



**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



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



1. First Year

First Semester					Second Semester				
Course Title	Credit Hours	Weekly Hours			Course Title	Credit Hours	Weekly Hours		
		The.	Lab.	Tut.			The.	Lab.	Tut.
Human Rights and Democracy	2	2	-	-	Computer Science	2	1	2	-
Engineering Drawing Using Computer	1	-	3	-	English Language	1	1	-	-
Physics	2	2	-	-	Arabic Language	1	1	-	-
Workshop Skills I	1	-	3	-	Workshop Skills II	1	-	3	-
Mathematics I	2	2	-	1	Mathematics II	2	2	-	1
Programming and Problem Solving Using C++ I	3	2	2	-	Programming and Problem Solving Using C++ II	3	2	2	-
Fundamentals of Logic Systems	2	2	-	-	Digital Logic Circuits I	3	2	2	-
Electrical Circuits I	3	2	2	1	Electrical Circuits II	3	2	2	1
Total	16	12	10	2	Total	16	11	11	2
		24					24		



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- **First Year Courses Details**

Course Number: U 103

Course Name: English Language

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

Prerequisites: None

Course Contents: This course is designed to enable the students to achieve academic oral and written communication to the standard required at university level. The course integrates all the language skills with emphasis on writing, and it stimulates students' imagination, and promotes personal expression. Students, in this course, are trained to apply critical thinking skills to a wide range of challenging subjects from diverse academic disciplines. Course activities include writing various types of academic essays, acquiring advanced academic vocabulary, and getting involved in group discussions and debates. In addition, the course also includes other skills to consolidate the main skills, such as further readings and use of the Blackboard Suite.

Course Number: E 101

Course Name: Mathematics I

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

Prerequisites: None

Course Contents: Equation of a line sets, function and type of function, logarithm and exponentiation, limit and continue. Complex numbers: Introduction and definition of complex number, Addition and subtraction of complex number, multiplication and division of complex number, geometric representation of complex number, complex conjugate and absolute value, cervical addition and subtraction of complex numbers. Polar form of a complex numbers exponent form of complex number, logic number. Vectors: Introduction to scalar and vector quantities, Vector Algebra. Laws of vector algebra, a unit vector components of a vector, The dot product, the cross product, triple product, angle between two vectors direction ratios, Vector differentiation, velocity and acceleration, differentiation formulas, vector Integration. Matrices: Matrices properties, the equal matrices algebraic operations, multiplication by scalar, diagonal metric, determinates of two order, third order, evaluation of a third order determinant, elementary row operation, inverse matrices by elementary row operation, solution of systems of linear equations, systems of linear differential equations.



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Course Number: E 103

Course Name: Physics

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

Prerequisites: None

Course Contents: Introduction about Insulators, Conductors and Semiconductors, PN-Junction, Physical operation of Diode, DC analysis of Diode, Load Line and Q-point, Constant Voltage Drop Model, Piecewise Linear Diode Model, Small Signal Diode Model, other diode types, Diode applications; Half and Full Wave Rectifiers circuits, Clipper circuits, Clamper circuits, Logic Gate using Diode, power supply Construction, Zener diode; construction and operation.

Course Number: CPE 101

Course Name: Engineering Drawing Using Computer

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

Prerequisites: None

Course Contents: The use of CAD in engineering drawing, description of menu Bar and toolbars, drawing Ellipse, Rectangle, line, Ray, Circle, point, Arc, ----- etc., CAD Electrical, Mechanical/ Special features The use of various layers, Drawing electrical symbols on simple architectural plans, editing commands: copy, cut, paste, erase, move, selecting objects, orthogonal projection, ISO drawing .

Course Number: E 106

Course Name: Workshop Skills I

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

Prerequisites: None

Course Contents: The workshop training program is designed to satisfy the following objectives Teaching safety rules and regulations on-site in an industrial environment Proper use of working tools, instruments, and machines, Introducing basic workshop practices, production, labour, and time-requirements of workshop operations. The students are introduced to training programs in nine workshops: electrical wiring, welding, forging, fitting, turning and milling, carpentry, plumbing auto-mechanics, and casting. The student is to spend 6 hours of training in every workshop.



