



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

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

**Bachelor of Science (B.Sc.) Undergraduate Program**

**Third Year**



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



**Third Year**

First Semester					Second Semester				
Course Title	Credit Hours	Weekly Hours			Course Title	Credit Hours	Weekly Hours		
		The.	Lab.	Tut.			The.	Lab.	Tut.
Engineering Analysis	3	3	-	-	Numerical Analysis	3	3	-	-
Digital Signal Processing I	3	2	2	-	Digital Signal Processing II	3	2	2	-
Digital System Design I	3	2	2	-	Digital System Design II	3	2	2	-
Digital Communications	3	2	2	-	Computer Networks I	3	3	-	-
Control Theory	3	2	2	1	Computer Control	3	2	2	1
Operating Systems II	3	2	2	-	Computer Interfacing	3	2	2	1
Internet Web Site Design	3	2	2	-	Digital Image Processing	3	2	2	1
<b>Total</b>	<b>21</b>	<b>15</b>	<b>12</b>	<b>1</b>	<b>Total</b>	<b>21</b>	<b>16</b>	<b>10</b>	<b>3</b>
		<b>28</b>					<b>29</b>		



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- **Third Year Courses Details**

**Course Number:** CPE 301

**Course Name:** Engineering Analysis

**Credit Hours:** (3-3-0-0)

**Prerequisites:** Applied Mathematics II (E 202)

**Course Contents:** Power Series Solutions of D.Es (Ordinary Points and Frobenius Method, Applications of Differential equations, Z-Transform, Solution of Linear Difference Equations Using Z- Transform, Gamma, Beta and Bessel's Functions, Complex Variables, Limit and Continuity, Analytic Functions, Cauchy and Their Riemann, Elementary Complex Functions, Exponential, Logarithm, Trigonometric, Hyperbolic, and Their Inverse, Integration In Complex Plane, Residues And Residue Theorem, Inverse Evaluation of Z-T using Residue Principle.

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**Course Number:** CPE 303

**Course Name:** Digital Signal Processing I

**Credit Hours:** (3-2-0-2)

**Prerequisites:** Fundamentals of Communications (CPE 211), Applied Mathematics II (E 202)

**Course Contents:** Introduction to Digital Signal Processing, Applications of DSP, Basic types of digital signal, Classification of digital systems, Periodic and Non periodic Signals, Describing digital LTI processors, Describing digital LTI processors, Digital convolution and de-convolution, Frequency Response of DSP Systems, Discrete time Fourier series, Discrete Fourier Transform (DFT), Inverse Discrete Fourier Transform (IDFT), Decimation in time fast Fourier Transform.

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**Course Number:** CPE 305

**Course Name:** Digital System Design I

**Credit Hours:** (3-2-0-2)

**Prerequisites:** Electronics (CPE 203), Digital Logic Circuits I and II (CPE 105 and CPE 205)

**Course Contents:** Introduction to Digital Systems Design, Complex Programmable Logic Devices (CPLDs), Field Programmable Gate Array (FPGA), Introduction to Sequential Logic Circuits, Analysis and Synthesis of Synchronous Sequential Circuits, Moore Model, Mealy Model, Analysis of sequential circuit state diagrams, Analysis of sequential circuit logic diagrams, Synthesis procedure, Simplification of Sequential Circuits, Redundant states, State reduction in completely specified circuits, inspection, partitioning, implication table, State reduction in incompletely specified circuits, optimal state assignment methods, Sequential circuits with programmable logic devices.

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**Course Number:** CPE 307

**Course Name:** Digital Communications

**Credit Hours:** (3-2-0-2)

**Prerequisites:** Fundamentals of Communications (CPE 211)

**Course Contents:** Digital Transmission of Analog Signals ,Sampling Theorem ,Quantization, Quantization error, Encoding, Pulse Shaping & Inter symbol Interference, Digital Carrier Modulation Systems, Pulse Modulation, Pulse Amplitude Modulation(PAM), Pulse width Modulation(PWM) Pulse Position Modulation(PPM), Delta Modulation(DM), Pulse Code Modulation (PCM), Bandwidth of PCM, Time Division Multiplexing(TDM), Bandwidth of TDM, Frequency Division Multiplexing(FDM), Digital Modulation, Amplitude Shift Keying(ASK), Frequency Shift Keying(FSK), Phase Shift Keying(PSK), Information Theory and Channel coding, Information Theory Detection of digital signals in noise ,Source coding of signals in noise ,Channel coding, Error detection codes.

