
- ▶ Features of High level Language
- ▶ Main Component of HLL
- ▶ 1- Variable & Constant (representation of Integer, real (fixed &floating point)\_ , characters.
- ▶ 2- Basic Arithmetic &logic Operation
- ▶ 3- I/O interface
- ▶ 4- Control Stricture (Sequences, Conditional, Loops)



- ▶ 5- Basic data Structure (String, Array, Pointers and Internal Representation of Scalar & Vector Data
- ▶ 6- Functions or subroutines and their calling Mechanism
- ▶ - Notion of an Algorithm and Flowchart
- ▶ - Problem Solving using top –Down design
- ▶ - Steps of developing an algorithm
- ▶
- ▶ - Developing algorithmic solution from a mathematical specification of the problem.
- ▶ - Introduction of Recursion.

### Reference

- 1- Concurrent programming: fundamental techniques for real time and parallel software design, Tom Axford, 1989.
- 2- Concepts Techniques and Models of Computer Programming, by peter ,&Seif Haride, 2002.
- 3- Java Programming for beginner, Joseph Russell, 2004.

### 5- Computer Organization and Information Technology

- ▶ Computer definition & history of computer. Importance and advantages of computers.
- ▶ Applications with computer systems. Computer system classification (hardware, software).
- ▶ Hardware: The structure of computer system
  - Input units ( تفصيل على كل وحدات الإدخال إلى عام 2009 ) Output units ( تفصيل على كل وحدات الإدخال إلى عام 2009 ) Central Processing Units (CPU) ,CPU definition. CPU components (ALU, Rs, CU).
    - CPU operations. Full example of CPU operation.
  - Main memory
    - Primary storage ,Magnetic core storage. Semiconductor memory. Full examples of memory. Instructions format with memory. Secondary storage.
    - Types of main memory (RAM, ROM ...).
  - Computer classification (analog, digital, hybrid).
- ▶ Software:
- ▶ Types of software (System SW, Application SW)
- ▶ Programming language & types of them (high level, mid level).
- ▶ Translation programs Compiler. Interpreters. Assemblers. Linkers. Debugging.
- ▶ Managing organization data & information
- ▶ Introduction ( data & information).
- ▶ Data hierarchy ( record, field). Files & Database. Database types
- ▶ Database representation.
- ▶ Telecommunications & networks (network type, transition media, cable & wireless)
- ▶ Signals (analog, digital). Telecommunication system components.
- ▶ Internet & Intranet.

### Reference

1. "Introduction to information technology", Turban&Rainer&Potter, 2001.
2. "Introduction to information systems", James.O'Brien, 1997.
3. Computer System Architecture M. Morris Mano 1993



4. Murdocca .M .J ., Heuring .V .P ., "Principle Of Computer Architecture", Prentice-Hall, Inc .
5. Hutchinson .S .E ., Sawyer .S .C ., with Contribution by Coulthard .G .J ., "Computers, Communications , and Information", Revised Edition, Mc-Graw.

### **6- Logic Design:**

Number System and Codes, Logic Gates, Boolean Algebra, Minimization Methods (K-Map, Q-M), Combination Logic Circuits, Adders, Sub-tractors, Comparators, Code Converters, Multiplexers, Sequential Logic Circuits, Flip-Flops, S-R FF, D FF, J-K FF, T FF, Registers, Counters, State Diagram and FSA, ROM and RAM.

### **References:**

Digital fundamentals by Floyd, 2003 .

### **7- حقوق الإنسان**

حقوق الإنسان في الحضارات القديمة، حقوق الإنسان في الشرائع والأديان السماوية، مصادر حقوق الإنسان، ضمانات حقوق الإنسان، مستقبل حقوق الإنسان.

### **المصادر:**

حقوق الإنسان والطفل والديمقراطية , د. ماهر صالح علاوي الجبوري وآخرون.

### **8- English:**



## Second Year Syllabus

## منهاج المرحلة الثانية

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	Object Oriented Programming	البرمجة الشيئية	1
3	-	2	2	Data Structures and Algorithms	هياكل البيانات والخوارزميات	2
3	1	2	2	Numeric Analysis	التحليل العددي	3
3	-	2	2	System Analysis and Databases Design	تحليل نظم و تصميم قواعد البيانات	4
3	-	2	2	Micro-Processors and Assembly Programming	المعالجات الميكروية و البرمجة بلغة التجميع	5
2	1	-	2	Advance Mathematics	الرياضيات المتقدمة	6
2	-	-	2	Computation Theory	النظرية الاحتمالية	7
pass	-	-	2	Democracy	ديمقراطية	8
<b>19</b>	<b>2</b>	<b>10</b>	<b>16</b>	<b>Total</b>		

Total No. of Unit for One Semester: (19)Units

مجموعة الوحدات للفصل الدراسي الواحد: (19) وحدة

Total No. of Unit for Year: (38) Units

مجموعة الوحدات لسنة دراسية: (38) وحدة

### 1-Object Oriented Programming and Visual C++

Overview for functions and parameter transmission in C++ , Introduction of OOP and its main features , Defining a Simple Class with Inline Member Functions, Constructors and destructors functions, Friends functions, Constant Members, Static Members, Default Arguments and Implicit Member Argument, Function and operators Overloading, Inheritance and Derived Classes, Virtual Functions and Multiple Inheritance, Function Template Definition and Function Template Instantiation, Class Template Definition and Class Template Instantiation, Introduction to Visual Studio. NET C++, Starting Visual C++ MDE, Starting Developer studio to implement a simple program, Concepts and tools for Windows Application, Microsoft Foundation Class Library Fundamentals, Explore the Microsoft Foundation Class (MFC) Library and the Visual C++ IDE (Integrated Development Environment), Create the standard MFC Application Architectures, use the Graphical Output features of MFC, Explore Message Maps, Message Handlers, and Command Routing, and add standard User Interface Elements to an MFC Application, Create Modal and Modeless Dialog Boxes for user interaction, implement Exception Handling, and use MFC Debugging Support and Visual C++ Debugging Tools, Add Data Access Services with MFC, build and use MFC-based ActiveX Controls, develop Internet applications with MFC, add Persistence using MFC Serialization Support, create multithreaded MFC Applications, and implement regular and extension MFC DLLs.

### References:

- 1- "Mastering C++", Prof. Oqeili Saleh and others, Dar Al-Shorok, Amman-Jordan, 2004. "Object Oriented Programming Language with C++", Bjarne Stroustrup, Addison-Wesley Publication, 2003.



## **2- Data Structures and Algorithms:**

Introduction to Data Structures, Memory representation for 1D and 2D arrays, Linear list, Linear list types, Stack: (Stack Operations, Applications of stack), Queue: (Queue Operations, Applications of queue), Circular Queue: (CQueue Operations, Applications of CQueue), Linked List, Linked-Stack, Linked-Queue, Linked-CQueue, Recursion, Graph, Trees: (Types of Tree, Binary tree, Binary tree scan, Represent Regulars expression using trees, convert tree to binary tree, Binary Search Tree), Sorting: (Sorting Algorithms, Types of Sorting algorithms, Bubble Sort, Insertion Sort, Quick Sort), Searching: (Searching Algorithm, Sequential Search, Binary Search).

### **References:**

- 1- Data structures and Algorithms with Object- Oriented design Patterns in C++ by: Bruno R. Preiss, B.A.Sc., M.A.Sc.Ph.D., P.Eng. Associate Professor, Department of electronic and computer engineering, university of waterloo.
- 2- Data Structures and algorithm analysis in C, By: Mark Allen Weiss.
- 3- Data Structures and algorithms in Java PDF file.
- 4- Data Structures using C and C++, Yedidyah language, Moshe J. augenstein, Aaeon M. Tenenbaum, Brooklyn College.

## **3- Numeric Analysis:**

Binary Fraction and Shifting, Scientific Notation Machine Number and Computer Accuracy, Computer Floating Point Numbers, Error Analysis (Absolute band Relative Errors, Truncation, Round-Off and Chopping Errors), The Solution of non-Linear Equations  $F(x)=0$ , The Solution of Linear Systems  $Ax=B$ , Interpolation and Polynomial Approximation, Numerical Differentiation, Numeric Integration, Solution of Differential Equations (Euler 'S Method, Runge-Kutta Methods), Eigen Values and Vector.

### **References:**

- 1- Thomas, G. Calculus and Analytic Geometry, 5<sup>th</sup> Edition, Addison Wesley, 1999.
- 2- Numerical Methods Using Matlab, Prentice Hall.
- 3- Programming and numerical analysis., Dr M. M. AlKassab 1989.
- 4 - التحليل العددي وبرمجة طرقه على الحاسبة الالكترونية, عبد المطلب 1999.

## **4- System Analysis and Databases Design:**

Introduction to database, (DBMS), Data abstraction, Analysis DB system ,Data models, Data independence, Database management & administrator, Entity relation model, Mapping constraints, Entity relation diagram, Representation of strong & weak entity, Generalization & aggregation, Design of an E-R database scheme, Mapping cardinalities, Data model-relational model, Example SQL and AQL, Hierarchical model, Example DL/1 and IQL, Network model, Data and file organization, Sequential & index file, Hash index & inverted files.

### **References:**

- 1-Database Management Systems 2<sup>nd</sup> Edition, by Raghu Ramakrishnan
- 2- Database, design, application development, and administration 2<sup>nd</sup> edition, 2004





### **5- Micro-Processors and Assembly Programming:**

CPU Architecture, Register Transfer, Memory, Peripheral Control Chips, Data Transfer, Fetch and Execute Cycles, Address and Data and Control Busses, Brief Introduction to Machine Code, Instruction Sets (Form, Orthogonality, Number of Addresses), and Decoding. Assembly Language Programming: Addressing Modes of the 808, Data Registers, Flags, The Status Register, and Implementing Control Structures in Assembly Language, Structured Assembly Language Programming using Procedures, Arithmetic and Logic Instructions Stack (Concepts and Applications), String Processing, Tools for Preparing and Debugging and Translating Programs. MS-DOS Operating System Structure: MS-DOS and BIOS Disk and Keyboard System Architecture. Advanced Features of Processors: Segments and Segment Registers, Interrupts and Interrupt Service Routines, I/O Port Addressing, Instruction Pipelining, Cache Memory.

#### **References:**

- 1- Abel P., "IBM PC Assembly Language and Programming", 4<sup>th</sup> Edition, Prentice Hall, 1998..
- 2- Thorne M., "Computer Organization and Assembly Language Programming", 2<sup>nd</sup> Edition, Benjamin/Cummings, 1990.

### **6- Advance Mathematics:**

Formation of Partial Differential Equations, First Order Linear and non-Linear Equations, Boundary Value Problems, Formation of the Wave Equation, Equation for the One Dimensional and Two Dimensional Heats Flow, Laplace Transform: (Laplace transformation and inverse, Properties of Laplace transform), Fourier series: (Periodic functions, Odd and even functions, Half range Fourier sine and cosine series), Fourier Transformation (Definition, Sine Cosine Transformation, Finite Fourier Sine and Cosine Transformation, Convolution, Inverses), Bessel's Equations: (Beta and Gamma function, Series Solutions of Bessel Equation).

#### **References:**

- 1- Thomas, G. Calculus and Analytic Geometry, 5<sup>th</sup> Edition, Addison Wesley, 1999.

### **7- Computation Theory:**

Regular Expression, Finite Automata, DFA and NFA, Equivalence of NFA and DFA, Equivalence of NFA and DFA with E-moves, Introduction to Crammers, Phrase Structure Grammar, Context sensitive Grammar, Context Free grammar, Chomsky Normal Form, Greibach Normal Form, Tree, The empty string in context free grammar ambiguity, Regular grammar, Left linear grammar, Right linear grammar, Kleen theorem, Two way finite automata with output (mealy machine, moor machine), The equivalence of mealy and moor machine, Push down automata, Top down –bottom up derivation, Turing machine.

#### **References:**

1. H.R.Lewis And G.H Papadimitiou,"Elements Of The Theory Of Computation", Prentig-Hall, 1981.
2. R.W.Floyd And R.Beigel,"The Languae Of Machine:An Introduction To Computability And Formal Languages"Computer Science Press, Network, 1994.
3. M.Sipser."Introduction To The Theory Of Computation" ,Boston Pws Pub ,1996.

### **8. Democracy:**



## Third Year Syllabus

## منهج المرحلة الثالثة

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	Computer Graphics	رسوم الحاسبة	1
3	-	2	2	Compilers	المترجمات	2
3	-	2	2	Advanced Databases	قواعد البيانات متقدمة	3
2	-	-	2	Computer Architecture	معمارية الحاسبة	4
3	-	2	2	Artificial Intelligent	الذكاء الاصطناعي	5
3	-	2	2	Software Engineering	هندسة البرمجيات (أختياري)	6
3	-	2	2	Internet and Intranet	أنترنت وانترانت (أختياري)	7
2	1	-	2	Operation Research	بحوث عمليات	8
22	1	12	16	<b>Total</b>		

Total No. of Unit for One Semester: (22)Units

مجموعة الوحدات للفصل الدراسي الواحد: (22) وحدة

Total No. of Unit for Year: (44) Units

مجموعة الوحدات لسنة دراسية: (44) وحدة

### 1. Operation Research:

Operating Research and the Art of Problem solving 0, Linear Programming, Formulation and Graphical Solution, Algebraic Solution, Duality and Sensitivity Analyses. Transportation Model .Networking Analyses .Decision Theory and Games, Inventory Model, Queuing Theory, Simulation.

#### References:

1. Operation Research: An Introduction, Hamdy A. Taha.

### 2. Computer Graphics:

Introduction: Display Devices (e.g. Raster, Vector). Elementary Graphics Figures: Line and Circle Drawing Algorithms. Sorting Pictures and 2D Transformations: Writing and Reading Graphics Data Files, Pictures Translation, Pictures Rotation, Pictures Scaling. Clipping and Windowing: Point and Line Clipping, Clipping Algorithms, Polygon Clipping. Curves: Polynomial Curves, Spline Curves. Elementary 3D Graphics: Introduction, Coordinates System, Transformations, Orthogonal Projection, Multiple Views, Hidden Lines and Surfaces, Shading and Coloring. Animation Techniques.

#### References:

- 1- J. D. Foley, Avan Dametal, "Introduction to Computer Graphic", Addison-Wesley, 1993.
- 2- D. Hearn and M.P. Baker, "Computer Graphics ", 2nd. Ed., Prentice-Hall, 1994



### **3. Computer Architecture:**

Introduction to computer architecture and CPU architecture, Instruction set and format, Addressing modes, Program control (interrupt and subroutine call), Microprogramming Design of CPU Control Unit and Micro programmed vs., hardwired Control, RISC and CISC, I/O organization and Peripheral Control Strategies, Input / output interfaces, Asynchronous data transfer, Programmed I/O, Memory Management, types and hierarchy, Main memory and memory address map, Direct Memory Access, Input / output processor (IOP) and Channels, Associative Memory and Content-Addressable Memories, Cache memory, Parallel processing, Pipeline (general consideration), Arithmetic pipeline, Instruction pipeline, Difficulties in Instruction pipeline, And theme solutions, Vector processing, And array processors, Interprocessor communication, Cache coherence.

#### References:

- 1- M.M Mano "Computer System Architecture" third Edition, Prentice Hall, 1993.
- 2- David A. Patterson And John L. Hennessy, "Computer Organization And Design" Morgan Kaufmann, 1998.

### **4. Compilers:**

Programming Language, Introduction to Compiler, Type of Errors, One Pass Compiler, Syntax Definition, Context Free Grammar, Parsing Tree & leftmost and rightmost derivations, Transition Graph, Lexical analysis, Syntax of Analysis, Problems of Compiler, First and Follow, Top down Parsing, Predictive Parsing Method, Bottom up Parsing, Operation Precedence Parser, Simple Left to Right Parser, Canonical LR Parser, Look Ahead LR, Semantic Analysis, Intermediate Code Generation, Code Optimization, Examples of Code Optimization, Code Generation, Build Simple Compiler.