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Number: CPE 102

Course Name: Programming and Problem Solving with C++ I

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

Prerequisites: None

Course Content: Problem Solving Methodology: Problem Definition, Problem Analysis , Design Of a Solution, Algorithms, Flowcharts, Development Of Programs (Coding, testing, debugging), Introduction to C++ , History , Characteristics of C++ , C++ Character Set ,Tokens , Keywords , Identifiers , Literals ,Punctuators ,Operators, Arithmetic operators , Relational operators , Logical operators , Unary operators , Ternary operators , Shorthand operators, Bitwise operators , Special operators, Assignment operators, Precedence of operators, Type conversion (Implicit and Explicit), Structure of a C++ program (with example), Importance of iostream.h, Comments in C++, Data types, Fundamental data types, Modifiers, Derived data types, User defined data types, Input and Output operators, Input operator ">>", Output operator "<<", Simple programs, Control Statements, Introduction: Types of Control statements, Selection statements, if" statement, if - else" statement , nested -if" statement, Switch" statement, Iteration statement , while" statement, do-while" statement, Comparison between "while" and "do-while", for" statement, Jump statements (go to, break, continue).

Number: CPE 104

Course Name: Fundamentals of Logic Systems

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

Prerequisites: None

Course Content: Introduction to digital quantities ,Numbering systems, Decimal numbers , Binary numbers , Octal numbers , Hexadecimal , Conversions between numbering systems, Digital codes , Binary coded decimal , Excess-3 codes, Gray code , Error detection and correction codes ,Arithmetic operations , for numbering systems , logic gates, applications of logic gates, Boolean Algebra ,DE Morgan's Theorem, Simplification of Boolean Algebra, Simplification using Boolean Karnaugh Map.

Course Number: CPE 106

Course Name: Electrical Circuits I

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

Prerequisites: None

Course Content: Temperature effect of the resistance, Ohm's law, Resistor in series, Resistor in parallel, Kirchhoff's voltage law, Kirchhoff's current law, Delta connection. Star connection, Delta to Star Transformation. Star to Delta Transformation, Current and Voltage Sources, The principle of Superposition, The Thevenin equivalent circuit, The Norton equivalent circuit, Maximum power transfer, The Node Voltage Method, The Mesh Current Method.



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Course Number: U 101

Course Name: Human Rights and Democracy

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

Prerequisites: None

Course Contents: Introduces students to the philosophic and political background of the concept of human rights, discusses important documents as part of the history of the development of human rights theories, examines important issues in current political and ethical debates about human rights, reviews core legal documents and the work of the most important governmental and nongovernmental institutions currently involved in human rights protection and promotion, examines at least one current problem area in human rights protection.

Course Number: U 102

Course Name: Computer Science

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

Prerequisites: None

Course Contents: Computer Architecture, Computer Assembly and parts Characteristics, History of Computer, Generations of computer, Types of computer, Personal computer, major parts of the Computer (Hard Ware); Input Devices, Processor, Output Devices, Storage Devices, Internal Components, Software; Types of software, System software, Application software, Computer Languages and Scripting, Booting, Computer maintenance and troubleshooting, BIOS Setting, Open Source Software and Linux OS, Navigating Linux GUI, The Internet.

Course Number: U 104

Course Name: Arabic Language

Credit Hours: (1-1-0-0)

Prerequisites: None

Course Contents: Introduction, Arabic language origin, formal and slang, translations and usual mistakes, Basic Arabic writing skills and its major roles, Arabic dictionaries and how to use it. Sentences and their types in Arabic tongue, Arabic sentence structure and safe constructed sentence in Arabic language, How to write a paragraph, How to write a report using the wright Arabic sentences, Applications.