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**Course Number:** CPE 309

**Course Name:** Control Theory

**Credit Hours:** (3-2-1-2)

**Prerequisites:** Mathematics I and II (E 101 and E102), Applied Mathematics I and II (E 201 and E 202)

**Course Contents:** Basic Definitions, Transfer function, Mathematical Representation of Control Systems: Mechanical system, Electrical system. State-Space Representation of Dynamic System, Block Diagram reduction: Basic rules of reduction with examples, Principles of superposition theorem with examples. Signal Flow Graph: Basic rules with examples, Mason's rule. Time-Domain Analysis of Control System: Introduction, Types of control system, Transient response analysis, Definitions of transient response specification. Steady-state error analysis: Static position error constant  $K_p$ , Static velocity error constant  $K_v$ , Static acceleration error constant  $K_a$ . Stability of Control System: Complex plane, Poles and zeros, Characteristic equation, Definition of stability, Routh's stability criterion. Root-Locus Analysis: Introduction, Root-locus plots. Frequency Response Analysis: Introduction, Polar plot (Nyquist plot), Nyquist stability criterion and analysis, Bode diagram plot. Control System Design by the Root-Locus Method: Lead compensation, Lag compensation, Lag-lead compensation.

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**Course Number:** CPE 311

**Course Name:** Operating Systems II

**Credit Hours:** (3-2-0-2)

**Prerequisites:** Operating Systems I (CPE 209)

**Course Contents:** A little UNIX and Linux background and history , getting started using Linux commands , Linux basics/fundamentals, files and operations on files, Intro to bash shell programming, Linux and IP networking/communication, Linux internals and services, Linux system administration, Introduction to the Android Operating System, The Android emulator and how it is used in Android application development, GUI design in Android , Handling of maps and location based services in Android, Process handling in Android, Persistent Storage in Files and Databases, Publishing Android applications.

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**Course Number:** CPE 313

**Course Name:** Internet Web Site Design

**Credit Hours:** (3-2-0-2)

**Prerequisites:** None

**Course Contents:** Introduction , History of Internet and WWW , Web Architecture: Client (browser) and Server , Web Documents , Types of Web Documents , Client-Side Scripting vs. Server-Side Scripting , HTML, HTML scripting language , HTML Tags , Java Scripting, Internet System , DNS , Mail Server , FTP , Remote Login , PHP Dynamic Language , MySQL Database Server.

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**Course Number:** CPE 304

**Course Name:** Digital Signal Processing II

**Credit Hours:** (3-2-0-2)

**Prerequisites:** Digital Signal Processing I (CPE 303)

**Course Contents:** Realization of Digital Filter(Direct and indirect, Cascade, Parallel ) methods, Realization of FIR filter Realization of IIR filter, Analog Filter Design Butterworth filters, Analog to analog transformations, Design of low pass Butterworth filters, Design of high pass Butterworth filters, Design of band pass Butterworth filters, Design of band stop Butterworth filters, Chebyshev filters Digital Filter Design: Discrete time filters, Design by using numerical solutions of differential equations, transformations, Analog design using digital filters,(Design of digital filters using digital to digital transformations, FIR Filter Design, Design of FIR filters using windows, FIR filter design using computer techniques).



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**Course Number:** CPE 306

**Course Name:** Digital System Design II

**Credit Hours:** (3-2-0-2)

**Prerequisites:** Digital System Design I (CPE 305)

**Course Contents:** Design of Digital Sequential Circuits Using New Methods, Algorithm State Machines ( A.S.M ), Finite State Machines ( F.S.M ), Datapath Unit (DU) and Control Unit (CU), Microcoding and Microprogrammed FSM, Counter-based microprogrammed FSM, Microcoded FSM based on a practical Microsequencer, Asynchronous Sequential Circuits, Introduction , Pulse Mode asynchronous sequential circuits, Analysis of Pulse –mode Asynchronous Circuits, Design procedure for pulse-mode circuits, Fundamental-mode asynchronous sequential circuits, Analysis of Fundamental-mode circuits, Synthesis of Fundamental-mode circuits.

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**Course Number:** CPE 302

**Course Name:** Numerical Analysis

**Credit Hours:** (3-3-0-0)

**Prerequisites:** Engineering Analysis (CPE 301)

**Course Contents:** Introduction, Errors, Types of Errors, Interpolation, Equal Space Interpolation, Network's Form Interpolation, Unequal Space, Solution of Non-Linear Algebraic Equation, Bi-section, Linear, Interpolation, Newton- Raphson Method, Iterative, Numerical Solutions of Linear Systems, Numerical Differentiation, Numerical Integration, Ordinary Differential Equations, Euler Method, Modified Euler Method, Range Kutta Methods, Adam's Method.