#### References:

1. Principles of Compiler Design, Alfred V. Aho, Jeffrey D. Ulman.

### **5. Artificial Intelligent:**

Introduction to Programming in Logic, Prolog Language Structure, Prolog Language Components, Facts, Simple Rules, Built in Functions in Prolog Language, Recursion in Prolog (Tail Recursion), Non Tail Recursion, Fail Structure, List Processing, String Processing, Database Structure and Properties, Files in Prolog and Applications with Database, Introduction to Artificial Intelligence, Knowledge Representation, Logical Representation, Graphical Representation, Problem State Space Characteristics, Problem Solving, Search Technique (Blind), Heuristic Search, The 8\_Puzzle Problem, Control Strategy (Structure), Forward Chaining for Problem Solving, Backward Chaining for Problem Solving, Hybrid Method (Rule Cycle).

#### References:

1. Elian Rich, Artificial Intelligence, Prentice Hall 1991.

### **6. Software Engineering (Optional):**

Introduction to Software Engineering, Computer System Engineering, Types of S/W E, Role of S/W E in system design, S/W system, General phases of S/W E, S/W E Tools, Characteristic of S/w E, S/W Process, S/W Process Models, Classical Model, Prototype Model, Spiral Model, Incremental Model, Iterative Model, RAD Model, Half-year Break, Requirement analysis and principles, Requirement analysis and Definition, Function Oriented Approach, Data Oriented Approach, System Modeling, Object Oriented Approach, Normalization, Jackson Method,



Finite State Machine, Requirement Document, CORE Approach, Data Flow Diagram, Testing Technology, State Transmission diagram, Decision Tree, Decision Table.

References:

1. Software Engineering by Roger Press Man
2. Introduction to Software Engineering by Sommer Ville

**7. Databases:**

Introduction (DBMS), Data abstraction, Data models, Data independence, Database management & administrator, Entity relation model, Mapping constraints, Entity relation diagram, Representation of strong & weak entity, Generalization & aggregation, Design of an E-R database scheme, Mapping cardinalities, Data model-relational model, Example SQL, AQL, Hierarchical model, Example DL/1, IQL, Structure of distributed Databases, Trade-off in Distributing the databases, Design of distributed databases, Transparency and Autonomy, Distributed Query Processing, Recovery in distributed databases.

References:

1. Database System Concepts (Henry F. Korth).
2. An Introduction Database System C.J.Date.

**8. Internet and Intranet (Optional):**

Data Communication & Computer Network (Introduction, Transmission Media, Network Topologies, Network Layers and Protocols). Internet Hardware & Software (Introduction, Internet Protocol Address, IP Datagram, Naming with DNS, Client / Server Interaction, Example of Client / Server Interaction, Internet Service Provider, Internet Browsers, World Wide Web page, Internet and Intranet, Internet services, Navigation, E-mail Technique). Internet Search Engine (Introduction, Search engine working, Types of search engine, Search engine frame work-I-crawler, Search engine frame work-II- indexer, Search engine frame work-III- indexer, Search engine frame work-VI-Ranker).

References:

1. Douglas E. Comer. Computer Networks and Internet. Department of Computer Science, Purdue University. Second edition. 1999.
2. Andrew S. Tanenbaum. Computer Networks. Vrije University, Amsterdam, The Netherlands. Third edition. 1996
3. Vrieze, P.. Improve Search Engine Technology. M. sc. Thesis. 7 March 2002.

**Elective Subjects for Third Year**

المواضيع الاختيارية للمرحلة الثالثة

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	Software Engineering	هندسة البرمجيات	1
3	-	2	2	Internet and Intranet	أنترنت وانترانيت	2
2	-	-	2	Advanced IT	تكنولوجيا المعلومات المتقدم	3
2	-	2	2	Mathematics Applied in Computer	تطبيقات رياضية في الحواسيب	4



## Forth Year Syllabus

## منهج المرحلة الرابعة

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
2	-	-	2	Computer and Data Security	امنية الحاسبات والبيانات	1
3	-	2	2	Advanced Windows Programming	برمجة نوافذ متقدمة	2
3	-	2	2	Communication and Computer Networks	الاتصالات وشبكات الحاسبة	3
3	-	2	2	Operating Systems	نظم التشغيل	4
3	-	2	2	Intelligence Applications	تطبيقات ذكية	5
3	-	2	2	Web programming	برمجة المواقع (أختياري)	6
3	-	2	2	Image Processing	معالجة الصور (أختياري)	7
3	-	4	1	Project	المشروع	8
<b>23</b>	-	<b>16</b>	<b>15</b>	<b>Total</b>		

Total No. of Unit for One Semester: (23)Units

مجموعة الوحدات للفصل الدراسي الواحد: (23) وحدة

Total No. of Unit for Year: (46) Units

مجموعة الوحدات لسنة دراسية: (46) وحدة

### 1. Computer and Data Security:

Introduction of Data security, Basic terminology of Data security, Mathematical Background, Basic definition of arithmetic modular with examples, How Compute the Greater common deviser (GCD) using different methods, Explain the methods to compute the Inv, Explain the methods to find Euler notation and compute inv using Euler notation, Introduction of types of cipher systems, Types traditional of ciphers systems, Introduction of transposition cipher systems, Implementation of simple transposition method with examples for encipher and decipher methods, Columner method and fixed pired method, Implementation of simple substitution methods with examples for encipher and decipher methods, Types of substitution cipher systems types, Monoalphabetic substitution cipher systems (keywords method), Homophonic substitution cipher systems(Beal cipher, Higher order homophnics), polyaphabetic substitution cipher systems(Vigener cipher, Beaufort cipher ,Running ker cipher), polygram substitution cipher systems(playfair cipher, hill cipher ,product cipher), Introduction to public key systems (secrecy and authenticity), Knapsack ciphers), Merkel-Hellman knapsacks, simple knapsack algorithm), Trapdoor knapsack algorithm, With example for encipher and decipher process, RSA algorithm (encryption and decryption processes), Public-key digital signature algorithms (RSA), Introduction of DES algorithm, X-box process in DES algorithm with example, Encryption process in DES algorithm with example, Decryption process in DES algorithm with example, Introduction of Stream ciphers, One time Pad system (vernam system), The requirements of steam cipher, The Basic Five Randomness tests (i.e. frequency test , serial test), Poker test , run test, auto correlation test.



## **2. Advance Windows Programming:**

Introduction, The Main Difference between DOS and Windows version, Windows Concept and Technology, The Windows' window, Visual Interface Component, Windows Class, Messages, Windows Resources, Windows Function, The Coordinate System, The Element of Windows Application Program, The WM-PAINT and WM-DESTROY messages, Creating Menus, Message Box, Dialog Box, Scroll Bars, Adding Icons, Cursors, and Bitmap.

### **References:**

1. "Windows NT4 Programming from the ground up".
2. "Windows 98 Programming from the ground up".
3. "Principle of Windows programming in Borland C++".

## **3. Communication and Computer Networks:**

Data Communication, Physical Topology, Basic Network Technology, LAN Devices, Collision and Collision Domains in Shared Layer Environments, Network Devices, Network Layer Addressing, Network Layer Field & Datagram, IP address Class, Subnet NW, Private Addresses, Transmission of Digital Data Interfaces and Modems, Transmission Media, Unguided Media, Satellite Communication, Error Detection and Correction, Data Link Control, Multiplexing, De Multiplexing, Data Link Protocols, ARP, FTP, TELNET, DNS, UDP, TCP, NFS and RPC, SMTP, TFTP, HTTP, WAIS, Gopher, SNMP, WWW, Browser Architecture, Methods for Assigning IP Address, Advance ARP, DHCP, Dynamic Addressing, Routable and non Routable Protocols, RIP Features.

### **References:**

- 1- "Computer Networks", 3<sup>rd</sup> Edition, A. Tannenbaum, Prentice-Hall, 1996.
- 2- "Data Communications, Computer Networks and OSI", 4<sup>th</sup> Edition, F. Halsall, Addison-Wesley, 1995.
- 3- "Computer Communications and Networks", J. R. Freer, USL Press, 1996.

## **4. Operating System:**

Introduction to Operating Systems, User view and system view of OS, OS for mainframe, Desktop computer systems, OS for multiprocessor and distributed systems, OS for clustered, real-time and handheld computer systems, Introduction to computer system structure, Hardware Protection, Operating system structure, System components1, System components2, Operating system services, System calls and System Programs, System Design, System implementation, Half-year Break, Introduction to Processes, Process Concepts, Process Control Block, Process Scheduling, Operation on Processes, Cooperating Processes, Interprocess Communication, Introduction to CPU Scheduling, CPU Scheduling concepts, Scheduling Criteria, Scheduling Algorithms, First Come First Served and Shortest Job First, Priority Scheduling algorithm and Round Robin Algorithm, Introduction to Deadlocks and handling.

### **References:**

1. "Operating System Concepts" by Silberschatz, Galvin and Gagne, 2003.



**Elective Subjects for Forth Year**

**المواضيع الاختيارية للمرحلة الرابعة**

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	3D Graphics and Vision	الرسوم ثلاثية الابعاد والرؤية	1
3	-	2	2	Web programming	برمجة المواقع	2
3	-	2	2	Image Processing	معالجة الصور	3
2	-	-	2	Modeling and Simulation	النمذجة والمحاكاة	4
2	-	-	2	Data Compression	ضغط البيانات	5



## Branch Information System

فرع نظم المعلومات

[www.uotechnology.edu.iq](http://www.uotechnology.edu.iq)



## First Year Syllabus

## منهج المرحلة الأولى

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
4	-	2	3	Structured Programming	البرمجة المهيكلية (C++)	1
2	1	-	2	Mathematics	الرياضيات	2
2	1	-	2	Discrete Structures	الهياكل المنقطعة	4
3	1	2	2	Logic Design	التصميم المنطقي	3
2	-	-	2	Principles of Information Technology	مبادئ تكنولوجيا المعلومات	5
2	-	-	2	Principles of Information Systems	مبادئ نظم المعلومات	6
Pass	-	-	2	Human Rights	حقوق الانسان	7
Pass	-	-	2	English Language	لغة انكليزية	8
15	3	4	17	Total		

Total No. of Unit for One Semester: (15)Units

مجموعة الوحدات للفصل الدراسي الواحد: ( 15 ) وحدة

Total No. of Unit for Year: ( 30 ) Units

مجموعة الوحدات لسنة دراسية: ( 30 ) وحدة

### 1.Structured Programming

Introduction, Procedural Programming Principles, Algorithm , Algorithm proper, Examples, Flowcharts, Flowchart Figure, Examples C++ Language Basics (Character set, Identifiers, Getting Started with C++, Variables Declaration, Variables, Constants, Arithmetic Operations, The “math.h” Library, Unary Minus, Increment and /decrement Operators, Operational Assignment Operators, Relational Operators, Logical Operators, Bitwise Operator), Selection Statements (Selection Statements, The Single If Statement Structure, The Single If Statement Structure (Blocks), The If/else Statement Structure, Nested If and If/else Statements, The Switch Selection Statement (Selector),Conditional Statement), Iteration Statements (Selection Statements, While Repetition Structure, Do/While Statement, For Statement, More about For Statement, Nested Loops, Break and Continue Control Statements), Functions (Function, Passing Parameters (Passing by Value, Passing by Reference)), Arrays (Array of One Dimension (Declaration of Arrays, Initializing Array Elements, Accessing Array Elements, Read / Write / Process Array Elements), Array of Two Dimension (Declaration of 2D-Arrays, Initializing 2D-Array Elements, Read / Write / Process Array Elements)), String (Read / Write / Process Array Elements, Member Function of String, stdlib Library), Structures (The Three Ways for Declare the Structure, Array of Structures).

### References

- Mastering c++ by sorhan sami & oqeli saleh 2002.



## **2.Mathematics**

Functions, Transcendental Functions, Sequence and Series, Differentiation and Applications, Integration and Applications, Multiple Integrals, Polar Plane, Complex Number, Matrices, Vector Analysis.

### **References:**

- Thomas calculus ,1989

Set theory ( sets & subsets, how to specify set, sequences , Operations on sets-, Algebra of sets & its proves, sets of numbers- Finite sets), Mathematical induction & recursion, Matrices, Logic and propositions- Equivalency, Tautology& Contradiction, Relations Computer representation of relations & Digraph, Manipulation of relations, Properties of relations, Composition of relations (Functions-types of functions, Graphs-definition-graphs & multigraphs- subgraph – degree of graph), Walk –length of walk- trail- path- cycle- the bridges of konnissberg, Traversable multigraphs- Euler theorem- special graph- bipartite graph matrices & graph, Labeled graphs –trees-rooted tree- ordered rooted tree- polish notation, Spanning tree- directed graph- matrix of digraph, Minimal path, Finite state machines, Language & pattern recognition machines, Optimistic approach to construct FSM, Finite automata, Finite automata (Contd).

### **References:**

- Discrete mathematics by Seymour Lipschutz
- Discrete mathematical structures for computer science by Bernard Kolman & Robert C. Busby.

## **4.Principles of Information Technology**

Introduction to information technology, Introduction to computer architecture computer hardware( Computer hardware: central processing unit and its components, Memory and its components), Computer software: (Application software, Programming languages types, Input technologies, Output technologies) Managing organizational data and information: introduction, Traditional file environment problems), Data base: the modern approach centralized database, distributed database, Data base management system, its components, Telecommunications and networks: introduction, Telecommunications system and its processes, Communications media and channels, Networks: introduction, Local area networks, wide area network, Network communications software, applications Internet, intranets: introduction: the evolution of the Internet, The operation of the internet: services provided by the Internet, Intranets: introduction, what the difference the internet and intranet, security.

### **References:**

- "Introduction to information technology", Turban&Rainer&Potter, 2001.
- "Introduction to information systems", James.OBrien, 1997.



### **5. Principles of Information Systems**

Information systems overview, Information system hardware, Information system software, Database management, Telecommunication, Electronic commerce and the internet, Organizational information system, Emerging Information System, Information System Development, Information system processes, Information system development approaches, Information system management, Managing Information system as an organizational resources, Making business case for a system, Organizing the information system function

### **3. Discrete Structure**

Jessup L., Valcich J., “ Information Systems Foundations”, Que E&T, 1999

### **6- حقوق الإنسان**

حقوق الإنسان في الحضارات القديمة، حقوق الإنسان في الشرائع والأديان السماوية، مصادر حقوق الإنسان، ضمانات حقوق الإنسان، مستقبل حقوق الإنسان.

### **المصادر:**

حقوق الإنسان والطفل والديمقراطية , د. ماهر صالح علاوي الجبوري وآخرون.