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Course Number: E 102

Course Name: Mathematics II

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

Prerequisites: None

Course Contents: Hyperbolic functions: Graphics of hyperbolic function, Evaluation of hyperbolic function, Inverse of hyperbolic function, Hyperbolic identities, Log form of the inverse-hyperbolic function, Trigonometric identities and hyperbolic identities, Relation between hyperbolic function and trigonometric, Further problem, Derivative: Laws of derivative, higher derivative, Implicit derivatives, chain Rule, Derivative of trigonometric function, Derivative of exponential function, Derivative of hyperbolic function, Derivative of inverse exponential function, Derivative of inverse hyperbolic function, Derivatives applications: Increasing, Decreasing, Integration: Law of integration, definite integration, Integration of trigonometrically functions, Integration of products, Integration by parts, problems, Reduction formula, problems,

Course Number: E 107

Course Name: Workshop Skills II

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

Prerequisites: None

Course Contents: The workshop training program is designed to satisfy the following objectives Teaching safety rules and regulations on-site in an industrial environment Proper use of working tools, instruments, and machines, Introducing basic workshop practices, production, labour, and time-requirements of workshop operations. The students are introduced to training programs in nine workshops: electrical wiring, welding, forging, fitting, turning and milling, carpentry, plumbing auto-mechanics, and casting. The student is to spend 6 hours of training in every workshop

Course Number: CPE 105

Course Name: Digital Logic Circuits I

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

Prerequisites: Fundamentals of Logic Systems (CPE 104)

Course Contents: Combinational logic analysis, Combinational logic circuit using NAND and NOR gates, implementation of Combinational logic circuit, functions of combinational logic circuit, Adders, series and Parallel binary adders, ripple Carry versus Look-Ahead Carry Adders, comparators, decoders, encoders, multiplexers, demultiplexer, latches, Flip-Flops, application of Flip-Flops, One – shots, 555 Timers.



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Course Number: CPE 102

Course Name: Programming and Problem Solving with C++ II

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

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

Course Contents : C++ review, Arrays Introduction to Arrays, Types of arrays, One Dimensional Arrays, Two Dimensional Arrays, Multi-Dimensional Arrays, One Dimensional Arrays, Declaration of 1-D Arrays, Initialization of 1-D arrays, Two Dimensional Arrays, Declaration of 2-D Arrays, Initialization of 2-D arrays, Functions, Introduction , Different Header files, Mathematical Library functions, Character and string functions, Other functions, User Defined Functions, Definition, Advantages of user defined functions, Structure of an user defined function, Calling a function, Returning a value, Function prototype, Types of arguments, Scope of variables, Types of functions, Call by value, Call by reference (using reference variables) ,Arrays as arguments, Structures, Introduction, Defining a structure, Declaring a structure, Initializing structure elements, Referencing structure elements, Nested structures, Array of structures, Advanced topics projects.

Course Number: CPE 107

Course Name: Electrical Circuits II

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

Prerequisites: Electrical Circuits I (CPE 106)

Course Contents: Alternating Quantities, Phasor representation of Alternating Quantities, Alternating Current Circuits, Resonance in series circuit, Resonance in parallel circuit, Complex representation of A.C, Power in Alternating Current, Transient in RL circuit, Transient in RC circuit, Measurement of Resistance, Measurement of Instrument.



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2. 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, Parseval'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.



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3. 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
Total	21	15	12	1	Total	21	16	10	3
		28					29		



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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.

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.

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.

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.

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.

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.

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.

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.

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.



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4. Fourth Year

First Semester					Second Semester				
Course Title	Credit Hours	Weekly Hours			Course Title	Credit Hours	Weekly Hours		
		The.	Lab.	Tut.			The.	Lab.	Tut.
Graduation Project	Continued	-	4	-	Graduation Project	2	-	4	-
Engineering Profession Ethics	2	2	-	-	Engineering Economy	2	2	-	-
Elective I	2	2	-	-	Elective II	2	2	-	-
Cryptography and Network Security I	4	3	2	-	Cryptography and Network Security II	4	3	2	-
GNSS Applications	3	2	2	-	Embedded Systems	3	2	3	-
Computer Networks II	3	2	2	-	Data Compression	2	2	-	1
Total	14	11	10	0	Total	15	11	9	1
		21					21		



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- **Fourth Year Courses Details**

Course Number: E 401

Course Name: Engineering Profession Ethics

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

Prerequisites: None

Course Contents: Introduction: Why Professional Ethics?, What Is A Profession?, Professions as Social Practices, Models Of Professionalism, The Business Model, The Professional Model, Types Of Ethics Or Morality, Responsibility in Engineering, Engineering Standards, Framing the Problems, Resolving Problems, The Social and Value Dimensions of Technology, Trust and Reliability, Risk and Liability in Engineering, Engineers in Organizations, Engineers and the Environment, Cases should be presented for use in conjunction with materials (over the world and local).