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**Course Number:** CPE 308

**Course Name:** Computer Networks I

**Credit Hours:** (3-3-0-0)

**Prerequisites:** None

**Course Contents:** Computer Networks and the Internet, General overview: Internet, Network Core, Delay, loss and Throughput in Packet-Switched Networks, Protocol Layers and their Services: Layered Architecture (OSI and TCP/IP Model), Encapsulation, Application Layer: Principles of Network Applications, The Web and HTTP, File Transfer FTP, Electronics Mail in the Internet, DNS, Peer-to-Peer Applications, Transport Layer: Introduction, Connectionless Transport: UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport: TCP, Network Layer: Introduction, Virtual Circuit and Datagram Networks, Router, Internet Protocol (IP), IPv4, IPv6, Routing algorithms, Routing in the internet, Broadcast and Multicast Routing, The link Layer and Physical Layer: Services, Error Detection and Correction Techniques, Multiple Access Links and Protocols, Overview on Physical Layer Operation.

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**Course Number:** CPE 310

**Course Name:** Computer Control

**Credit Hours:** (3-2-1-2)

**Prerequisites:** Applied Mathematics II (E 202), Engineering Analysis (CPE 301), Control Theory (CPE 309).

**Course Contents:** PID controller, Ideal Sampling, the pulse Transfer function, The Closed-Loop pulse transfer function, Digital Control Systems, Stability in the Z-Plane, Mapping from the S-Plane into the Z-Plane, The Jury Stability Test, Root Locus Analysis in the Z-Plane, Root Locus Construction Rules. Digital Compensator Design, Digital Compensator Types, Digital PID Controller, Tustin's Rule, Digital Compensator Design using Pole Placement, Dead-Beat Controller Design. Introduction to Real-Time (R-T) system, Elements of computer control system, Classification of R-T system, Concept of R-T control system, Sequence control, Direct Digital Control (DDC) Machine control, Hardware requirements for R-T control system, Interface technique, Data transfer techniques, R-T languages, User Requirements, language Requirements & Features, Choice of programming language, Operating system.

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**Course Number:** CPE 312

**Course Name:** Computer Interfacing

**Credit Hours:** (3-2-1-2)

**Prerequisites:** Computer Architecture I and II (CPE 201 and CPE 202), Microprocessor Programming (CPE 206)

**Course Content:** Introduction to Computer Interfacing, Principle of Interface, PC I/O address and memory configuration, PC Bus Architecture, PC Interrupt concept, Bus Interface, ISA Bus, PCI Bus, LPT Interface, Serial COM Ports , USB Bus, AGP Port, Advanced bus interface, Memory Interface, Devices, Address Decoding, Intel microprocessors Memory Interface, Dynamic RAM, Basic I/O Interface, Introduction to I/O Interface, I/O Port Address Decoding, The Programmable Peripheral Interface, Programmable Interval Timer, Programmable Communications Interface, Asynchronous Serial Data , ADC and DAC Converters, Interrupts, Basic Interrupt Processing, Hardware Interrupts, the Interrupt Structure, Programmable Interrupt Controller, Interrupt Examples, DMA-Controlled I/O, Basic DMA Operation, The 8237 DMA Controller, Shared-Bus Operation, Disk Memory Systems, and Video Displays.



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**Course Number:** CPE 314

**Course Name:** Digital Image Processing

**Credit Hours:** (3-2-1-2)

**Prerequisites:** Digital Signal Processing I (CPE 303)

**Course Contents:** Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization,, Some basic relationships, Distance Measures between pixels, Translation, Scaling, Rotation and Perspective Projection of image, Linear and Non Linear Operations, Image Enhancement in the Spatial Domain: Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Combining Spatial Enhancement, Smoothing and Sharpening Spatial Filters, Image Enhancement in the Frequency Domain: Introduction to Fourier Transform and the frequency Domain, Computing and Visualizing the 2D DFT, Smoothing Frequency Domain Filters, Sharpening Frequency Domain Filters, Homomorphic Filtering, A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Geometric Transformations, Color Image Processing, Color fundamentals, Color models, Basics of full-color image processing, Wavelets :Fourier Analysis – Shortcomings, Wavelet Transforms, CWT and DWT, One Dimension (1D) DWT, Multi-Resolution 2D Wavelet Transforms, Different Decomposition Schemes, Statistical Properties of Wavelet subbands, Applications of Wavelet Transforms.

- **Summer Training (1 Month)**

Each student **MUST** satisfy **ONE**-month summer training at private or governmental companies, institutes or any other firms. A dedicated department staff members' committee will monitor and guide the students throughout their summer training.