### **8- English language**



## Second Year Syllabus

## منهج المرحلة الثانية

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	Object Oriented Programming and Visual	البرمجة الشيئية ولغة VC++	1
3	1	2	2	Data Structures and Algorithms	هياكل البيانات والخوارزميات	2
2	1	2	2	Mathematics and Numeric Analysis	الرياضيات والتحليل العددي	3
3	-	2	2	Databases	قواعد البيانات	4
2	-	-	2	Information Systems Analysis and Design	تحليل وتصميم نظم المعلومات	5
3	-	2	2	Software Engineering	هندسة برمجيات	6
2	-	-	2	Computation Theory	النظرية الاحتمالية	7
Pass	-	-	2	Democracy	ديمقراطية	8
<b>18</b>	<b>2</b>	<b>10</b>	<b>16</b>	<b>Total</b>		

Total No. of Unit for One Semester: (18)Units

مجموعة الوحدات للفصل الدراسي الواحد: (18) وحدة

Total No. of Unit for Year: (36) Units

مجموعة الوحدات لسنة دراسية: (36) وحدة

### 1.Object Oriented Programming and Visual C++

Overview for functions and parameter transmission in C++ , Introduction of OOP and its main features , Defining a Simple Class with Inline Member Functions, Constructors and destructors functions, Friends functions, Constant Members, Static Members, Default Arguments and Implicit Member Argument, Function and operators Overloading, Inheritance and Derived Classes, Virtual Functions and Multiple Inheritance, Function Template Definition and Function Template Instantiation, Class Template Definition and Class Template Instantiation, Introduction to Visual Studio. NET C++, Starting Visual C++ MDE, Starting Developer studio to implement a simple program, Concepts and tools for Windows Application, Microsoft Foundation Class Library Fundamentals, Explore the Microsoft Foundation Class (MFC) Library and the Visual C++ IDE (Integrated Development Environment), Create the standard MFC Application Architectures, use the Graphical Output features of MFC, Explore Message Maps, Message Handlers, and Command Routing, and add standard User Interface Elements to an MFC Application, Create Modal and Modeless Dialog Boxes for user interaction, implement Exception Handling, and use MFC Debugging Support and Visual C++ Debugging Tools, Add Data Access Services with MFC, build and use MFC-based ActiveX Controls, develop Internet applications with MFC, add Persistence using MFC Serialization Support, create multithreaded MFC Applications, and implement regular and extension MFC DLLs.



References:

- “Mastering C++”, Prof. Oqeili Saleh and others, Dar Al-Shorok, Amman-Jordan, 2004.
- “Object Oriented Programming Language with C++”, Bjarne Stroustrup, Addison-Wesley Publication, 2003.

**2.Data Structures and Algorithms:**

Introduction to Data Structures, Memory representation for 1D and 2D arrays , Linear list, Linear list types, Stack: (Stack Operations, Applications of stack), Queue: (Queue Operations, Applications of queue), Circular Queue: (CQueue Operations, Applications of CQueue), Linked List, Linked-Stack, Linked-Queue, Linked-CQueue, Recursion, Graph, Trees: (Types of Tree, Binary tree, Binary tree scan, Represent Regulars expression using trees, convert tree to binary tree, Binary Search Tree), Sorting: (Sorting Algorithms, Types of Sorting algorithms, Bubble Sort, Insertion Sort, Quick Sort), Searching: (Searching Algorithm, Sequential Search, Binary Search).

References:

- Data structures and Algorithms with Object- Oriented design Patterns in C++ by: Bruno R. Preiss, B.A.Sc., M.A.Sc.Ph.D., P.Eng. Associate Professor, Department of electronic and computer engineering, university of waterloo.
- Data Structures and algorithm analysis in C, By: Mark Allen Weiss.
- Data Structures and algorithms in Java PDF file.
- Data Structures using C and C++, Yedidyah language, Moshe J. augenstein, Aaeon M. Tenenbaum, Brooklyn College.

**3.Mathematics and Numerical Analysis**

**Partial Differentiation:** - Function with two independent variables or more, Partial differentiation for first and higher order of derivative, Chain rule , Directional derivative, Total derivative, **First Order differential Equations** Definition, Formation of differential Equation, Solution of differential equation by:- ( Direct Integration, Separating the variables, Homogeneous equation , Exact Equation, Integrating Factor, Linear equation, Bernulli’s equation), Application of first order differential equation, **Second and higher Order differential Equations:-** Details ( Special types of second Order Equations, Linear Second Order differential Equations with constant ), Coefficient (Solution of second order homogeneous linear differential equation with constant coefficients, Solution of second order non-homogeneous linear differential equation with constant coefficients by:- (Undetermined Coefficients, Variation of parameters, Application of Second order Differential Equations), **Laplace Transform (L.T):-** Details:( Mathematical Definition of Laplace Transform, Laplace Transform for standard important Function, Properties of Laplace Transform:- (Linearity, Shifting), Multiplication by  $t^n$  , Division by  $t$  , Laplace Transform of Derivatives, Laplace Transform of Periodic Function, Unit Step Function , Mathematical definition of Inverse Laplace Transform, Inverse Laplace Transform for standard important function , Properties of Inverse Laplace



Transform:- (Linearity, Shifting), Inverse Laplace Transform of Derivatives, Inverse Laplace Transform of Integral, Partial Function for finding Inverse Laplace Transform, Long division for finding Inverse Laplace Transform, Laplace Transform application: (Solution of ordinary differential equations, The Gamma Function), **Partial Differential Equation:-** Details (Formation of Partial differential Equation, Types of Partial differential Equation, Solution of Partial differential Equation, Formation of Partial differential Equation, Solution of first order Partial differential Equation, Methods of variable separable, Initial and Boundary conditions, Solution of heat equation, Solution of wave equation, Solution of Laplace equation, **Fourier series:-** Definition, Periodic functions, Periodic functions for Odd and even functions, Half range Fourier sine and cosine series, Change of Interval, **Numerical Analysis :-** Solving Sets of Equation (Eliminating Method, Iterative Method). Interpolating Polynomial (Lag ranging Polynomial), Solving Non-Linear Equation (Newton's Method), Numerical Differentiation and Numerical Integration (The Trapezoidal Rule Simpson's Rules), Numerical Solution of ordinary Differential equation (Euler and Modified Euler Methods, Range-Kutta Methods), Curve fitting and Approximation of Functions (Least-Square Approximations)

References:

- Thomas, G. Calculus and Analytic Geometry, 5<sup>th</sup> Edition, Addison Wesley, 1999.
- Numerical Methods Using Matlab, Prentice Hall.
- Programming and numerical analysis, Dr.M.M Alkassab, 1989.
- التحليل العددي وبرمجة طرقه على الحاسبة الالكترونية، عبد المطلب 1999

**4. Databases**

Centralized database system (introduction, purpose of database, DBMS, differences between a file processing system and DBMS, ...), Entity relationship model (entities and entity sets, relationships and relationship set, attributes, mapping constraints, keys,...), Relational model (data representation in relational model, data manipulation language : Clause of relations-SQL and algebra of relation –AQL,..), Hierarchical model (data representation in Hierarchical model, data manipulation language DL/1, example about DL/1,..), Network model (data representation in Network model, data manipulation language CODASYL, example about DML by using CODASYL language, Data and file organization in physical database model (sequential file, indexed connected files, has indexing ,inverted files)

References:

- Date C. J., "An Introduction to Database Systems", 2004  
Abraham Silberschatz, Henry F.Korth, S. Subarshan, " Database System Concepts", 2006  
David M. Kroenke, "Database Concepts", 2005.



### **5. Information Systems Analysis and Design**

Overview (System Concepts), Introduction to Information Systems (Information System Definition, Information General Model, Information System Computer Hardware, Information System Software, Information System and Data Management, Information System Telecommunications, Information System People), The Role of System Analysis (Sake Holders, System Analysts, Skills of Successful System Analysis, The Analysis Responsibilities, Variations on the System Analysts Title, The System Analysts as a Facilitator), The System Development Life Cycle (Definition, Phase1(Primary Investigation and Planning, Problem Recognition, Feasibility Study), Phase2 (Analysis Concept, Information Gathering Techniques (Interviewers, Questionnaires, Written Materials, Samples, Observations), Data Analysis Methods (Data Flows, Flow Charts, Decision Tables)), Phase3 (Initial Design, Prototyping, Detailed Design (Output Design, Input Design, Database Design, Coding Systems)), Phase4 (Implementation), Phase5 (Maintenance), Case Study (IS Development), Information, Decision, Management, Information System Types (Transaction Processing System, Management Information System, Decision Support System, Expert Systems, Executive Information System), Online Analytical Processing (OLAP), Geographic Information System (GIS)).

#### **References:**

- "Introduction to Information System", O' Bram.
- "Systems Analysis and Design", Elias M. Awad.

Regular Expression, Finite Automata, DFA and NFA, Equivalence of NFA and DFA, Equivalence of NFA and DFA with E-moves, Introduction to Crammers, Phrase Structure Grammar, Context sensitive Grammar, Context Free grammar, Chomsky Normal Form, Greibach Normal Form, Tree, The empty string in context free grammar ambiguity, Regular grammar, Left linear grammar, Right linear grammar, Kleen theorem, Two way finite automata with output (mealy machine, moor machine), The equivalence of mealy and moor machine, Push down automata, Top down –bottom up derivation, Turing machine.

#### **References:**

- H.R.Lewis And G.H Papadimitiou, "Elements Of The Theory Of Computation", Prentig-Hall, 1981.
- R.W.Floyd And R.Beigel, "The Languae Of Machine:An Introduction To Computability And Formal Languages" Computer Science Press, Network, 1994.
- M.Sipser. "Introduction To The Theory Of Computation" ,Boston Pws Pub ,1996.

## Third Year Syllabus

## منهج المرحلة الثالثة

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
2	1	-	2	Operation Research	بحوث العمليات	1
3	1	2	2	Computer Graphics	رسوم الحاسبة	2
2	-	-	2	Computer Architecture	معمارية الحاسبة	3
3	-	2	2	Compilers	مترجمات	4
3	-	2	2	Artificial Intelligent	ذكاء اصطناعي	5
3	-	2	2	Software Engineering	هندسة البرمجيات (اختياري)	6
3	-	2	2	Distributed Databases	قواعد البيانات الموزعة (اختياري)	7
2	-	-	2	Advanced IT	تكنولوجيا معلومات متقدمة	8
<b>21</b>	<b>2</b>	<b>10</b>	<b>16</b>	<b>Total</b>		

Total No. of Unit for One Semester: (21)Units

مجموعة الوحدات للفصل الدراسي الواحد: (21) وحدة

Total No. of Unit for Year: (42) Units

مجموعة الوحدات لسنة دراسية: (42) وحدة

### 1. Operation Research:

Operating Research and the Art of Problem solving 0, Linear Programming, Formulation and Graphical Solution, Algebraic Solution, Duality and Sensitivity Analyses. Transportation Model .Networking Analyses .Decision Theory and Games, Inventory Model, Queuing Theory, Simulation.

#### References:

1. Operation Research: An Introduction, Hamdy A. Taha.

### 2. Computer Graphics:

Introduction: Display Devices (e.g. Raster, Vector). Elementary Graphics Figures: Line and Circle Drawing Algorithms. Sorting Pictures and 2D Transformations: Writing and Reading Graphics Data Files, Pictures Translation, Pictures Rotation, Pictures Scaling. Clipping and Windowing: Point and Line Clipping, Clipping Algorithms, Polygon Clipping. Curves: Polynomial Curves, Spline Curves. Elementary 3D Graphics: Introduction, Coordinates System, Transformations, Orthogonal Projection, Multiple Views, Hidden Lines and Surfaces, Shading and Coloring. Animation Techniques.

#### References:

- 1- J. D. Foley, Avan Dametal, "Introduction to Computer Graphic", Addison-Wesley, 1993.
- 2- D. Hearn and M.P. Baker, "Computer Graphics ", 2nd. Ed., Prentice-Hall, 1994.





3.

Introduction to computer architecture and CPU architecture, Instruction set and format, Addressing modes, Program control (interrupt and subroutine call), Microprogramming Design of CPU Control Unit and Micro programmed vs., hardwired Control, RISC and CISC, I/O organization and Peripheral Control Strategies, Input / output interfaces, Asynchronous data transfer, Programmed I/O, Memory Management, types and hierarchy, Main memory and memory address map, Direct Memory Access, Input / output processor (IOP) and Channels, Associative Memory and Content-Addressable Memories, Cache memory, Parallel processing, Pipeline (general consideration), Arithmetic pipeline, Instruction pipeline, Difficulties in Instruction pipeline, And theme solutions, Vector processing, And array processors, Interprocessor communication, Cache coherence.

References:

- 1- M.M Mano "Computer System Architecture " third Edition, Prentice Hall, 1993.
- 2- David A. patterson And John L.Hennessy, "Computer Organization And Design " Morgan Kaufmann, 1998.

**4-Compilers:**

Programming Language, Introduction to Compiler, Type of Errors, One Pass Compiler, Syntax Definition, Context Free Grammar, Parsing Tree & leftmost and rightmost derivations, Transition Graph, Lexical analysis, Syntax of Analysis, Problems of Compiler, First and Follow, Top down Parsing, Predictive Parsing

**6.Computational Theory**

Parsing, Operation Precedence Parser, Simple Left to Right Parser, Canonical LR Parser, Look Ahead LR, Semantic Analysis, Intermediate Code Generation, Code Optimization, Examples of Code Optimization, Code Generation, Build Simple Compiler.

References:

1. Principles of Compiler Design, Alfred V. Aho, Jeffrey D. Ulman.

**5- Artificial Intelligent:**

Introduction to Programming in Logic, Prolog Language Structure, Prolog Language Components, Facts, Simple Rules, Built in Functions in Prolog Language, Recursion in Prolog (Tail Recursion), Non Tail Recursion, Fail Structure, List Processing, String Processing, Database Structure and Properties, Files in Prolog and Applications with Database, Introduction to Artificial Intelligence, Knowledge Representation, Logical Representation, Graphical Representation, Problem State Space Characteristics, Problem Solving, Search Technique(Blind), Heuristic Search, The 8\_Puzzle Problem, Control Strategy(Structure), Forward Chaining for Problem Solving, Backward Chaining for Problem Solving, Hybrid Method (Rule Cycle).

References:

1. Elian Rich, Artificial Intelligence, Prentice Hall 1991.



### **Computer Architecture:**

Introduction to Software Engineering, Computer System Engineering, Types of S/W E, Role of S/W E in system design, S/W system, General phases of S/W E, S/W E Tools, Characteristic of S/w E, S/W Process, S/W Process Models, Classical Model, Prototype Model, Spiral Model, Incremental Model, Iterative Model, RAD Model, Half-year Break, Requirement analysis and principles, Requirement analysis and Definition, Function Oriented Approach, Data Oriented Approach, System Modeling, Object Oriented Approach, Normalization, Jackson Method, Finite State Machine, Requirement Document, CORE Approach, Data Flow Diagram, Testing Technology, State Transmission diagram, Decision Tree, Decision Table.

#### **References:**

1. Software Engineering by Roger Press Man
2. Introduction to Software Engineering by Sommer Ville.

### **7- Distributed Databases:**

Structure of Distributed Database, Trade-offs in Distributed Database, Advantages of data distribution, Data sharing and distributed control, Reliability and Availability, speed up query processing, disadvantages of data distribution, software development cost, examples and exercises, Design of distributed database, Data Replication, Availability, Increased parallelism, Increased overhead on update, Data fragmentation, Horizontal fragmentation, vertical fragmentation, Mixed fragmentation, Examples and exercises, Transparency and Autonomy, Naming of data items, Fragmentation of data items, Location fragments and replicas, Examples, Recovery in Distributed systems, system structure, Robustness, commit protocols, concurrency controls, time stamping, Deadlock Handling, Examples and exercises, Database system concepts Henry K. Korta 1991, Database system using Oracle. 2E shah, Distributed system concepts couloirs 2005.

### **8 - Advance Information Technology (Optional).**

Hardware component, The motherboard, Processing, Machine Cycle Time, Clock Speed, Word length and Bus Line Width, Memory, Storage Capacity, Types of Memory, Secondary Storage, Access Methods, Devices, Input Devices, Output Devices.

Information Technology of files & Data Base, Data Base administrator, Data storage Hierarchy, File& data management system, Types of file, program& data file, Two types of data file: master& transaction file, Types of database organization, Hierarchical database, Network Data Base, O.O Data Base, Relational Data Base, Types of Data, Data mining, Data warehouse, data mart.

COMMUNICATIONS Telecommunications: Basic COMMUNICATIONS CHANNEL CHARACTERISTICS, Type of media, Types of Telecommunications, Online Telecommunications systems, NETWORKS, LINKING PERSONAL COMPUTERS TO MAINFRAMES AND NETWORKS, Advantages of Networks, and MULTIMEDIA.