Course Number: E 404

Course Name: Engineering Economy

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

Prerequisites: None

Course Contents: Principles of Engineering Economy, equivalence and compound interest formula Single payment model, Uniform payment model, gradient payment model. Decision criteria for single and multiple alternatives: Present worth, annual worth, future worth, annual rate of return, and benefit cost ratio, before and after tax analysis, economic laws. Comparison among projects, projects evaluation, replacement, inflation, cost estimation, cost control monitoring and accounting, strategic planning, stakeholder management, procurement management and risk management.

Note: This course is covered by two semesters

Course Number: E 402

Course Name: Engineering Project

Credit Hours: (2-4-0-0)

Prerequisites: None

Course Contents: This course encompasses analysis, design, experimental; synthesis, testing and evaluation work is carried out in accordance with a preapproved project plan under the supervision of faculty member(s). The students will use modern laboratory equipment's to achieve project objectives. Also, the students will be discussed in project teams about design, build, test and present results for realistic projects from university and industrial sponsors, Formulation of specifications, consideration of alternative solutions, feasibility considerations, detailed system descriptions, economic factors, safety, reliability, aesthetics, ethics and social impact.



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Course Number: CPE 403

Course Name: Cryptography and Network Security I

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

Prerequisites: None

Course Contents: Basic Definitions, Computer Security Concepts, Vulnerability- Threat - Control Model, classical and modern Security Attacks, Security Services and Mechanisms. Mathematical background: Numbers Theory, Complexity Theory, Finite Fields, Information Theory, Probability Theory, Abstract Algebra. Overview of Classical ciphers: Playfair, Hill and Vigenere Ciphers. Symmetric ciphers: Overview of Substitution Ciphers and Transposition Ciphers, Overview of Block Ciphers and Stream Ciphers , Operation Modes of Ciphers, block ciphers: DES, RC5, RC6, Blowfish, AES and Serpent algorithms, Stream Ciphers: RC4, SEAL, Stream Ciphers based on Feed Back Shift Register and Trivium Algorithms. Public-key cryptography: Basic Principles, RSA Public Key Encryption Rabin Public Key Encryption, ElGamal Public Key Encryption, Diffie Hellman Key Exchange, Elliptic Curve Crypto System, Digital Signatures, Hash Functions, Message Authentication Codes (MAC).

Course Number: CPE 405

Course Name: GNSS Applications

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

Prerequisites: Mathematics II (E 102), Object Oriented Programming with Java (CPE 212), Digital Signal Processing I and II (CPE 303 and CPE 304)

Course Contents: Introduction to GNSS System, GPS Constellation, GLONASS Constellation, Galileo Constellation, Civilian GNSS signals, Modulation, Receiving and De-modulation Process, GPS - NMEA sentence information, Interpreted sentences, Garmin proprietary sentences, All \$GPxxx sentence codes, Format of latitudes and longitudes, Navigation/Positioning onboard Smartphones (PoS), 1st PoS version, 2nd PoS version, Future PoS version, General GNSS Applications onboard Smartphones/Tablets, Location Based Service, Agriculture and Surveying, Civilian Application, Timing & Synchronization, Security, Overview of Personal Applications, Pedestrian Navigation, Outdoor Navigation, Photography Geocoding, Develop GNSS application (Android or other OS), Build Positioning Application, Build Timing Application, Encrypt the Header File of the geocoded photo.



