



**University of Diyala
College of Engineering
Department of Computer Engineering
Courses Description**



**University of Diyala
College of Engineering
Department of Computer Engineering**

Bachelor of Science (B.Sc.) Undergraduate Program

Second Year



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Second Year

First Semester					Second Semester				
Course Title	Credit Hours	Weekly Hours			Course Title	Credit Hours	Weekly Hours		
		The.	Lab.	Tut.			The.	Lab.	Tut.
Applied Mathematics I	3	3	-	1	Applied Mathematics II	3	3	-	1
Computer Architecture I	2	2	-	-	Computer Architecture II	2	2	-	-
Electronics	3	2	2	1	VLSI Circuit and Design	3	2	2	-
Digital Logic Circuits II	4	3	2	-	Microprocessor Programming	3	2	2	-
Data Structures and Algorithms	3	2	2	1	Database Systems	3	2	3	-
Operating Systems I	2	2	-	1	Software Engineering	3	2	2	1
Fundamentals of Communications	3	3	-	-	Object Oriented Programming using Java	3	2	2	-
Total	20	17	6	4	Total	20	15	11	2
		27					28		



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• **Second Year Courses Details**

Course Number: E 201

Course Name: Applied Mathematics I

Credit hours: (3-3-1-0)

Prerequisites: None

Course Contents: Series, Power Series, Theory of the Power Series Method, Legendre Polynomials, Extended Power Series, Euler–Cauchy Equation, Bessel Functions, Convergence and Divergence, Fourier analysis, Fourier series, Arbitrary Period. Even and Odd Functions, Forced Oscillations, Approximation by Trigonometric Polynomials, Fourier Integral and Applications, Fourier Transform, discrete Fourier Transform (DFT), Fast Fourier Transform (FFT), Laplace Transforms, Laplace Transforms properties, Shifting Theorem, Inverse Laplace Transforms, Transforms of Derivatives and Integrals, Differential Equations, Initial Value Problems, Systems of ODEs.

Course Number: CPE 201

Course Name: Computer Architecture I

Credit hours: (2-2-0-0)

Prerequisites: Fundamentals of Logic Systems (CPE 104), Digital Logic Circuits I (CPE 105).

Course Contents: Digital Computer system, Register transfer language, Bus and memory transfers, Arithmetic micro operations, Logic micro operations, Basic computer organization and design, Memory, Register and Input- output reference instructions, Input - output instructions, Program interrupt. Interrupt cycle, complete computer description, Design of basic computer, Design of Accumulator logic, Control of accumulator register, adder and logic circuit design, programming the basic computer, machine language, assembly language, the assembler, Program loops, programming arithmetic and logic operations Subroutines, Input-output programming, Micro programmed control memory. Control memory. Microprogram example: computer configuration, microinstruction format, symbolic microinstructions, the fetch routine, Central processing unit, general register organization, Stack organization: register stack, memory stack. Reverse polish notation, evaluation of arithmetic expressions, addressing modes, numerical example, Data transfer and manipulation, program control and types of interrupts.



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Course Number: CPE 203

Course Name: Electronics

Credit hours: (3-2-1-2)

Prerequisites: Physics (E 103)

Course Contents: Bipolar Junction Transistor (BJT); Construction, Operation, Configuration, BJT Biasing and DC Load Line; Fixed, Emitter-Stabilized and Voltage Divider Biasing Circuits, MOSFET; Construction, Operation, V-I characteristics, MOSFET DC Biasing, Small Signal Equivalent Circuits Models, MOSFET Amplifier; MOSFET Common Source, CMOS Common Source, Common Source with Source Degeneration, Common Gate, CMOS Common Gate, Common Drain, Operational Amplifier (OP-AMP) Applications; Non-Inverting, Inverting, Summing Amplifier, Difference Amplifier, Instrumentation, Integrator, and Differentiator.

Course Number: CPE 207

Course Name: Data Structures and Algorithms

Credit hours: (3-2-1-2)

Prerequisites: Programming and Problem Solving with C++ I and II (CPE 102 and CPE 103)

Course Contents: Linear Data Structures; Introduction to Data Structures, Single Linked Lists, Linked Lists Functions, Reverse List, Double Linked Lists. Stacks; Introduction, Stack Operations, Array Implementation of Stack Data Structure, Stack Implementation Using Linked Lists, Applications of Stack, Infix to Postfix Notation, Evaluation of Postfix Expression. Queues; Introduction to Queues, Array Representation of Queue, Algorithm for Addition of an Element to the Queue, Algorithm for Deletion of an Element to the Queue, Dynamic Representation of Queues Using Linked Lists, Circular Queue-Array Representation. Non Linear Data Structures: Trees; Trees Why-What-How, Terminology and Definitions of Tree, Binary Tree, Binary Search Tree, Creating Binary Tree, Insertion in a BST, Deletion in a BST, Searching a Binary Search Tree, Tree Traversals, Non Recursive Algorithms for BST. Graphs; Basic Terminologies, representation of Graph, Operations on Graph, Breadth First Search, Depth First Search, Minimum Spanning Tree, Shortest Path. Searching and Sorting; Introduction, Big Oh-O Notation, Efficiency Considerations in Sorting Algorithms, Searching, Linear Search, Analysis of Linear Search, Binary Search, Binary Search Algorithm, Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Heap Sort.