**6- Software Engineering (Optional):** Electronic World: Electronic World, E-banking, E-DATABASES, E-mail, Electronic Commerce, MULTISTAGE MODEL for E-COMMERCE, E-COMMERCE CHALLENGES, The advantages of e-commerce, The disadvantages of e-commerce.

The Internet, How the Internet Works, Accessing the Internet, Internet Services, The Worlds Wide Web, Web Browsers, Search Engines.

Reference:

1. Principles of Information systems  
By Ralph M. Stair, Gorge W. Reynolds, sixth edition, 2003.
2. Concepts of Information Technology (IT), ECDL Module 1, By Dr. M. Al-Kolaly, Version 4, 2005.

**Elective Subjects for Third Year**

المواضيع الاختيارية للمرحلة الثالثة

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
2	-	-	2	decision making systems	نظم اتخاذ القرار	1
2	-	-	2	Modeling and Simulation	نمذجة ومحاكاة	2
3	-	2	2	Software Engineering	هندسة البرمجيات	3
3	-	2	2	Distributed Databases	قواعد بيانات موزعة	4



## Forth Year Syllabus

## منهج المرحلة الرابعة

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	Intelligence Systems	انظمة ذكية	1
3	-	2	2	Communication and Computer Networks	الاتصالات وشبكات الحاسبات	2
2	-	-	2	Management information system	نظم ادارة المعلومات	3
3	-	2	2	Operating System	نظم تشغيل	4
2	-	-	2	Computer and Data Security	امنية الحاسبات والبيانات	5
3	-	2	2	Image Processing	معالجة الصور (اختياري)	6
3	-	2	2	Web programming	برمجة المواقع (اختياري)	7
3	-	4	1	Project	مشروع	8
22	-	14	15	<b>Total</b>		

Total No. of Unit for One Semester: (22)Units

مجموعة الوحدات للفصل الدراسي الواحد: (22) وحدة

Total No. of Unit for Year: (44) Units

مجموعة الوحدات لسنة دراسية: (44) وحدة

### 1- Intelligence Systems:

Expert Systems Using and Applications, Forward Chaining, Backward Chaining, Systems Based on Simple Search, Using Heuristics in Games, Search With Heuristics Embedded in Rules, Controlling the Reasoning Strategy, Systems Depend Under Uncertainty, Systems That Explain Their Actions, Using WHY Facility in Explanation Processor, Using HOW Facility in Explanation Processor, Natural Language Understanding, NLP Informal Method, NLP Formal Method, An Introduction to Adaptive Algorithms, An Introduction to Neural Network, Perceptron Neural Net, Back Propagation Neural Net, Hopfield Neural Net, Bidirectional Associative Memory Neural Net, Case Study in NN, An Introduction to Genetic Algorithms, GA in Travelling Sales Man Problem Solving, GA in the 8\_Puzzle Problem Solving, GA in the Transitions Problem Solving, An Introduction to Genetic Programming.

#### References:

2. Daniel H. Marcellus, Expert Systems Programming in Turbo Prolog, Prentice Hall (New Jersey) 1992.
3. 1.George F. Luger, Artificial Intelligence (structures and strategies for complex problem solving), Pearson Education Asia (Singapore), 2002.
4. 2. Laurene Fauset, Fundamentals of neural Networks: Architecture, Algorithms, and Applications, 1994.



5. David E. Goldberg, Genetic Algorithms in Search optimization, and Machine Learning, 1993.

## **2- Communication and Computer Networks:**

Data Communication, Physical Topology, Basic Network Technology, LAN Devices, Collision and Collision Domains in Shared Layer Environments, Network Devices, Network Layer Addressing, Network Layer Field & Datagram, IP address Class, Subnet NW, Private Addresses, Transmission of Digital Data Interfaces and Modems, Transmission Media, Unguided Media, Satellite Communication, Error Detection and Correction, Data Link Control, Multiplexing, De Multiplexing, Data Link Protocols, ARP, FTP, TELNET, DNS, UDP, TCP, NFS and RPC, SMTP, TFTP, HTTP, WAIS, Gopher, SNMP, WWW, Browser Architecture, Methods for Assigning IP Address, Advance ARP, DHCP, Dynamic Addressing, Routable and non Routable Protocols, RIP Features.

### References:

- 1- "Computer Networks", 3<sup>rd</sup> Edition, A. Tannenbaum, Prentice-Hall, 1996.
- 2- "Data Communications, Computer Networks and OSI", 4<sup>th</sup> Edition, F. Halsall, Addison-Wesley, 1995.
- 3- "Computer Communications and Networks", J. R. Freer, USL Press, 1996.

## **3- Management Information Systems:**

Definition of MIS, MIS as an Evolving Concept, Subsystem of MIS, Operating Element of Information System, MIS Support for Decision Making, MIS Structure based on Management Activity, MIS Structure based on Organization Function, Synthesis of MIS Structure, Some Issues of MIS Structure, H/W \_ S/W and Communication Technology for Information System, Storage and Retrieval of Data, Physical version Logical Models of Data.

## **4- Operating System:**

Introduction to Operating Systems, User view and system view of OS, OS for mainframe, Desktop computer systems, OS for multiprocessor and distributed systems, OS for clustered, real-time and handheld computer systems, Introduction to computer system structure, Hardware Protection, Operating system structure, System components<sup>1</sup>, System components<sup>2</sup>, Operating system services, System calls and System Programs, System Design, System implementation, Half-year Break, Introduction to Processes, Process Concepts, Process Control Block, Process Scheduling, Operation on Processes, Cooperating Processes, Intercrosses Communication, Introduction to CPU Scheduling, CPU Scheduling concepts, Scheduling Criteria, Scheduling Algorithms, First Come First Served and Shortest Job First, Priority Scheduling algorithm and Round Robin Algorithm, Introduction to Deadlocks and handling.

### References:

1. "Operating System Concepts" by Silberschatz, Galvin and Gagne, 2003.



### **5- Computer and Data Security:**

Introduction of Data security, Basic terminology of Data security, Mathematical Background, Basic definition of arithmetic modular with examples, How Compute the Greater common deviser (GCD) using different methods, Explain the methods to compute the Inv, Explain the methods to find Euler notation and compute inv using Euler notation, Introduction of types of cipher systems, Types traditional of ciphers systems, Introduction of transposition cipher systems, Implementation of simple transposition method with examples for encipher and decipher methods, Columner method and fixed pired method, Implementation of simple substitution methods with examples for encipher and decipher methods, Types of substitution cipher systems types, Monoalphabetic substitution cipher systems (keywords method), Homophonic substitution cipher systems(Beal cipher, Higher order homophnics), polyaphabetic substitution cipher systems(Vigener cipher, Beaufort cipher ,Running ker cipher), polygram substitution cipher systems(playfair cipher, hill cipher ,product cipher), Introduction to public key systems (secrecy and authenticity), Knapsack ciphers), Merkel-Hellman knapsacks, simple knapsack algorithm), Trapdoor knapsack algorithm, With example for encipher and decipher process, RSA algorithm (encryption and decryption processes), Public-key digital signature algorithms (RSA), Introduction of DES algorithm, X-box process in DES algorithm with example, Encryption process in DES algorithm with example, Decryption process in DES algorithm with example, Introduction of Stream ciphers, One time Pad system (vernam system), The requirements of steam cipher, The Basic Five Randomness tests (i.e. frequency test , serial test), Poker test , run test, auto correlation test.

### **6- Image Processing (Optional):**

Introduction to Image Processing, Compression between Computer Image and Computer Vision, Major topics for Computer Vision, Major topic for image processing, Image restoration, Image Enhancement, Image Compression, Image Representation, Digitization, Type of digital image, Binary Image, Gray Image, Color Image, HSL, Digital Image File Format, Spatial Domain, Frequency Domain, Region of interest image geometry (Crop, enlarge , shrinking , translate , rotate), Zoom algorithm, Zero order hold, First order hold, Convolution, Image Analysis: Image analysis steps, Preprocessing, Data reduction, Feature Analysis, Image algebra operation, Arithmetic operation, Logical operation, Spatial Filters, Mean Filters, Median Filters, Enhancement filters, Laplacian Filter, Difference Filter, Image Equalization, Gray level reduction, Spatial reduction, Edge line detection technique, Robert operator (Sobel operator, Prewitt operator, Krisch compass, Robinson compass mask, Laplacian operator, Frei chen mask), Segmentation, Region growing, Clustering methods, Boundaries detects, Combined approach, Histogram (Histogram features, Histogram Equalization, Histogram advantage, Image enhancement: Introduction, Gray scale modification, Histogram modification, Adaptive contrast enhancement, Color, Image sharpening (High pass filter, High frequency emphasis, Homomorphism filter), Image smoothing (Mean and median filters, Low pass filter, Image Restoration), Image Compression: Discrete transformation, Fourier transform (Walsh Hadamard transform, Wavelet transform).

### **7-Web Programming:**

Introduction to Web, Introduction to the Internet, The World Wide Web, The Internet and Web, The History and Growth of the Web, The Purpose of the Web, The Web Concepts, The Web Site Generations, Classifying the Web Sites, Programming Technologies, ASP Principles, Web Programming with ASP  
Web based Applications.

#### **References:**

1. World Wide Web Consortium (W3C)  
<http://www.w3c.org>
2. Tim Berners-Lee Web Page  
<http://www.w3.org/People/Berners-Lee>
3. Weaving the Web ... "Book"  
<http://www.w3.org/People/Berners-Lee/Weaving/Overview.html>
4. Web Site Engineering ... "Book"  
[http://www.geocities.com/website\\_engineering/chapter01.htm](http://www.geocities.com/website_engineering/chapter01.htm)

### **8- Project.**

#### **Elective Subjects for Forth Year**

#### **المواضيع الاختيارية للمرحلة الرابعة**

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	Neural Networks	شبيكات عصبية	1
2	-	-	2	Management information system	نظم المعلومات الادارية	2
2	-	-	2	Distributed system	الانظمة الموزعة	3
3	-	2	2	Image Processing	معالجة الصور	4
3	-	2	2	Web programming	برمجة المواقع	5



## Artificial Intelligent Branch

فرع الذكاء الاصطناعي

[www.uotechnology.edu.iq](http://www.uotechnology.edu.iq)





## First Year Syllabus

## منهج المرحلة الاولى

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
4	-	2	3	Structured Programming	البرمجة المهيكلية	1
2	1	-	2	Mathematics	الرياضيات	2
2	1	-	2	Discrete Structures	الهياكل المتقطعة	3
3	-	2	2	Computer Organization and Logic Design	تركيب الحاسبة و التصميم المنطقي	4
3	-	2	2	Principles of Artificial Intelligence	مبادئ الذكاء الاصطناعي	5
2	1	-	2	Introduction to statistics theory	مقدمة الى نظرية الاحصاء	6
Pass	-	-	2	Human Rights	حقوق الانسان	7
Pass	-	-	2	English Language	اللغة الانكليزية	8
16	3	6	17	<b>Total</b>		

Total No. of Unit for One Semester: (16)Units

مجموعة الوحدات للفصل الدراسي الواحد: ( 16 ) وحدة

Total No. of Unit for Year: ( 32 ) Units

مجموعة الوحدات لسنة دراسية: ( 32 ) وحدة

### 1- Structured Programming (with C++ Programming Language):

Introduction, Procedural Programming Principles, Algorithm , Algorithm properties , Examples, Flowcharts, Flowchart Figure, Examples ,C++ Language Basics (Character set, Identifiers, Getting Started with C++, Variables Declaration, Variables, Constants, Arithmetic Operations, The “math.h” Library, Unary Minus, Increment and /decrement Operators, Operational Assignment Operators, Relational Operators, Logical Operators, Bitwise Operator), Selection Statements (Selection Statements, The Single If Statement Structure, The Single If Statement Structure (Blocks), The If/else Statement Structure, Nested If and If/else Statements, The Switch Selection Statement (Selector), Conditional Statement), Iteration Statements (Selection Statements, While Repetition Structure, Do/While Statement, For Statement, More about For Statement, Nested Loops, Break and Continue Control Statements), Functions (Function, Passing Parameters (Passing by Value, Passing by Reference)), Arrays (Array of One Dimension (Declaration of Arrays, Initializing Array Elements, Accessing Array Elements, Read / Write / Process Array Elements), Array of Two Dimension (Declaration of 2D-Arrays, Initializing 2D-Array Elements, Read / Write / Process Array Elements)), String (Read / Write / Process Array Elements, Member Function of String, stdlib Library), Structures (The Three Ways for Declare the Structure, Array of Structures).

### References:

Mastering c++ by sorhan sami & oqeli saleh 2002

### 2- Mathematics:



Functions, Transcendental Functions, Sequence and Series, Differentiation and Applications, Integration and Applications, Multiple Integrals, Polar Plane, Complex Numbers, Matrices, Vector Analysis.

References:

Thomas calculus ,1989

Set theory -sets & subsets - how to specify sets -, sequences -Operations on sets-, Algebra of sets & its proves, sets of numbers- Finite sets, Mathematical induction & recursion, Matrices, Logic and propositions- Equivalency, Tautology& Contradiction, Relations- Computer representation of relations & Digraph, Manipulation of relations, Properties of relations, Composition of relations (Functions-types of functions, Graphs-definition-graphs & multigraphs- subgraph – degree of graph), Walk –length of walk- trail- path- cycle- the bridges of konnisberg, Traversable multigraphs- Euler theorem- special graph- bipartite graph matrices & graph, Labeled graphs – trees-rooted tree- ordered rooted tree- polish notation, Spanning tree- directed graph- matrix of digraph, Minimal path, Finite state machines, Language & pattern recognition machines, Optimistic approach to construct FSM, Finite automata, Finite automata (Contd).

References:

1. Discrete mathematics by Seymour Lipschutz
2. Discrete mathematical structures for computer science by Bernard Kolman & Robert C. Busby 2004

**4- Computer Organization and Logic Design:**

Digital systems conversion, Digital system arithmetic, Complement scheme, Subtraction with complement, Logic gates, Addition digital system, The basic postulation, Prove the theorem, Simplification by map, Combinational circuits, Sequential circuits, Flip-flops, Multilevel logic implementation, Encoder and decoder, Multiplexer and de-multiplexer, Msl and vlsc, Computer definition, Computer generation, Computer architecture, CPU operation, Fetch cycle, Execution cycle, Memory representation, Memory types, Primary storage, Secondary storage, Computer classification, Language classification, Translators program, Operating systems, Networking, Internet.

References:

1. Computer System Architecture, M. Morris Mano, Third Edition, 1993.
2. Digital Fundamental, Floyd, Eight Edition, 2003.
3. Principle Of Computer Architecture, Murdocca. M. J., Heuring .V.P., Prentice-Hall, Inc.
4. Computer Communications and Information, Hutchinson .S.E., Sawyer .S.C. ,with Contribution by Coulthard G.J. .



### **5- Principles of Artificial Intelligence :**

Propositional logic, Predicate Logic, First-Order- Predicate, Production rules, Problem Characteristics, Search Strategies (Problem state space and search space , Problem Solving , Blind Search , Search Space Problems, Monkey & Banana , 8-puzzle , 2-jug ) , Forward &

### **3- Discrete Structures** Matching , Prolog (Terms, List, String)

#### References:

1. Artificial Intelligence structures and strategies for complex problem solving by "George F. Luger".
2. Elin Rich, "Artificial Intelligence", 1991.
3. Matt Carter , "Mind and Computers" "An Introduction to the Philosophy of Artificial Intelligence " , Edinbwhg University press , 2007.
4. Max Bramer, " Logic Programming with prolog " , Spring , 2005.
5. زينب الزرقاء وايمان عودة ، الذكاء الصناعي في لغة prolog شعاع للنشر والعلوم ، سورية ، حلب ، 2005.
6. الدكتور ف. سكر الذكاء الاصطناعي من خلال لغة prolog شعاع للنشر والعلوم ، سورية ، حلب ، 1998.