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Course Number: CPE 407

Course Name: Computer Networks II

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

Prerequisites: Computer Networks I (CPE 308), Digital Communications (CPE 307)

Course Contents: Introduction: General Review: Network Types (LAN, WAN, MAN, SAN, VPN, ...), OSI and TCP/IP Model, IP addressing, Review, Wired LANs: Ethernet, IEEE Standards and Standard Ethernet, MAC Sublayer, Physical Layer, Bridged Ethernet, Switched Ethernet, Full-Duplex Ethernet, Wireless LANs, IEEE 802.11, Bluetooth, Connecting LANs, Backbone Networks, and Virtual LANs: Connecting Devices, Backbone Networks, and Virtual LANs, Wireless WANs, Cellular a view on: Telephone, Satellite Networks, Synchronous Optical Network (SONET/SDH), SONET Architecture, SONET layers, SONET Network, Virtual-Circuit Networks: Frame Relay, ATM.

Course Number: CPE 404

Course Name: Cryptography and Network Security II

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

Prerequisites: Computer Networks I and II (CPE 308 and CPE 407), Operating Systems II (CPE 311), Cryptography and Network Security I (CPE 403)

Course Content: Transport Layer and Electronic mail Security: Browser Attacks, Web Attacks Targeting User Data and Web Site Data, Secure Socket Layer (SSL), Transport Layer Security (TLS), HTTPS and Secure Shell, Electronic Mail Security Pretty Good Privacy (PGP) and S/MIME Security Protocols, IEEE 802.11 Wireless LAN Overview and Security Wireless Application Protocol Overview, Wireless Transport Layer Security, WAP End-to-End Security WEP (Wired Equivalent Privacy) Protocol, WPA (WiFi Protected Access) Protocol, IP Security Overview and Security, Encapsulating Security Payload, Internet Key Exchange, Distributed Denial of Service. Emerging topics in information security: Internet of Things Security (IoT), Mobile Phones and Medical Devices Security, Cloud Computing Security, Cyber Warfare and Quantum Cryptography.



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Course number: CPE 406

Course name: Embedded Systems

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

Prerequisites: Programming and Problem Solving with C++ I and II (CPE 102 and CPE 103), Computer Architecture I and II (CPE 201 and CPE 202), Microprocessor Programming (CPE 206) and Computer Interfacing (CPE 312)

Course Contents: Embedded Systems Overview, What is an embedded system?, Embedded Systems Vs General Computing Systems, Embedded Systems Classification, Characteristics and Quality Attributes of Embedded Systems, Embedded System Design Process, Embedded system hardware, Typical Architecture, Input Components, Communication, Processing Units (Overview of Processors & Microcontrollers), Memories, Output Components, Secure hardware, System software, Embedded operating systems, ERIKA, Hardware abstraction layers, Middleware, Real-time databases, Complex Embedded Systems, Techniques for low-power operation, Mobile and networked embedded systems, and Applications of Embedded Systems in Modern Life.

Course Number: CPE 408

Course Name: Data Compression

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

Prerequisites: Digital Image Processing (CPE 314)

Course Contents: Introduction to Compression Theory, Information Redundancy Types, Information Theory and Coding Concepts, Entropy Definition and Interpretation, Theoretical limits of compressibility, Fidelity Criteria and Kolmogorov–Chaitin Complexity Measure, Compression Models and standards, Overview of lossless Compression Theory, Burrows–Wheeler Transform, Context Tree Weighting Method, Dictionary Coders, Run Length Coding, Entropy Coders, Huffman Coding, Arithmetic Coding, Prediction By Partial Matching (PPM) Algorithm, Sequitur Algorithm, , Overview of lossy Compression Theory, Scalar and Vector Quantization, Still Image and Video Compression Methods, Block Transform Coding (BTC) Method Discrete Cosine Method, Discrete Wavelet Method, SPIHT Method, Fractal Method, Frame-by-Frame Video Compression, Audio and Speech Compression Methods, A-Low Algorithm, Code-Excited Linear prediction (CELP) Algorithm, Linear Predictive Coding (LPC) ,Warped Linear Predictive Coding (WLPC), Text Compression: Block Sorting. Introduction to the compression standards JPEG, JPEG2000, MPEG, MPEG2000 and H.264/AVC and HEVC.