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Course Number: CPE 205

Course Name: Digital Logic Circuits II

Credit hours: (4-3-0-2)

Prerequisites: Digital Logic Circuits I (CPE 105)

Course Contents: Sequential Logic Circuit synchronous sequential logic circuits Asynchronous sequential logic circuits Race, Stability conditions, Hazard, Asynchronous Counter, Synchronous Counter, Cascading Counter, Counter Applications, Shift Register Kinds of Shift register, Shift register Applications, Data Conversion circuits, analog to Digital Conversion (ADC), ADC methods, Digital to analog Conversion (DAC), Diode – Transistor- Logic, Transistor-Transistor -Logic (T.T.L), Programmable Logic Devices, Programmable Logic Array(PLA), Programmable Array Logic, Generic Array Logic.

Course Number: CPE 209

Course Name: Operating Systems I

Credit hours: (2-2-1-0)

Prerequisites: None

Course Contents: Overview of Operating Systems (OS) : Applications vs. the OS , Role and purpose of the OS and its development history , Types of OSs , OS design goals and OS design influences, Computer Hardware & Software: Computer hardware components , Memory hierarchy, device I/O models and methods , protection, Application programming interfaces (APIs) and middleware, operating System Principles: Abstractions, processes and resources , Application needs and evolution of hardware/software techniques , Operating system modes , User state / system state and protection, Concurrency: Concept of concurrency , Task states and state diagrams , Dispatching and context switching , Role of system interrupts , The mutual exclusion problem and solutions , Producer-consumer problems and synchronization , Models and mechanisms, Deadlock causes, conditions, and prevention, Scheduling and Dispatch: Preemptive vs. nonpreemptive scheduling , Schedulers, policies, processes and threads , Memory Management: Physical vs. virtual memory and memory management hardware, Paging, segmentation, placement, caching, Device Management : Serial and parallel device characteristics , Buffering strategies, direct memory access and failure recovery, File Systems: Files, Directories, File systems, partitioning, and virtual file systems , Naming, searching, access, backups.



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Course Number: CPE 211

Course Name: Fundamentals of Communications

Credit hours: (3-3-0-0)

Prerequisites: Physics (E 103)

Course Contents: Signals, Definitions, Analog and digital signals, Types of signals, Fourier transform, Signal Power and Energy, Perceval's Theorem, Amplitude and Phase of Spectrum, Power Spectral Density, Amplitude modulation Analysis of standard AM, Modulation index Power, spectrum and efficiency, Modulation methods, Demodulation methods, Types of AM transmitters, Types of AM receivers, AM receivers specifications, Frequency modulation ,Angle modulation(FM and PM), Analysis of standard FM ,Modulation index ,Bessel functions, Bandwidth(NBFM/WBFM) and Carson's rule, Implementation of FM Modulators and Demodulators, FM Transmitters and Receivers.

Course Number: CPE 202

Course Name: Computer Architecture II

Credit hours: (2-2-0-0)

Prerequisites: Computer Architecture I (CPE 201), Digital Logic Circuits I (CPE 105).

Course Contents: Pipeline and vector processing, parallel processing, instruction pipeline, RISC pipeline, fundamentals of Quantitative Design and Analysis, Pipelining: Basic and Intermediate Concepts, Memory Hierarchy Design, Review of Memory Hierarchy, Instruction-Level Parallelism and Its Exploitation, Thread-Level Parallelism, Data-Level Parallelism in Vector, SIMD, and GPU Architectures, Project REPORTS due.

Course Number: CPE 204

Course Name: VLSI Circuit and Design

Credit hours: (3-2-0-2)

Prerequisites: Physics (E 103) and Electronics (CPE 203)

Course Contents: Integration levels and technology evolution of integrated circuits. Design issues, MOS Transistor; Current equation, parasitic capacitance, CMOS Inverter; Voltage-transfer characteristic, noise margin, switching threshold, propagation delay, power dissipation, Circuit Layout; Fabrication process, design rules, stick diagram, Euler path, Design Techniques for CMOS Circuits; Complementary CMOS, pass-transistor logic, dynamic circuits, transistor sizing, Circuit Optimization for Speed; Logical effort, path delay, inverter chain to drive load, Circuit Optimization for Power; Effect of input transitions, multiple threshold technique.