### **6- Introduction to statistic theory**

Set theory, Binary operations on set , Permutation, Combination , Sample space, events, random variable , Addition theorem, multiplication theorem, Conditional probability , Bays theorem, Independent of events , Birnolli trails , Introduction to the theory of statistics , Descriptive statistics, Measure of central tendency , Measure of dispersion , Binominal distribution , Exponential distribution , Normal (Gaussian) distribution , Correlation of Coefficient , The Chi-square test, the Goodness – of –Fit test, test of homogeneity, Regression , Regression analysis.

#### References:

1. Statistics: theories and applications, Joseph Inungo, 2006.
2. Probability and statistics, theory and applications, Gunnar Blom, 1989.

### **7- حقوق الإنسان**

حقوق الإنسان في الحضارات القديمة، حقوق الإنسان في الشرائع والأديان السماوية، مصادر حقوق الإنسان، ضمانات حقوق الإنسان، مستقبل حقوق الإنسان.

#### المصادر:

حقوق الإنسان والطفل والديمقراطية , د. ماهر صالح علاوي الجبوري وآخرون

### **8- English Language**

## Second Year Syllabus

## منهج المرحلة الثانية

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	1	2	2	Object Oriented Programming	البرمجة الشيئية	1
3	-	2	2	Data Structures and Algorithms	هياكل البيانات والخوارزميات	2
2	-	-	2	Fuzzy logic	المنطق المضبب	3
3	-	2	2	AI strategies and algorithms	خوارزميات ذكاء وطرق بحث	4
3	-	2	2	Micro-Processors and Assembly Programming	المعالجات الميكروية و البرمجة بلغة التجميع	5
3	1	2	2	Advance Mathematics and numerical analysis	الرياضيات المتقدمة والتحليل العددي	6
2	-	-	2	Computation Theory	النظرية الاحتمالية	7
Pass	-	-	2	Democracy	ديمقراطية	8
<b>19</b>	<b>2</b>	<b>10</b>	<b>16</b>	<b>Total</b>		

Total No. of Unit for One Semester: (19)Units

مجموعة الوحدات للفصل الدراسي الواحد: (19) وحدة

Total No. of Unit for Year: (38) Units

مجموعة الوحدات لسنة دراسية: (38) وحدة

### 1- Object Oriented Programming and Visual C++

Overview for functions and parameter transmission in C++ , Introduction of OOP and its main features , Defining a Simple Class with Inline Member Functions, Constructors and destructors functions, Friends functions, Constant Members, Static Members, Default Arguments and Implicit Member Argument, Function and operators Overloading, Inheritance and Derived Classes, Virtual Functions and Multiple Inheritance, Function Template Definition and Function Template Instantiation, Class Template Definition and Class Template Instantiation, Introduction to Visual Studio. NET C++, Starting Visual C++ MDE, Starting Developer studio to implement a simple program, Concepts and tools for Windows Application, Microsoft Foundation Class Library Fundamentals, Explore the Microsoft Foundation Class (MFC) Library and the Visual C++ IDE (Integrated Development Environment), Create the standard MFC Application Architectures, use the Graphical Output features of MFC, Explore Message Maps, Message Handlers, and Command Routing, and add standard User Interface Elements to an MFC Application, Create Modal and Modeless Dialog Boxes for user interaction, implement Exception Handling, and use MFC Debugging Support and Visual C++ Debugging Tools, Add Data Access Services with MFC, build and use MFC-based ActiveX Controls, develop Internet applications with MFC, add Persistence using



MFC Serialization Support, create multithreaded MFC Applications, and implement regular and extension MFC DLLs.

References:

1. "Mastering C++", Prof. Oqeili Saleh and others, Dar Al-Shorok, Amman-Jordan, 2004.
2. "Object Oriented Programming Language with C++", Bjarne Stroustrup, Addison-Wesley Publication, 2003.

**2- Data Structures and Algorithms:**

Introduction to Data Structures, Memory representation for 1D and 2D arrays, Linear list, Linear list types, Stack: (Stack Operations, Applications of stack), Queue: (Queue Operations, Applications of queue), Circular Queue: (CQueue Operations, Applications of CQueue), Linked List, Linked-Stack, Linked-Queue, Linked-CQueue, Recursion, Graph, Trees: (Types of Tree, Binary tree, Binary tree scan, Represent Regulars expression using trees, convert tree to binary tree, Binary Search Tree), Sorting: (Sorting Algorithms, Types of Sorting algorithms, Bubble Sort, Insertion Sort, Quick Sort), Searching: (Searching Algorithm, Sequential Search, Binary Search).

References:

- 1- Data structures and Algorithms with Object- Oriented design Patterns in C++ by: Bruno R. Preiss, B.A.Sc., M.A.Sc.Ph.D., P.Eng. Associate Professor, Department of electronic and computer engineering, university of waterloo.
- 2- Data Structures and algorithm analysis in C, By: Mark Allen Weiss.
- 3- Data Structures and algorithms in Java PDF file.
- 4- Data Structures using C and C++, Yedidyah language, Moshe J. augenstein, Aaeon M. Tenenbaum, Brooklyn College.

**3- Fuzzy Logic**

Fuzzy sets, the operations of fuzzy sets, fuzzy relations and compositions, fuzzy graph and relation, fuzzy number, fuzzy functions, probability and uncertainty, fuzzy logic, fuzzy inference, fuzzy control and fuzzy expert systems, real applications.

References:

1. First course on fuzzy theory and application ", Kwang H. Le , spring 2005.
2. Introduction to fuzzy logic , and fuzzy control system ,Guanrony Chen ,Trung Tat Pham,© 2001 by CRC press LLC.



#### **4- Artificial Intelligence Strategies and algorithms:**

More complex Search Space ( More Problems Solving Approach Used ) , Heuristic Search ( Heuristic Functions , Hill Climbing , Best-First – Search , A – Algorithm , A\* - Algorithm , -Heuristic Search Examples , - 8-puzzle , Salesman Problem , 2-Jug , Monkey & Banana , Tic-Tac- Toe , Minimax , Alpha – Beta , -Problem Reduction (and \ or) , Constraint satisfactions , Mean- Ends analysis) , Knowledge Representation ( Semantic Net , Conceptual Graph ,Frame) , Theorem Proving Using Resolution ( Predicate Logic , Clause Form ) , Statistical Reasoning ( Probability , Bayser Network , Dempster – Shafer – Theory).

#### **References:**

1. Elin Rich, “Artificial Intelligence”,1991.
2. Luger E.George, ”Artificial Intelligence structure and strategies ”, 2005.
- 3 Stewart Russel and Peter Norvig , "Artificial Intelligent ,A modern approach ,2003.
- 4 Amit Konar, " Artificial Intelligence and soft computing , Behavior and cognitive modeling of the Human Brain " , CRC press ,1991.
- 5- Dimitris Varkas and Ioannis Pl. Vlashavos, " Artificial Intelligence for Advanced problem solving technique", published in the USA by Information science reference (an imprint of "IGI" Global),2008.

#### **5- Micro-Processors and Assembly Programming:**

CPU Architecture, Register Transfer, Memory, Peripheral Control Chips, Data Transfer, Fetch and Execute Cycles, Address and Data and Control Busses, Brief Introduction to Machine Code, Instruction Sets (Form, Othogonality, Number of Addresses), and Decoding. Assembly Language Programming: Addressing Modes of the 808, Data Registers, Flags, The Status Register, and Implementing Control Structures in Assembly Language, Structured Assembly Language Programming using Procedures, Arithmetic and Logic Instructions Stack (Concepts and Applications), String Processing, Tools for Preparing and Debugging and Translating Programs. MS-DOS Operating System Structure: MS-DOS and BIOS Disk and Keyboard System Architecture. Advanced Features of Processors: Segments and Segment Registers, Interrupts and Interrupt Service Routines, I/O Port Addressing, Instruction Pipelining, Cache Memory.

#### **References:**

- 1- Abel P., "IBM PC Assembly Language and Programming", 4th Edition, Prentice Hall, 1998..
- 2- Thorne M., "Computer Organization and Assembly Language Programming", 2nd Edition, Benjamin/Cummings, 1990.



### **6- Advance Mathematic and Numeric Analysis:**

Partial differentiation, ( partial differentiation for first and higher order of derivative, chain rule, directional derivative), first order equations, (solution of differential equation by direct integration, separating the variables, homogeneous equation,....), Second and higher order differential equations, linear second order differential equation with constant), Lap Transform (Laplace transform for standard important function, multiplication by  $t^n$ , division by  $t$ , Inverse Laplace transform of derivatives, Partial differential equations ( formation of partial differential equations, types of partial differential equations,....), Fourier series ( periodic functions, Fourier series for odd and even function, half range Fourier sin and cosine series, change of interval ), Numerical analysis ( solving sets of equation, elimination and iterative methods, interpolating polynomials, Lagrange polynomial ), solving non-linear equation, numerical differentiation and numerical integration, numerical solution of ordinary differential equations, curve-fitting and approximations.

#### **References:**

- 1- Thomas, G. Calculus and Analytic Geometry, 5th Edition, Addison Wesley, 1999.
- 2- Numerical Methods Using Matlab, Prentice Hall.

### **7- Computation Theory:**

Regular Expression, Finite Automata, DFA and NFA, Equivalence of NFA and DFA, Equivalence of NFA and DFA with E-moves, Introduction to Chomsky, Phrase Structure Grammar, Context sensitive Grammar, Context Free grammar, Chomsky Normal Form, Greibach Normal Form, Tree, The empty string in context free grammar ambiguity, Regular grammar, Left linear grammar, Right linear grammar, Kleen theorem, Two way finite automata with output (mealy machine, moor machine), The equivalence of mealy and moor machine, Push down automata, Top down –bottom up derivation, Turing machine.

#### **References:**

1. H.R.Lewis And G.H Papadimitiou, "Elements Of The Theory Of Computation", Prentig-Hall, 1981.
2. R.W.Floyd And R.Beigel, "The Languae Of Machine:An Introduction To Computability And Formal Languages" Computer Science Press, Network, 1994.
3. M.Sipser. "Introduction To The Theory Of Computation" ,Boston Pws Pub ,1996.

### **8. Democracy.**



## Third Year Syllabus

## منهج المرحلة الثالثة

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	Computer Graphics	رسوم الحاسبة	.1
3	-	2	2	Compilers	المترجمات	.2
3	-	2	2	Databases	قواعد البيانات	.3
2	-	-	2	Computer Architecture	معمارية الحاسبة	.4
3	-	2	2	Natural Languages Processing	معالجة اللغات الطبيعية	.5
3	-	2	2	Expert Systems	النظم الخبيرة (أختياري)	.6
3	-	2	2	Neural Networks + Genetic Algorithms	الشبكات العصبية و الخوارزميات الجينية (أختياري)	.7
2	1	-	2	Operation Research	بحوث عمليات	.8
22	1	12	16	<b>Total</b>		

Total No. of Unit for One Semester: (22)Units

مجموعة الوحدات للفصل الدراسي الواحد: (22) وحدة

Total No. of Unit for Year: (44) Units

مجموعة الوحدات لسنة دراسية: (44) وحدة

### 1. Operation Research:

Operating Research and the Art of Problem solving 0, Linear Programming, Formulation and Graphical Solution, Algebraic Solution, Duality and Sensitivity Analyses. Transportation Model .Networking Analyses .Decision Theory and Games, Inventory Model, Queuing Theory, Simulation.

#### References:

1. Operation Research: An Introduction, Hamdy A. Taha.

### 2. Computer Graphics:

Introduction: Display Devices (e.g. Raster, Vector). Elementary Graphics Figures: Line and Circle Drawing Algorithms. Sorting Pictures and 2D Transformations: Writing and Reading Graphics Data Files, Pictures Translation, Pictures Rotation, Pictures Scaling. Clipping and Windowing: Point and Line Clipping, Clipping Algorithms, Polygon Clipping. Curves: Polynomial Curves, Spline Curves. Elementary 3D Graphics: Introduction, Coordinates System, Transformations, Orthogonal Projection, Multiple Views, Hidden Lines and Surfaces, Shading and Coloring. Animation Techniques.

#### References:

- 1- J. D. Foley, Avan Dametal, "Introduction to Computer Graphic", Addison-Wesley, 1993.
- 2- D. Hearn and M.P. Baker, "Computer Graphics ", 2nd. Ed., Prentice-Hall, 1994.





3.

Introduction to computer architecture and CPU architecture, Instruction set and format, Addressing modes, Program control (interrupt and subroutine call), Microprogramming Design of CPU Control Unit and Micro programmed vs., ardwired Control, RISC and CISC, I/O organization and Peripheral Control Strategies, Input / output interfaces, Asynchronous data transfer, Programmed I/O, Memory Management, types and hierarchy, Main memory and memory address map, Direct Memory Access, Input / output processor (IOP) and Channels, Associative Memory and Content-Addressable Memories, Cache memory, Parallel processing, Pipeline (general consideration), Arithmetic pipeline, Instruction pipeline, Difficulties in Instruction pipeline, And theme solutions, Vector processing, And array processors, Interprocessor communication, Cache coherence.

References:

- 1- M.M Mano “Computer System Architecture “third Edition, Prentice Hall, 1993.
- 2- David A. patterson And John L.Hennessy,”Computer Organization And Design “ Morgan Kaufmann, 1998.

**4. Compilers:**

Programming Language, Introduction to Compiler, Type of Errors, One Pass Compiler, Syntax Definition, Context Free Grammar, Parsing Tree & leftmost and rightmost derivations, Transition Graph, Lexical analysis, Syntax of Analysis, Problems of Compiler, First and Follow, Top down Parsing, Predictive Parsing Method, Bottom up Parsing, Operation Precedence Parser, Simple Left to Right Parser, Canonical LR Parser, Look Ahead LR, Semantic Analysis, Intermediate Code Generation, Code Optimization, Examples of Code Optimization, Code Generation, Build Simple Compiler.

References:

1. Principles of Compiler Design, Alfred V. Aho, Jeffrey D. Ulman.

**5. Natural Languages Processing (NLP):**

Introduction to NLP: (Definition of NLP, NLP Goal, The advantage of NLP, Example of Intelligent Robot), Understanding: (What is Understanding?, What makes understanding hard?, The complexity of the target representation, Type of mapping, Level of interactive among components), Types of Languages & Grammars: (Type 0: Phrase Structure Grammar (PSG), Type 1: Context Sensitive Grammar (CSG), Type 2: Context Free Grammar (CFG), Type 3: Regular Grammar (RG), Written Text Processing (Formal Method), Lexical analysis, Syntax analysis: (Rules of Grammar, Parse Tree and Transition Network Parser), Semantic analysis, Syntax Analysis (Formal Method): Rules of English Grammar, Example of PROLOG program of English Grammar solved in: Append Mechanism.Syntax Analysis, Formal Method, Append Mechanism with Singular & Plural Consideration. Syntax Analysis (Formal Method): Difference Pair Idea, Semantic Analysis (Formal Method): A: Knowledge Representation (Rule-Base System, Semantic Net, Frame Representation, Conceptual Graph, Semantic Analysis (Formal Method), B: Analyzing the semantic structure of a



sentence: (object case, Agent case, Co-agent case, Beneficiary case, Location case, Time case, Instrument case, Source and destination cases ...), C: The Case Analysis Parser. Written Text Processing (Informal Method), Extracting meaning from keywords, Example of PROLOG program (DOCSYS) for a manual of a company. Machine Translation (MT): (Definition of MT and its usage, Computer-Aided Human Translation (CAHT), Language Similarities & Differences), Machine Translation Methods: (Direct Translation Method, Transfer Metaphor Model, The Interlingua Idea: Using Meaning), Translation Dictionary: (Types of dictionary, Dictionary structure), Spoken language Processing: (Speech definition, Problem areas in speech recognition system, Text-Dependent & text Independent SR, Continuous & Isolated SR), SR System model, From talk to text: Dual purpose speech (medical report), From talk to text: (Dual purpose speech (schedule appointment), Multiple pronunciations lexicons (Using Hidden Markov Model (HMM), Speech Recognition Grammar: Using XML Data Structure, Application on SR system: (Understanding speech without recognizing words)), Application on SR system, Speech Compression (Lossless compression, Lossy compression), Application on SR system: Distributed speech recognition system, The relationship between NL & SR, Compares between Written text processing & Speech processing, Natural Language Generation: Example and Program.