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5. Elective Courses

Course Number: CPE 401 or CPE 402

Course Name: Soft Computing

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

Prerequisites: None

Course Contents: Introduction to soft computing: Introduction , Fuzzy computing, Neural computing ,Genetic algorithms ,Associative memory , Adaptive resonance theory, Application Fundamentals neural networks, Introduction, Model of artificial neuron, Architectures learning methods , taxonomy of NN Systems , Single-layer NN system , Applications, Back propagation network: Background, Back-propagation learning , Back –propagation algorithm, Associative memory , Discretion, Auto-associative memory, Bi-directional metro-associative memory. Adaptive resonance theory : Recap-supervised, Unsupervised, Back prop algorithms, Competitive learning , Stability-plasticity dilemma (SPD), ART networks iterative Clustering ,unsupervised ART clustering ,Fuzzy set theory: Introduction, Fuzzy set: membership, operations, properties ; fuzzy relation ,Fuzz systems: Introduction ,Fuzzy logic, Fuzzification, Fuzzy inference ,Fuzzy rule, Based system , Defuzzification, Fundamentals of genetic algorithms: Introduction, Encoding, Operators of genetic algorithm, Basic genetic, Algorithm., Hybrid systems: Integration of neural networks, Fuzzy logic and genetic algorithms, Ga based back propagation networks, Fuzzy back propagation networks, Fuzzy associative memories Simplified fuzzy ARTMP.

Course Number: CPE 401 or CPE 402

Course Name: Computer Vision

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

Prerequisites: Digital Image Processing (CPE 314)

Course Contents: Introduction to Computer Vision, Cameras and Optics, Light and Color, Image Pyramids and Applications, Model Fitting and Frequency Domain Analysis, Computer Vision Applications. Edge, Interest Points, Line and Corners Detection, Invariant Local Image Features, Feature Matching and Hough Transform, Model fitting and RANSAC, Feature Detectors: SURF, SIFT and others. Overview of Morphology, Segmentation and Clustering Techniques, Erosion, Dilation, opening and Closing Morphological Operations, Some Basic Morphological Algorithms, Threshold based Segmentation Methods, Region based Segmentation Methods, Segmentation using Morphological Watersheds, The use of Motion in segmentation, Some Clustering Algorithms. Basic Concepts in Classification and Recognition, Classification: Generative and Discriminative Models, introduction to the Object Recognition, Multiple views, Motion and Tracking.



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Course Number: CPE 401 or CPE 402

Course Name: Digital Multimedia

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

Prerequisites: Digital Image Processing (CPE 314), Programming and Problem Solving with C++ I and II (CPE 102 and CPE 103)

Course Contents: Introduction to Multimedia, What is multimedia, Components of multimedia, Web and Internet multimedia applications, Transition from conventional media to digital media, Issues in multimedia (Authoring and Design), Computer Fonts and Hypertext, Families and faces of fonts, outline fonts, bitmap fonts, International character sets and hypertext, Digital fonts techniques, Audio fundamentals and representations, Digitization of sound, frequency and bandwidth, decibel system, data rate, Sound synthesis, MIDI, wavetable, Compression and transmission of audio on Internet, Audio software and hardware, Graphics and image representations, Graphics/Image data types measurements, Digital graphics and image formats, Vector graphics and Vector based animation on Internet, Color science, color gamut, Color models, RGB, HSV, CMYK, LUVLAB, Output devices and their characteristics, Graphics and image software and hardware, Video theory and representations, Analogue video, PAL, NTSC standard, Digital video, AVI, MPEG, Video software and hardware, Multimedia Network Communications and Applications, Quality of Multimedia Data Transmission , Quality of Service (QoS) , QoS for IP Protocols, Prioritized Delivery, Multimedia over IP.

Course Number: CPE 401 or CPE 402

Course Name: Computer Simulation and Modelling

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

Prerequisites: None

Course Contents: What Is Simulation, Modelling, Computer Simulation, How Simulation Get Done, When Simulation Are Used, Fundamental Simulation Concepts, The System, Analysis Options, Pieces of a Simulation Model, Event-Driven Hand Simulation, Event and Process-Oriented Simulation, Randomness in Simulation, A Guided Tour through Arena, Exploring the Arena Window, Browsing Through an Existing Model, Build It Yourself, More on Menus, Toolbars, Drawing and Printing, Modelling Basic Operations and Inputs, An Electronic Assembly and Test System, The Enhanced Electronic Assembly and Test System, Input Analysis: Specifying Model Parameters and Distributions, Modelling Detailed Operations, , Modelling Approach, Building the Model, Finding and Fixing Model Errors, Statistical Analysis of Output from Terminating Simulations, Continuous and Combined Discrete/Continuous Model, Modelling Simple Discrete/Contiguous System, Continuous State-Change System, Conducting Simulation Studies, A Successful Simulation Study, Problem Formulation, Solution Methodology, Verification and Validation, Experimentation and Analysis.