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Course Number: E 202

Course Name: Applied Mathematics II

Credit hours: (3-3-1-0)

Prerequisites: Applied Mathematics I (E 201)

Course Contents: Ordinary Differential Equations (ODEs), First-Order ODEs, Separable ODEs, modelling, exact ODEs. Integrating Factors, Existence and Uniqueness of Solutions for (IVP) , Applied problems, Second-Order Linear ODEs, Homogeneous Linear ODEs of Second Order, Homogeneous Linear ODEs with Constant Coefficients, Nonhomogeneous ODEs, Applied problems, Multiple integral, Mathematical definition, Methods of integration, Multiple improper integral, Multiple integrals and iterated integrals, Some practical applications, Partial Differential Equations (PDEs) and Wavelet, Basic Concepts of PDEs, Modelling: Vibrating String, Wave Equation, Solution by Separating Variables. Use of Fourier series, Laplacian in Polar Coordinates, Fourier–Bessel Series, Laplace’s Equation in Cylindrical and Spherical Coordinates, Solution of PDEs by Laplace Transforms, Wavelet bases for discrete and continuous variables, The Haar basis, Differentiable wavelet bases, Compact wavelet bases, Multiresolution analysis and applications.

Course Number: CPE 206

Course Name: Microprocessor Programming

Credit hours: (3-2-0-2)

Prerequisites: Digital Logic Circuits I and II (CPE 105 and CPE 205), Computer Architecture I (CPE 201)

Course Contents: Introduction to Programming Microprocessor :Basic Definitions, Modular Programming, Assembler, Linker , Macros and Libraries, Overview Intel 8086 Microprocessor Architecture Specifications, **Data Movement Instructions:** MOV Instruction , PUSH/POP Instruction and Initializing the Stack, Load Effective Address: LEA, LDS, LES, LFS, LGS, string Data Transfers: LODS, STOS, MOVS, INS and OUTS, Miscellaneous Data Transfer Instructions: XCHG; LANF and SAHF; XLAT; IN and OUT; MOVSX and MOVZX; BSWAP; CMOV, **Arithmetic and Logic Instructions:** Addition, Subtraction, and Comparison, Multiplication and Division, BCD and ASCII Arithmetic, Basic Logic Instructions: AND; OR; Test and Bit Test Instructions; NOT and NEG, Shift and Rotate: Shift; Rotate; Bit Scan Instructions, String Comparisons: SCAS; CMPS, **Program and Control Instructions:** The Jump Group: Unconditional Jump (JMP); Conditional Jumps and Conditional Sets; LOOP, Controlling the Flow of the Program: WHILE Loops; REPEAT-UNTIL, Loops, Procedures: Call and Return ,Introduction to Interrupts: Interrupt Vector, Machine Control and Miscellaneous Instructions, **USING ASSEMBLY LANGUAGE WITH C/C++:**Using Assembly Language with C++ for 16-Bit DOS Applications: Using Assembly Language with Visual C/C++ for 32-Bit Applications, Mixed Assembly and C++ Objects.



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Course Number: CPE 208

Course Name: Database Systems

Credit hours: (3-2-0-3)

Prerequisites: None

Course Contents: Introduction to DB:, The Database environment and development process, The relational database model, Intro to Structured Query Language (SQL), The SQL SELECT statement / Table Joins, Advanced SQL SELECT, aggregates, sub---selects, views, SQL programming: stored procedures functions, Data and database administration, Client/Server, distributed DBMSs, Database analysis – data modelling, Logical database design , mapping complex data models, Logical database design – normalization, Data migration, Physical database design , performance, course projects.

Course Number: CPE 210

Course Name: Software Engineering

Credit hours: (3-2-1-2)

Prerequisites: None

Course Content: Software and Software Engineering, Process Models, Understanding Requirements, Requirement Modelling, Design concepts, Architectural Design, UI Design, WEBAPP Design, Software testing Strategies, Testing conventional applications, Testing object oriented applications, Testing web applications, Formal modelling and applications, Product metrics, Process and project metrics, Project management concepts, Estimation for software projects, Project scheduling, Maintenance and re-engineering, Software process improvement.

Course Number: CPE 212

Course Name: Object Oriented Programming with Java

Credit hours: (3-2-0-2)

Prerequisites: None

Course Contents: Object Oriented Concepts, Evolution Of Programming techniques, Procedural programming, Structured programming, Object Oriented programming, Basic concepts of OOP, Classes and Objects, Data Abstraction, Data Encapsulation, Polymorphism, Inheritance, Advantages and dis-advantages of OOP, Java Fundamentals, Types, variables, operators, methods, conditionals, Loops and arrays, Objects and classes, Access control, class scope, packages, Java API, Design, debugging, interfaces, Inheritance, exceptions, file I/O.