References:

1. "AI", By: Alian Rich, 1991.

**6. Neural Networks & Genetic Algorithms (Optional):**

Introduction, Artificial neuron concepts, NN Architecture, Supervised & Unsupervised, Activation Functions, learning Rules, Hebbian Learning rule, Basic Delta Rule, ANN taxonomy, Hopfield NN, Back Propagation NN, Continue with application, BAM, Adaline, Application, Kohonen NN, Application, (ART), Auto & Hetero Associative, GA concepts, GA Operators, GA Parameters, GA Fitness Function, Genetic Programming, GA Application.

References:

- 1- Fundamentals of Neural Networks: Architecture, Algorithms, and application. By Laurene Fausett
- 2- Neural Networks. By Phil Picton
- 3- Neural Networks. Fundamentals, Application, Examples. By Werner Kinnebrock
- 4- Neural network for identification, prediction and control. By D. T. Pham and X. Liu.
- 5- Genetic Algorithms. By Gross berg

**7. Databases:**

Introduction (DBMS), Data abstraction, Data models, Data independence, Database management & administrator, Entity relation model, Mapping constraints, Entity relation diagram, Representation of strong & weak entity, Generalization & aggregation, Design of an E-R database scheme, Mapping cardinalities, Data model-relational model, Example SQL, AQL, Hierarchical model, Example DL/1, IQL,



**Computer Architecture** Databases, Trad-off in Distributing the databases, Design of distributed databases, Transparency and Autonomy, Distributed Query Processing, Recovery in distributed databases.

References:

1. Database System Concepts (Henry F. Korth).
2. An Introduction Database System C.J.Date.

**8. Expert Systems (Optional):**

Expert Systems Using and Applications, Forward Chaining, Backward Chaining, Systems Based on Simple Search, Using Heuristics in Games, Search With Heuristics Embedded in Rules, Controlling the Reasoning Strategy, Systems Depend Under Uncertainty, Systems That Explain Their Actions, Using WHY Facility in Explanation Processor, Using HOW Facility in Explanation Processor, Natural Language Understanding, NLP Informal Method, NLP Formal Method, An Introduction to Adaptive Algorithms, An Introduction to Neural Network, Perceptron Neural Net, Back Propagation Neural Net, Hopfield Neural Net, Bidirectional Associative Memory Neural Net, Case Study in NN, An Introduction to Genetic Algorithms, GA in Travelling Sales Man Problem Solving, GA in the 8\_Puzzle Problem Solving, GA in the Transitions Problem Solving, An Introduction to Genetic Programming.

References:

1. Daniel H. Marcellus, Expert Systems Programming in Turbo Prolog, Prentice Hall (New Jersey) 1992.
2. 1.George F. Luger,Artificial Intelligence (structures and strategies for complex problem solving), Pearson Education Asia (Singapore), 2002.
3. 2. Laurene Fausett, Fundamantals of neural Networks: Architecture, Algorithms, and Applications, 1994.
4. David E. Goldberg, Genetic Algorithms in Search optimization, and Machine Learning, 1993.

**Elective Subjects for Third Year**

المواضيع الاختيارية للمرحلة الثالثة

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	Expert Systems	النظم الخبيرة	1
3	-	2	2	Neural Network and Genetic Algorithms	الشبكات العصبية والخوارزميات الجينية	2
3	-	2	2	Moulding and Simulation	النمذجة والمحاكاة	3
2	-	-	2	Predicted and Decision Making	التنبؤ واتخاذ القرار	4



## Forth Year Syllabus

## منهج المرحلة الرابعة

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	Advanced Artificial Intelligence	ذكاء اصطناعي متقدم	1
3	-	2	2	Communication and Computer Networks	الاتصالات وشبكات الحاسبة	2
2	-	-	2	Computer and Data Security	امنية الحاسبات والبيانات (أختياري)	3
3	-	2	2	Operating System	نظم التشغيل	4
2	-	-	2	Fuzzy Logic	المنطق المضبب	5
3	-	2	2	Web programming	برمجة مواقع الانترنت (أختياري)	6
3	-	2	2	Image Processing	معالجة الصور	7
3	-	4	1	Project	مشروع	8
22	-	14	15	<b>Total</b>		

Total No. of Unit for One Semester: (22)Units

مجموعة الوحدات للفصل الدراسي الواحد: (22) وحدة

Total No. of Unit for Year: (44) Units

مجموعة الوحدات لسنة دراسية: (44) وحدة

### 1- Advanced Artificial Intelligence:

Planning: ( P-A-D Algorithm, Non-linear Constraint Planning, Means Ends Algorithm),  
Symbolic Learning: (Framework, Candidates Elimination Algorithms, ID3 Algorithm),  
Reinforcement Learning, Non- Monotonic Logic, Tabu Search, Simulated Annealing,  
Introduction to Data Mining: (Association Rules Extraction, Apriori Algorithm),  
Introduction to Swarm intelligent.

### References:

5. Daniel H. Marcellus, Expert Systems Programming in Turbo Prolog, Prentice Hall (New Jersey) 1992.
6. 1.George F. Luger,Artificial Intelligence (structures and strategies for complex problem solving), Pearson Education Asia (Singapore), 2002.
7. 2. Laurene Fausett, Fundamantals of neural Networks: Architecture, Algorithms, and Applications, 1994.
8. David E. Goldberg, Genetic Algorithms in Search optimization, and Machine Learning, 1993.



## **2- Computer Networks and Internet:**

Data Communication, Physical Topology, Basic Network Technology, LAN Devices, Collision and Collision Domains in Shared Layer Environments, Network Devices, Network Layer Addressing, Network Layer Field & Datagram, IP address Class, Subnet NW, Private Addresses, Transmission of Digital Data Interfaces and Modems, Transmission Media, Unguided Media, Satellite Communication, Error Detection and Correction, Data Link Control, Multiplexing, De Multiplexing, Data Link Protocols, ARP, FTP, TELNET, DNS, UDP, TCP, NFS and RPC, SMTP, TFTP, HTTP, WAIS, Gopher, SNMP, WWW, Browser Architecture, Methods for Assigning IP Address, Advance ARP, DHCP, Dynamic Addressing, Routable and non Routable Protocols, RIP Features.

### **References:**

- 1- "Computer Networks", 3<sup>rd</sup> Edition, A. Tannenbaum, Prentice-Hall, 1996.
- 2- "Data Communications, Computer Networks and OSI", 4<sup>th</sup> Edition, F. Halsall, Addison-Wesley, 1995.
- 3- "Computer Communications and Networks", J. R. Freer, USL Press, 1996.

## **3- Fuzzy Logic:**

Introduction: why we need fuzzy theory , advantages and applications, Fuzzy set: definition , comparison between the crisp set and fuzzy set, examples, Operations on fuzzy sets and comparison to the crisp operations with examples, Fuzzy logic and compatriot to logic rule with examples, Fuzzy number with example, Definition of fuzzification, fuzzification functions, and examples, Definition of de-fuzzification, de-fuzzification functions, examples, Rules, rule structures, rule firing, confides and rules Inference engine, Knowledge base, data base, Big picture of fuzzy logic system structure, Preprocessing and post-processing, Review of fuzzy logic system, Data, conclusions to be reached, purpose, Mapping out the reasoning process, Turbine controller, fuzzy stream, Fuzzy logic controller, Comparison between fuzzy system and fuzzy controller, Working one-line real time constraint, On-line real time data input and output and processing algorithms, Memory storage requirement and response time, Introduction to fuzzy hybrid systems, Feature detection , c-mean, Fuzzy c-mean with example, Introduction to NN, Fuzzy NN with example, Introduction to wavelet transform, wavenet, Fuzzy wavenet with example, Review of the hybrid systems, Application of hybrid systems.

### **References:**

3. Fuzzy system hand book, Byearl Cox, 1999.
4. Fuzzy controllers by; Leonid Reznik, 1997.

## **4- Operating System:**

Introduction to Operating Systems, User view and system view of OS, OS for mainframe, Desktop computer systems, OS for multiprocessor and distributed systems, OS for clustered, real-time and handheld computer systems, Introduction to computer system structure, Hardware Protection, Operating system structure, System



components1, System components2, Operating system services, System calls and System Programs, System Design, System implementation, Half-year Break, Introduction to Processes, Process Concepts, Process Control Block, Process Scheduling, Operation on Processes, Cooperating Processes, Interprocess Communication, Introduction to CPU Scheduling, CPU Scheduling concepts, Scheduling Criteria, Scheduling Algorithms, First Come First Served and Shortest Job First, Priority Scheduling algorithm and Round Robin Algorithm, Introduction to Deadlocks and handling.

References:

1. "Operating System Concepts" by Silberschatz, Galvin and Gagne, 2003.

**5- Computer and Data Security:**

Introduction of Data security, Basic terminology of Data security, Mathematical Background, Basic definition of arithmetic modular with examples, How Compute the Greater common deviser (GCD) using different methods, Explain the methods to compute the Inv, Explain the methods to find Euler notation and compute inv using Euler notation, Introduction of types of cipher systems, Types traditional of ciphers systems, Introduction of transposition cipher systems, Implementation of simple transposition method with examples for encipher and decipher methods, Columner method and fixed pired method, Implementation of simple substitution methods with examples for encipher and decipher methods, Types of substitution cipher systems types, Monoalphabetic substitution cipher systems (keywords method), Homophonic substitution cipher systems(Beal cipher, Higher order homophnics), polyaphabetic substitution cipher systems(Vigener cipher, Beaufort cipher ,Running ker cipher), polygram substitution cipher systems(playfair cipher, hill cipher ,product cipher), Introduction to public key systems (secrecy and authenticity), Knapsack ciphers), Merkel-Hellman knapsacks, simple knapsack algorithm), Trapdoor knapsack algorithm, With example for encipher and decipher process, RSA algorithm (encryption and decryption processes), Public-key digital signature algorithms (RSA), Introduction of DES algorithm, X-box process in DES algorithm with example, Encryption process in DES algorithm with example, Decryption process in DES algorithm with example, Introduction of Stream ciphers, One time Pad system (vernam system), The requirements of steam cipher, The Basic Five Randomness tests (i.e. frequency test , serial test), Poker test , run test, auto correlation test.

**6- Image Processing:**

Introduction to Image Processing, Comparession between Computer Image and Computer Vision, Major topics for Computer Vision, Major topic for image processing, Image restoration, Image Enhancement, Image Comprission, Image Representation, Digitization, Type of digital image, Binary Image, Gray Image, Color Image, HSL, Digital Image File Format, Spatial Domain, Frequency Domain, Region of interest image geometry (Crop, enlarge , shrinking , translate , rotate), Zoom algorithm, Zero order hold, First order hold, Convolution, Image Analysis: Image analysis steps, Preprocessing, Data reduction, Feature Analysis, Image algebra



operation, Arithmetic operation, Logical operation, Spatial Filters, Mean Filters, Median Filters, Enhancement filters, Laplacian Filter, Difference Filter, Image Equalization, Gray level reduction, Spatial reduction, Edge line detection technique, Robert operator (Sobel operator, Prewitt operator, Krisch compass, Robinson compass mask, Laplacian operator, Frei chen mask), Segmentation, Region growing, Clustering methods, Boundaries detects, Combined approach, Histogram (Histogram features, Histogram Equalization, Histogram advantage, Image enhancement: Introduction, Gray scale modification, Histogram modification, Adaptive contrast enhancement, Color, Image sharpening (High pass filter, High frequency emphasis, Homomorphic filter), Image smoothing (Mean and median filters, Low pass filter, Image Restoration), Image Compression: Discrete transformation, Fourier transform (Walsh Hadamard transform, Wavelet transform).

### **7-Web Programming:**

Introduction to Web, Introduction to the Internet, The World Wide Web, The Internet and Web, The History and Growth of the Web, The Purpose of the Web, The Web Concepts, The Web Site Generations, Classifying the Web Sites, Programming Technologies, ASP Principles, Web Programming with ASP  
Web based Applications.

#### **References:**

1. World Wide Web Consortium (W3C)  
<http://www.w3c.org>
2. Tim Berners-Lee Web Page  
<http://www.w3.org/People/Berners-Lee>
3. Weaving the Web ... "Book"  
<http://www.w3.org/People/Berners-Lee/Weaving/Overview.html>
4. Web Site Engineering ... "Book"  
[http://www.geocities.com/website\\_engineering/chapter01.htm](http://www.geocities.com/website_engineering/chapter01.htm).

### **8-project.**

#### **Elective Subjects for Forth Year**

#### **المواضيع الاختيارية للمرحلة الرابعة**

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	<b>Intelligent Databases</b>	قواعد البيانات الذكية	1
3	-	2	2	<b>Robotics</b>	الروبوت	2
3	-	2	2	<b>Web programming</b>	برمجة مواقع الانترنت	3
2	-	-	2	<b>Computer and Data Security</b>	امنية الحاسبات والبيانات	4
3	-	2	2	<b>Advanced Intelligent Systems</b>	الانظمة الذكية المتقدمة	5



## Computer Security Branch

فرع أمنية الحاسوب

[www.uotechnology.edu.iq](http://www.uotechnology.edu.iq)





## First Year Syllabus

## منهج المرحلة الأولى

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
4	-	2	3	Structured Programming	البرمجة المهيكلية	.1
2	-	-	2	Mathematics	الرياضيات	.2
2	1	-	2	Discrete Structures	الهياكل المتقطعة	.3
3	1	2	2	Computer Organization and Logic Design	تركيب الحاسبة والتصميم المنطقي	.4
2	1	-	2	Principals of security	مبادئ الامنية	.5
2	1	-	2	Probability Theory	نظرية الاحتمالات	.6
Pass	-	-	2	Human Rights	حقوق الإنسان	.7
Pass	-	-	2	English Language	لغة انكليزية	.8
15	4	4	17	<b>Total</b>		

Total No. of Unit for One Semester: (15)Units  
Total No. of Unit for Year: ( 30 ) Units

مجموعة الوحدات للفصل الدراسي الواحد: ( 15 ) وحدة  
مجموعة الوحدات لسنة دراسية: ( 30 ) وحدة

### **1.Structured Programming (with C++ Programming Language): update**

Introduction, Procedural Programming Principles, Algorithm ,Algorithm properties ,Examples, Flowcharts, Flowchart Figure, Examples C++ Language Basics (Character set, Identifiers, Getting Started with C++, Variables Declaration, Variables, Constants, Arithmetic Operations, The “math.h” Library, Unary Minus, Increment and /decrement Operators, Operational Assignment Operators, Relational Operators, Logical Operators, Bitwise Operator), Selection Statements (Selection Statements, The Single If Statement Structure, The Single If Statement Structure (Blocks), The If/else Statement Structure, Nested If and If/else Statements, The Switch Selection Statement (Selector), Conditional Statement), Iteration Statements (Selection Statements, While Repetition Structure, Do/While Statement, For Statement, More about For Statement, Nested Loops, Break and Continue Control Statements), Functions (Function, Passing Parameters (Passing by Value, Passing by Reference)), Arrays (Array of One Dimension (Declaration of Arrays, Initializing Array Elements, Accessing Array Elements, Read / Write / Process Array Elements), Array of Two Dimension (Declaration of 2D-Arrays, Initializing 2D-Array Elements, Read / Write / Process Array Elements)), String (Read / Write / Process Array Elements, Member Function of String, stdlib Library), Structures (The Three Ways for Declare the Structure, Array of Structures).