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Course Number: CPE 402

Course Name: Cloud Computing

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

Prerequisites: Operating Systems I and II (CPE 209 and CPE 311), Computer Networks I and II (CPE 308 and CPE 407)

Course Contents: Introduction: What is the cloud?, The Emergence of cloud computing, Cloud-Based Service Offering and Benefits, The Evolution of Cloud Computing: Hardware and Internet Software Evolution, Server Virtualization, Web Services Delivered from the Cloud: Communication-as-a-Service (CaaS), Infrastructure as a Service (IaaS), Monitoring-as-a-Service (MaaS), Platform as a Service (PaaS), Software-as-a-Service (SaaS), Building Cloud Networks: The Evolution from the MSP Model to Cloud Computing and Software-as-a-Service, The Cloud Data Centre, The Role of Open Source Software in Data Centres, Virtualization Practicum (Practice Projects):Downloading and Installing Sun xVM VirtualBox, Adding a Guest Operating System to VirtualBox, End-User Access to Cloud Computing: YouTube, Zimbra, Facebook, etc., Mobile Internet Devices and the Cloud: Mobile Operating Systems for Smartphones, iPhone, Google (Android), Blackberry, Windows Mobile, Ubuntu Mobile Internet Device (MID), Mobile Platform Virtualization: KVM, VMWare.

Course Number: CPE 402

Course name: Mobile Computing

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

Prerequisites: Computer Network I and II (CPE 308 and CPE 407)

Course Contents: Introduction: Mobile Computing,, Mobile Computing Vs. wireless Networking , Mobile Computing Applications ,Characteristics of Mobile computing ,Structure of Mobile Computing, Application. MAC Protocols, Wireless MAC Issues ,Fixed Assignment Schemes, Random Assignment Schemes , Reservation Based Schemes, Mobile internet protocol and transport layer : Overview of Mobile IP , Features of Mobile IP ,Key Mechanism in Mobile IP , Route Optimization, Mobile telecommunication system : Global System for Mobile Communication (GSM) , General Packet Radio Service, (GPRS) – Universal Mobile Telecommunication System (UMTS), Mobile managements: Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations. Mobile Agents computing, security and fault tolerance, transaction processing in mobile Computing environment.



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Course Number: CPE 402

Course Name: Wireless Sensor Networks

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

Prerequisites: Digital Communications (CPE 307), Computer Networks I and II (CPE 308 and CPE 407), Computer Control (CPE 310)

Course Contents: Introduction and Overview of Wireless Sensor Networks, Basic Wireless Sensor Technology, Wireless Transmission Technology and Systems , Medium Access Control Protocols for Wireless Sensor Networks, Routing Protocols for Wireless Sensor Networks, Transport Control Protocols for Wireless Sensor Networks, Network Management for Wireless Sensor Networks.

Course Number: CPE 401 or CPE 402

Course Name: Data Mining and Warehousing

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

Prerequisites: Database Systems (CPE 208)

Course Contents: Introduction to data mining, Visual data mining, Statistical primer, parameter estimation, quality metrics of parameter estimation, hypothesis testing, Bayes theorem, histograms, scatter plots, regression , Classification algorithms , Clustering algorithms , Association rules , Data warehousing , SQL OLAP extensions, Multi-dimensional Join , Data warehouse performance.

Course Number: CPE 401 or CPE 402

Course Name: Distributed Systems

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

Prerequisites: Computer Architecture I and II (CPE 201 and CPE 202)

Course Contents: Introduction to Distributed Systems (DS) , Theories evolve DS, Sequence and Parallel Computers, Model Properties, Computing organization for parallel and distributed ,Distributed of computing, master-slave, client server. DS and Parallelism: Architecture Classification, Flynn Taxonomy: SISD, SIMD, MISD, and MIMD vs. SIMD, Multiprocessors DS: Types of Multiprocessors: Dual and Multi Core, Hyper-Threading Shared Memory, Architecture, Access to Share Memory: UMA, NUMA, COMA, and ccNUMA ,Characteristics of Share Memory in DS Communication: Fundamentals, Remote procedure call, Synchronization, Mutual execution, central algorithm, decentralized algorithm, Distributed algorithm, token ring algorithm Fault tolerance: Introduction, Basic concept, Failure models.



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Course Number: CPE 401 or CPE 402

Course Name: Nano computing

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

Prerequisites: None

Course Contents: Introduction to Nanocomputing, Historical Context for Computing, What are Nanotechnologies?. Reconfigurable Computing and Crossbar-Based Computing, Comparison of different crossbar based architectures, Logic implementation using nanowire crossbar, Logic gate implementation using asymmetric nano-crossbar. General Properties of Nanoarrays, Introduction to nanowires, Undifferentiated nanowires (NW) Decoders, Decoders nanowires, Encoded nanowires (NW) Decoders, Nanowire-Based PLA, NanoFabrics – an early model for Nanoarrays, NanoPLAs - A programmable architecture, NanoPALs - A programmable architecture, field-programmable nanowire interconnect (FPNI). DNA (Deoxyribonucleic Acid) computing, RNA (Ribonucleic Acid) computing, Reliable Computation with Unreliable Elements, Codes and Finite Fields. Coded Computation, Spielman's Computational Model. Three Parallel Models of Computation (Parallel Random Access Model (PRAM), Hypercube, Mesh).

Course Number: CPE 401 or CPE 402

Course Name: Bioinformatics

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

Prerequisites: Data Structures and Algorithms (CPE 207), Digital Image Processing (CPE 314)

Course Content: Introduction to Bioinformatics and Data Generation, What is Bioinformatics, Bioinformatics Relation with Molecular Biology (tools, databases, software), Data generation, Applications of Bioinformatics, Biological Database and its Type, Introduction to Data Types and Source, Population and sample, Classification and Presentation of Data, General Introduction of Biological Databases (Nucleic acid, Protein, Specialized Genome, and Structure databases), Data storage and retrieval and Interoperability, Flat files (relational, object oriented databases and controlled vocabularies) , File Format, Introduction to Metadata and search, The challenges of data exchange and integration, Sequence Alignments and Visualization, Introduction to Sequences, Alignments and Dynamic Programming (Local, Global, Pairwise, and sequence alignments, Methods for presenting large quantities of biological data (sequence viewers, 3D structure viewers, Anatomical visualization), Gene Expression and Representation of patterns and relationship, General introduction to Gene expression, Introduction to Regular Expression, Hierarchies, and Graphical models, Genetic variability and connections to clinical data.



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Course Number: CPE 401 or CPE 402

Course Name: Distributed Databases

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

Prerequisites: Database Systems (CPE 208)

Course Contents: general introduction in distributed DBMS, DDBMS Architecture: definition of DDBMS architecture, ANSI/SPARC standard, global, local, external, and internal schemas, DDBMS architectures, components of DDBMS, Distributed Database Design: conceptual design (what can be distributed, design patterns), top-down, bottom-up patterns, technical design (fragmentation, allocation and replication of fragments, optimality, heuristics) Semantic Integrity Control, view management, security control, integrity control, Distributed Query Processing: overview of query processing and query optimization, query decomposition and data localization, Query decomposition and data localization: normalization, analysis, elimination of redundancy, rewriting, reduction for HF, reduction for VF, Optimization of Distributed Queries:, basic concepts, distributed cost model, database statistics, ordering of joins and semijoins, query optimization algorithms, INGRES, System R, hill climbing, Transactions:, introduction to transactions, definition and examples, properties, classification, processing issues, execution, Concurrency Control: definition, execution schedules, examples, locking based algorithms, timestamp ordering algorithms, deadlock management Reliability: definitions, basic concepts, local recovery management, distributed reliability protocols, 2PC protocol.