#### **References:**

- 1- Mastring C++ , Amman-Jordan, AL-Shorok\2002.
- 2- Oqeili Salch, prof. Department of IT-AL-Balqa Applied University.



## **2.Mathematics:**

Functions, Transcendental Functions, Sequence and Series, Differentiation and Applications, Integration and Applications, Multiple Integrals, Polar Plane, Complex Numbers, Matrices, Vector Analysis.

### **References:**

1- Calculas , Thomas.

## **3.Discrete Structures**

Set theory -sets & subsets - how to specify sets -, sequences -Operations on sets-, Algebra of sets & its proves, sets of numbers- Finite sets, Mathematical induction & recursion, Matrices, Logic and propositions- Equivalency, Tautology& Contradiction, Relations- Computer representation of relations & Digraph, Manipulation of relations, Properties of relations, Composition of relations (Functions-types of functions, Graphs-definition-graphs & multigraphs- sub graph – degree of graph), Walk –length of walk- trail- path- cycle- the bridges of Konigsberg, Traversable multigraphs- Euler theorem- special graph- bipartite graph matrices & graph, Labeled graphs – trees- rooted tree- ordered rooted tree- polish notation, Spanning tree- directed graph- matrix of digraph, Minimal path, Finite state machines, Language & pattern recognition machines, Optimistic approach to construct FSM, Finite automata, Finite automata (Contd).

### **References:**

1. Discrete mathematics by Seymour Lipchitz
2. Discrete mathematical structures for computer science by Bernard Kolman & Robert C. Busby

## **4.Computer Organization and Logic Design:**

Digital systems conversion, Digital system arithmetic, Complement scheme, Subtraction with complement, Logic gates, Addition digital system, The basic postulation, Prove the theorem(Booleen Algebra), Simplification by K-map, Combinational logic circuits Using (NAND, NOR Gates), Half-Adder, Full-Adder, 4-Bit Parallel Adder, Sequential circuits, Flip-flops, Multilevel logic implementation, Encoder and decoder, Multiplexer and de-multiplexer, Msl and vlsc, Computer definition, Computer generation, Computer architecture, CPU operation, Fetch cycle, Execution cycle, Memory representation, Memory types, Primary storage, Secondary storage, Computer classification, Language classification, Translators program, Operating systems, Networking, Internet.

### **References:**

1. Computer System Architecture, M. Morris Mano, Third Edition, 1993.
  2. Digital Fundamental, Floyd, Eight Edition, 2003.
  3. Principle Of Computer Architecture, Murdocca. M. J., Heuring .V.P., Prentice-Hall, Inc.
  4. Computer Communications and Information, Hutchinson .S.E., Sawyer .S.C. ,with Contribution by Coulthard G.J. .
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## **5. Principals of security :**

### **6. Number Theory:**

What is number theory, Definition of : set, binary operation, group, Definition of : ring, field, Basic properties of divisibility, Fundamental theorem of arithmetic, Mersenn prime and Fermat number, Euclid's algorithm, Definition of: mod, congruent, Properties of congruent, Residue class of a modular, The properties of residue classes, Modular arithmetic, Linear congruence: Fermat's little theorem, Euler's theorem, How to find the multiplicative inverse, Applications for binary number, Applications for integer number, Linear congruent generation, Power and discrete exponential generator, Introduction to cryptography.

#### **References:**

- 1- Number Theory for Computing, By: Song Y. Yan.

### **7- Probability Theory:**

set theory, equality of sets, subset , binary operations on set, Venn diagram, finite set and countable sets , cardinality, Cartesian product, Relations , inverse relation, functions, type of function, inverse function, equality of function, composite function , Permutation and combination, Permutation, combination, binomial theorem, Probability theory, Basic probability definition and rules, sample space, event, type of sample space, Probability, complement rule, addition theorem, books inequality, multiplication theorem , Conditional probability, the general multiplication rule, Independent of events, probability distributions , random variable, the probability density function , cumulative probability , the binomial distribution

#### **References:**

- 1- Probability and Statistics Theory and Applications, Gunnar Blom.

### **8. حقوق الإنسان**

حقوق الإنسان في الحضارات القديمة، حقوق الإنسان في الشرائع والأديان السماوية، مصادر حقوق الإنسان، ضمانات حقوق الإنسان، مستقبل حقوق الإنسان.

#### **المصادر:**

حقوق الإنسان والطفل والديمقراطية , د. ماهر صالح علاوي الجبوري وآخرون

### **8- English language:**

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## Second Year Syllabus

## منهج المرحلة الثانية

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	1	2	2	Object Oriented programming	البرمجة الشيئية	1
3	1	2	2	Data Structures and Algorithms	هياكل البيانات والخوارزميات	2
3	1	2	2	Advance Mathematic and Numeric Analysis	الرياضيات المتقدمة والتحليل العددي	3
2	-	-	2	Information Theory	نظرية معلومات	4
2	-	-	2	Stream ciphers	التشفير الانسيابي	5
2	1	-	2	Number Theory	نظرية الارقام	6
2	-	-	2	Computation Theory	النظرية الاحتمالية	7
Pass	-	-	2	Democracy	ديمقراطية	8
17	4	6	16	Total		

Total No. of Unit for One Semester: (17)Units  
Total No. of Unit for Year: (34) Units

مجموعة الوحدات للفصل الدراسي الواحد: (17) وحدة  
مجموعة الوحدات لسنة دراسية: (34) وحدة

### 1- Object Oriented Programming (with C++ Programming Language):

An Introduction: (The Evolution of OOP, Encapsulation and Data Hiding, Inheritance and Reuse, Polymorphism, Short History, C++ Program Development Process (PDP)),  
Classes: (Introduction, Declaration of classes, Class Constructors and Destructors, Overloading Constructors, Class Templates, Case Study1(Guessing Password Game)),  
Inheritance: (Introduction, Declaration of Inheritance, An Example – Single Inheritance, Inheritance based on access-specifier (Inheritance with Public access-specifier, Inheritance with Private access-specifier), Parent Constructors and Destructors),  
Polymorphism: (Introduction, Pointer to Classes, Static and Dynamic Binding, Types of Polymorphism (Polymorphism of Variables, Polymorphism of Functions, Polymorphism of Objects), Virtual Functions, Override Function, Constructor and Virtual Destructor, Abstract Base Class (ABC) and Pure Virtual Function), Operator Overloading: (Introduction, Operators that can't be overloaded, Operator Functions, Operator Overloading with the Member Operator Functions, Operator Overloading with the Non-member Operator Functions (Friend Function), The Flexibility of Friend Operator Functions, Overload the Output Operator), Selected Advance OOP Topics: (Custom Header Files, Selected Problems: Program's Self-Protection, Simple Virus and its Anti-Virus)).

#### References:

3. "Mastering C++", Prof. Oqeili Saleh and others, Dar Al-Shorok, Amman-Jordan, 2004.



4. “Object Oriented Programming Language with C++”, Bjarne Stroustrup, Addison-Wesley Publication, 2003.

## **2- Data Structures and Algorithms:**

Introduction to Data Structures, Memory representation for 1D and 2D arrays, Linear list, Linear list types, Stack: (Stack Operations, Applications of stack), Queue: (Queue Operations, Applications of queue), Circular Queue: (C Queue Operations, Applications of CQueue), Linked List, Linked-Stack, Linked-Queue, Linked-C Queue, Recursion, Graph, Trees: (Types of Tree, Binary tree, Binary tree scan, Represent Regulars expression using trees, convert tree to binary tree, Binary Search Tree), Sorting: (Sorting Algorithms, Types of Sorting algorithms, Bubble Sort, Insertion Sort, Quick Sort), Searching: (Searching Algorithm, Sequential Search, Binary Search).

### **References:**

- 1- Data structures and Algorithms with Object- Oriented design Patterns in C++  
BY: Bruno R. Preiss, B.A.Sc., M.A.Sc.Ph.D., P.Eng. Associate Professor, Department of electronic and computer engineering, university of waterloo.
- 2- Data Structures and algorithm analysis in C, By: Mark Allen Weiss.
- 3- Data Structures and algorithms in Java PDF file.
- 4- Data Structures using C and C++, Yedidyah language, Moshe J. augenstein, Aaeon M. Tenenbaum, Brooklyn College.

## **3- Advance Mathematic and Numeric Analysis:**

Partial differentiation, ( partial differentiation for first and higher order of derivative, chain rule, directional derivative), first order equations, (solution of differential equation by direct integration, separating the variables, homogeneous equation,....), Second and higher order differential equations, linear second order differential equation with constant), Lap Transform (Laplace transform for standard important function, multiplication by  $t^n$ , division by  $t$ , Inverse Laplace transform of derivatives, Partial differential equations ( formation of partial differential equations, types of partial differential equations,....), Fourier series ( periodic functions, Fourier series for odd and even function, half range Fourier sin and cosine series, change of interval ), Numerical analysis ( solving sets of equation, elimination and iterative methods, interpolating polynomials, Lagrange polynomial ), solving non-linear equation, numerical differentiation and numerical integration, numerical solution of ordinary differential equations, curve-fitting and approximations.

### **References:**

- 1- Thomas, G. Calculus and Analytic Geometry, 5<sup>th</sup> Edition, Addison Wesley, 1999.
- 2- Numerical Methods Using Matlab, Prentice Hall.

## **4-Information Theory.**

The measure of information, self information, average information entropy, maximum entropy of a discrete source, binary source, ternary source, mutual information, normal

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noisy channel, noiseless channel, total channel, channel capacity, channel efficiency, channel redundancy, source efficiency, symmetric channel, capacity of symmetric channel, binary symmetric channel capacity, cascade channel, coding, source coding, average length of coding, compact code, code efficiency and redundancy, source coding technique, fixed length coding, variable length coding, source coding for special source, Shannon-fano method, Huffman method, extension of code.

#### **References:**

- 1- Coding and Information Theory, Richard W. Hamming.

#### **5- Stream ciphers:**

Stream Ciphers ( Self-Synchronizing Stream Ciphers, Cipher-Feedback Mode, Synchronous Stream Ciphers, Output-Feedback Mode, Counter Mode, Other Block-Cipher Modes, choosing a cipher mode, interleaving, Block Ciphers vs. Stream Ciphers), Modern Stream Ciphers (One-Time Pad, Using a Vernam Cipher, Stream Ciphers and Pseudo-Random Generators, Using Block Ciphers as Stream Ciphers, Cipher Feedback, Linear Feedback Shift Registers (LFSR), LFSR Insecurities, Berlekamp-Massey algorithm), Stream Ciphers Design Criteria (large linear complexity (based on size of equiv LFSR, correlation immunity (have tradeoff with linear complexity, confusion (output bits depend on all key bits), diffusion (use of highly non-linear Boolean functions)), Stream Ciphers Based on LFSRs, A5, SOBER, RC4, RC4 Security.

#### **References:**

1. B Schneier, "Applied Cryptography", 2/e, Chs 16-17
2. R A Rueppel, "Analysis and Design of Stream Ciphers", Springer-Verlag, 1986

#### **6 Number Theory**

Divisibility, Prime Numbers, Division, Greatest Common Divisor, The Euclidean Algorithm, Congruences, Divisibility Tests, More Properties of Congruences, Residue Classes,  $\mathbb{Z}_m$  and Complete Residue Systems, Addition and Multiplication in  $\mathbb{Z}_m$ , The Group of Units, The Chinese Remainder Theorem, Fermat's Little Theorem, Euler's Function, Prime Numbers, Prime Testing and Certification, Strong Pseudoprimes, Industrial-Grade Primes, Prime Certification Via Primitive Roots, An Improvement, Pratt Certificates

#### **References:**

- 1-Elementary Number Theory, William Stein, 2004

#### **7- Computation Theory:**

Regular Expression, Finite Automata, DFA and NFA, Equivalence of NFA and DFA, Equivalence of NFA and DFA with E-moves, Introduction to Crammers, Phrase Structure Grammar, Context sensitive Grammar, Context Free grammar, Chomsky Normal Form, Greibach Normal Form, Tree, The empty string in context free grammar ambiguity, Regular grammar, Left linear grammar, Right linear grammar, Kleen theorem, Two way finite automata with output (mealy machine, moor machine), The equivalence



of mealy and moor machine, Push down automata, Top down –bottom up derivation, Turing machine.

**References:**

1. H.R.Lewis And G.H Papadimitiou,"Elements Of The Theory Of Computation", Prentig-Hall, 1981.
2. R.W.Floyd And R.Beigel,"The Languae Of Machine:An Introduction To Computability And Formal Languages"Computer Science Press, Network, 1994.
3. M.Sipser."Introduction To The Theory Of Computation" ,Boston Pws Pub ,1996.

**8. Democracy.**

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## Third Year Syllabus

## منهج المرحلة الثالثة

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	Computer Graphics	رسوم الحاسوبية	.1
3	-	2	2	Compilers	المتجمات (اختياري)	.2
3	-	2	2	Databases	قواعد البيانات (اختياري)	.3
2	-	-	2	Computer Architecture	معمارية الحاسوبية	.4
3	-	2	2	Computer Networks	شبكات الحاسوبية	.5
3	-	2	2	Artificial Intelligence	الذكاء الاصطناعي	.6
3	-	2	2	Data Encryption	تشفير البيانات	.7
2	-	-	2	Information Hiding	اخفاء المعلومات	.8
22	-	12	16	<b>Total</b>		

Total No. of Unit for One Semester: (22)Units

مجموعة الوحدات للفصل الدراسي الواحد: (22) وحدة

Total No. of Unit for Year: (44) Units

مجموعة الوحدات لسنة دراسية: (44) وحدة

### 1. Information Hiding:

Main Subdisciplines of Information Hiding, A Brief History of Information Hiding, Some Applications of Information Hiding, Frameworks for Secret Communication, Security of Steganography Systems, Information Hiding in Noisy Data, Information Hiding in Written Text, Examples of Invisible Communication, Least Significant Bit Substitution, Cover-Regions and Parity Bits, Palette-Based Images, Information Hiding in Binary Images, Steganography in the DCT Domain, Information Hiding and Data Compression, Statistical Steganography, Encoding Information in Formatted Text, Distortion of Digital Images.

#### References:

- 1- Information Hiding Techniques for Steganography and Digital Watermarking By Stefan Katzenbesser, Fabien Pericolas, 2000.

### 2. Computer Graphics:

Introduction: Display Devices (e.g. Raster, Vector). Elementary Graphics Figures: Line and Circle Drawing Algorithms. Sorting Pictures and 2D Transformations: Writing and Reading Graphics Data Files, Pictures Translation, Pictures Rotation, Pictures Scaling. Clipping and Windowing: Point and Line Clipping, Clipping Algorithms, Polygon Clipping. Curves: Polynomial Curves, Spline Curves. Elementary 3D Graphics: Introduction, Coordinates System, Transformations, Orthogonal Projection, Multiple Views, Hidden Lines and Surfaces, Shading and Coloring. Animation Techniques.

#### References:





- 1- J. D. Foley, Avam Dametal, "Introduction to Computer Graphic", Addison-Wesley, 1993.
- 2- D. Hearn and M.P. Baker, "Computer Graphics ", 2nd. Ed., Prentice-Hall, 1994

### **3. Computer Architecture:**

Introduction to computer architecture and CPU architecture, Instruction set and format, Addressing modes, Program control (interrupt and subroutine call), Microprogramming Design of CPU Control Unit and Micro programmed vs., ardwired Control, RISC and CISC, I/O organization and Peripheral Control Strategies, Input / output interfaces, Asynchronous data transfer, Programmed I/O, Memory Management, types and hierarchy, Main memory and memory address map, Direct Memory Access, Input / output processor (IOP) and Channels, Associative Memory and Content-Addressable Memories, Cache memory, Parallel processing, Pipeline (general consideration), Arithmetic pipeline, Instruction pipeline, Difficulties in Instruction pipeline, And theme solutions, Vector processing, And array processors, Interprocessor communication, Cache coherence.

#### **References:**

- 1- M.M Mano "Computer System Architecture " third Edition, Prentice Hall, 1993.
- 2- David A. patterson And John L.Hennessy, "Computer Organization And Design " Morgan Kaufmann, 1998.

### **4. Compilers:**

Programming Language, Introduction to Compiler, Type of Errors, One Pass Compiler, Syntax Definition, Context Free Grammar, Parsing Tree & leftmost and rightmost derivations, Transition Graph, Lexical analysis, Syntax of Analysis, Problems of Compiler, First and Follow, Top down Parsing, Predictive Parsing Method, Bottom up Parsing, Operation Precedence Parser, Simple Left to Right Parser, Canonical LR Parser, Look Ahead LR, Semantic Analysis, Intermediate Code Generation, Code Optimization, Examples of Code Optimization, Code Generation, Build Simple Compiler.

#### **References:**

1. Principles of Compiler Design ,Alfred V. Aho, Jeffry D. Ulman.

### **5. Artificial Intelligence:**

Introduction to Programming in Logic, Prolog Language Structure, Prolog Language Components, Facts, Simple Rules, Built in Functions in Prolog Language, Recursion in Prolog (Tail Recursion), Non Tail Recursion, Fail Structure, List Processing, String Processing, Database Structure and Properties, Files in Prolog and Applications with Database, Introduction to Artificial Intelligence, Knowledge Representation, Logical

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Representation, Graphical Representation, Problem State Space Characteristics, Problem Solving, Search Technique(Blind), Heuristic Search, The 8\_Puzzle Problem, Control Strategy(Structure), Forward Chaining for Problem Solving, Backward Chaining for Problem Solving, Hybrid Method (Rule Cycle).

References:

1. Elian Rich, Artificial Intelligence, Prentice Hall 1991.

**6. Data Encryption:**

Introduction of Data security, Basic terminology of Data security, Mathematical Background, Basic definition of arithmetic modular with examples, How Compute the Greater common deviser (GCD) using different methods, Explain the methods to compute the Inv, Explain the methods to find Euler notation and compute inv using Euler notation, Introduction of types of cipher systems, Types traditional of ciphers systems, Introduction of transposition cipher systems, Implementation of simple transposition method with examples for encipher and decipher methods, Columner method and fixed pired method, Implementation of simple substitution methods with examples for encipher and decipher methods, Types of substitution cipher systems types, Monoalphabetic substitution cipher systems (keywords method), Homophonic substitution cipher systems(Beal cipher, Higher order homophnics), polyaphabetic substitution cipher systems(Vigener cipher, Beaufort cipher ,Running ker cipher), polygram substitution cipher systems(playfair cipher, hill cipher ,product cipher), Introduction to public key systems (secrecy and authenticity), Knapsack ciphers), Merkel-Hellman knapsacks, simple knapsack algorithm), Trapdoor knapsack algorithm, With example for encipher and decipher process, RSA algorithm (encryption and decryption processes), Public-key digital signature algorithms (RSA), Introduction of DES algorithm, X-box process in DES algorithm with example, Encryption process in DES algorithm with example, Decryption process in DES algorithm with example, Introduction of Stream ciphers, One time Pad system (vernam system), The requirements of steam cipher, The Basic Five Randomness tests (i.e. frequency test , serial test), Poker test , run test, auto correlation test.

**7. Databases:**

Introduction (DBMS), Data abstraction, Data models, Data independence, Database management & administrator, Entity relation model, Mapping constraints, Entity relation diagram, Representation of strong & weak entity, Generalization & aggregation, Design of an E-R database scheme, Mapping cardinalities, Data model-relational model, Example SQL,AQL, Hierarchical model, Example DL/1,IQL, Structure of distributed Databases, Trad-off in Distributing the databases, Design of distributed databases, Transparency and Autonomy, Distributed Query Processing, Recovery in distributed databases.

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References:

- 1- Database System Concepts(Henry F. Korth).
- 2- An Introduction Database System C.J.Date.

**8. Computer Networks:**

Data Communication, Physical Topology, Basic Network Technology, LAN Devices, Collision and Collision Domains in Shared Layer Environments, Network Devices, Network Layer Addressing, Network Layer Field & Datagram, IP address Class, Subnet NW, Private Addresses, Transmission of Digital Data Interfaces and Modems, Transmission Media, Unguided Media, Satellite Communication, Error Detection and Correction, Data Link Control, Multiplexing, De Multiplexing, Data Link Protocols, ARP, FTP, TELNET, DNS, UDP, TCP, NFS and RPC, SMTP, TFTP, HTTP, WAIS, Gopher, SNMP, WWW, Browser Architecture, Methods for Assigning IP Address, Advance ARP, DHCP, Dynamic Addressing, Routable and non Routable Protocols, RIP Features.

References:

- 1- “Computer Networks”, 3<sup>rd</sup> Edition, A. Tannenbaum, Prentice-Hall, 1996.
- 2- “Data Communications, Computer Networks and OSI”, 4<sup>th</sup> Edition, F. Halsall, Addison-Wesley, 1995.
- 3- “Computer Communications and Networks”, J. R. Freer, USL Press, 1996.

**Elective Subjects for Third Year**

المواضيع الاختيارية للمرحلة الثالثة

No. of Units	Tutorial	No. of Lab. hour	No. Of Theory hour	Subject	اسم المادة	ت
2	-	-	2	<b>Intrusion Detection</b>	تعقب المتطفلين	1
3	-	2	2	<b>Neural Networks + Genetic Algorithms</b>	الشبكات العصبية و الخوارزميات الجينية	2
3	-	2	2	<b>Internet and Intranet</b>	أنترنت وانترانيت	3
3	-	2	2	<b>Compilers</b>	المترجمات	4
3	-	2	2	<b>Databases</b>	قواعد البيانات	5



## Forth Year Syllabus

## منهج المرحلة الرابعة

No. of Units	Tutorial	No. of Lab. hour	No. of Theory hour	Subject	اسم المادة	ت
3	-	2	2	Intelligence Systems	أنظمة ذكية	.1
2	-	-	2	Networks Security	أمنية الشبكات	.2
2	-	-	2	Cryptanalysis	تحليل شفرة	.3
3	-	2	2	Operating System	نظم التشغيل	.4
2	-	-	2	Advanced Cryptography	تشفير متقدم	.5
3	-	2	2	Web Programming	برمجة مواقع	.6
3	-	2	2	Image Processing	معالجة الصور	.7
3	-	4	1	Project	المشروع	.8
21	-	12	15	Total		

Total No. of Unit for One Semester: (21)Units  
Total No. of Unit for Year: (42) Units

مجموعة الوحدات للفصل الدراسي الواحد: (21) وحدة  
مجموعة الوحدات لسنة دراسية: (42) وحدة

### 1- Intelligence Systems:

Expert Systems Using and Applications, Forward Chaining, Backward Chaining, Systems Based on Simple Search, Using Heuristics in Games, Search With Heuristics Embedded in Rules, Controlling the Reasoning Strategy, Systems Depend Under Uncertainty, Systems That Explain Their Actions, Using WHY Facility in Explanation Processor, Using HOW Facility in Explanation Processor, Natural Language Understanding, NLP Informal Method, NLP Formal Method, An Introduction to Adaptive Algorithms, An Introduction to Neural Network, Perceptron Neural Net, Back Propagation Neural Net, Hopfield Neural Net, Bidirectional Associative Memory Neural Net, Case Study in NN, An Introduction to Genetic Algorithms, GA in Travelling Sales Man Problem Solving, GA in the 8\_Puzzle Problem Solving, GA in the Transitions Problem Solving, An Introduction to Genetic Programming.

References:



1. Daniel H. Marcellus, Expert Systems Programming in Turbo Prolog, Prentice Hall (New Jersey) 1992.
2. 1. George F. Luger, Artificial Intelligence (structures and strategies for complex problem solving), Pearson Education Asia (Singapore), 2002.
3. 2. Laurene Fauset, Fundamentals of neural Networks: Architecture, Algorithms, and Applications, 1994.

## **2- Networks Security:**

Introduction to network security, Network security definition, computing systems, IOS-OSI Reference Model, TCP/IP Model, IP Address, ports, networks are system, too, security attacks, active and passive attacks, methods of defense, threats in Networks, Reasons for network security problems, Network security threats, wiretapping, impersonation, message confidentiality violations, message integrity violations, hacking, code integrity violations, denial of service, protocol flaws, spoofing, web site defacement, distributed denial of service, threats to active or mobile code, complex attacks, security involving programs, information access problems, service problems, Trojan horse applications, the Trojan horse applications work, Trojan and the port numbers, examples of Trojan horse application, Network Security Control, encryption, encryption methods, link encryption method, end –to-end encryption method, comparison of encryption methods, virtual private network, PKI and certificates, SSH encryption, SSL encryption, IP sec, signed code, key distribution, secure key distribution protocol , key server, secure cryptographic facility, port protection, Authentication, Traffic control, Data integrity, Network security solutions, Kerberos Authentication System, Firewalls, intrusion detection Systems, Secure E-Mail, Multilevel Security on Networks, Advance Network Security Topics.

### **References:**

- 1- Security in Computing, 3<sup>rd</sup> Edition, By Charles P. Pfleeger, Shari Lawrence Pfleeger. Prentice Hall-2003.
- 2- Cryptography and Network Security, By William Stalling. Prentice Hall-1999.
- 4- Several Papers Published on the Web.

## **3- Cryptanalysis:**

Definition of Cryptanalysis and Cryptanalyst, Cryptanalyst position is some, simple cryptosystems, Requirements of Cryptosystems, Type of Attacks on Cryptosystems, Shannon's Theory: Entropy, Cryptanalysis of the Classical cryptography "Methods" Steps in Cryptanalysis and old tools, Cryptanalysis of the Classical cryptography "Methods" transition cipher, Cryptanalysis of the Classical cryptography "Substitution cipher", Cryptanalysis of the Classical cryptography "Affine Cipher", Cryptanalysis of the Classical cryptography "Vigenere Cipher" of the Classical cryptography "Beaufort Cipher" of the Classical cryptography Hill Cipher", Cryptanalysis of the Classical cryptography "Playfair Ciphers".

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References:

- 1- Applied Cryptography, Bruce Schneier, 1996.
- 2- Cipher Systems: The protection of communication, H.Beker, F.Piper, 1998.
- 3- Cryptography & Data Security, D.E.R. Denning, Purdue University, 1983.
- 4- A new Dimension in computer Data Security, C.H. Meyer, S.M. Matyas.

**4- Operating System:**

Introduction to Operating Systems, User view and system view of OS, OS for mainframe, Desktop computer systems, OS for multiprocessor and distributed systems, OS for clustered, real-time and handheld computer systems, Introduction to computer system structure, Hardware Protection, Operating system structure, System components<sup>1</sup>, System components<sup>2</sup>, Operating system services, System calls and System Programs, System Design, System implementation, Half-year Break, Introduction to Processes, Process Concepts, Process Control Block, Process Scheduling, Operation on Processes, Cooperating Processes, Interprocess Communication, Introduction to CPU Scheduling, CPU Scheduling concepts, Scheduling Criteria, Scheduling Algorithms, First Come First Served and Shortest Job First, Priority Scheduling algorithm and Round Robin Algorithm, Introduction to Deadlocks and handling.

References:

1. "Operating System Concepts" by Silberschatz, Galvin and Gagne, 2003.

**5- Advanced cryptography:**

Block Cipher Principles, The Data Encryption Standard, Differential and Linear Cryptanalysis, Groups, Rings, and Fields, Modular Arithmetic, The Euclidean Algorithm, Finite Fields of The Form  $GF(p)$ , Polynomial Arithmetic, Finite Fields Of the Form  $GF(2^n)$ , Evaluation Criteria For AES, The AES Cipher, Polynomials with Coefficients in  $GF(28)$ , Simplified AES, Multiple Encryption and Triple DES, Placement of Encryption Function, Key Distribution, Random Number Generation Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality, The Chinese Remainder Theorem, Discrete Logarithms, Principles of Public-Key Cryptosystems, The RSA Algorithm, Proof of the RSA Algorithm, Key Management, Diffie-Hellman Key Exchange, Elliptic Curve Arithmetic.

References:

- 1- Cryptograph and Network Security Principles and Practices, Four Edition By William Statings, 2005

**6- Image Processing:**

Introduction to Image Processing, Compression between Computer Image and Computer Vision, Major topics for Computer Vision, Major topic for image

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processing, Image restoration, Image Enhancement, Image Compression, Image Representation, Digitization, Type of digital image, Binary Image, Gray Image, Color Image, HSL, Digital Image File Format, Spatial Domain, Frequency Domain, Region of interest image geometry (Crop, enlarge, shrinking, translate, rotate), Zoom algorithm, Zero order hold, First order hold, Convolution, Image Analysis: Image analysis steps, Preprocessing, Data reduction, Feature Analysis, Image algebra operation, Arithmetic operation, Logical operation, Spatial Filters, Mean Filters, Median Filters, Enhancement filters, Laplacian Filter, Difference Filter, Image Equalization, Gray level reduction, Spatial reduction, Edge line detection technique, Robert operator (Sobel operator, Prewitt operator, Krisch compass, Robinson compass mask, Laplacian operator, Frei chen mask), Segmentation, Region growing, Clustering methods, Boundaries detects, Combined approach, Histogram (Histogram features, Histogram Equalization, Histogram advantage, Image enhancement: Introduction, Gray scale modification, Histogram modification, Adaptive contrast enhancement, Color, Image sharpening (High pass filter, High frequency emphasis, Homomorphic filter), Image smoothing (Mean and median filters, Low pass filter, Image Restoration), Image Compression: Discrete transformation, Fourier transform (Walsh Hadamard transform, Wavelet transform).

References:

- 1- Computer Vision and Image Processing, Scotte Eumbaugh, PH.D.
- 2- Digital Image Processing, Second edition  
Rafael C. Gonzalez University of Tennessee.  
Richard E. Woods UedData interactive.
- 3- Image processing Algorithms.

**7-Web Programming:**

Introduction to Web, Introduction to the Internet, The World Wide Web, The Internet and Web, The History and Growth of the Web, The Purpose of the Web, The Web Concepts, The Web Site Generations, Classifying the Web Sites, Programming Technologies, ASP Principles, Web Programming with ASP  
Web based Applications.

References:

1. World Wide Web Consortium (W3C)  
<http://www.w3c.org>
  2. Tim Berners-Lee Web Page  
<http://www.w3.org/People/Berners-Lee>
  3. Weaving the Web ... "Book"  
<http://www.w3.org/People/Berners-Lee/Weaving/Overview.html>
-



4. Web Site Engineering ... "Book"  
[http://www.geocities.com/website\\_engineering/chapter01.htm](http://www.geocities.com/website_engineering/chapter01.htm)

### **8- Project.**

#### **Elective Subjects for Forth Year**

#### **المواضيع الاختيارية للمرحلة الرابعة**

No. of Units	Tutorial	No. of Lab. Hour	No. Of Theory hour	Subject	اسم المادة	ت
3	-	2	2	3D Graphics and Vision	الرسوم ثلاثية الابعاد والرؤية	1
2	-	-	2	Internet Architecture	معمارية الانترنت	2
3	-	2	2	Image Processing	معالجة الصور	3
2	-	-	2	Modeling and Simulation	النمذجة والمحاكاة	4
2	-	-	2	Data Compression	ضغط البيانات	5
3	-	2	2	Web Programming	برمجة المواقع	6