

# Summary of the Courses

## 4th Year 1st Semester

Sl. No.	Course No.	Course Title	Theory hrs/week	Sessional hrs/week	Credits
1.	CSE-4000	Project and Thesis	0	3	1.50*
2.	CSE-4811	Digital System Design	3	0	3.00
3.	CSE-4812	Digital System Design Sessional	0	3/2	0.75
4.	CSE-4813	Peripherals & Interfacing	3	0	3.00
5.	CSE-4814	Peripherals & Interfacing Sessional	0	3/2	0.75
6.	CSE-4411	Computer Networks	3	0	3.00
7.	CSE-4412	Computer Networks Sessional	0	3/2	0.75
8.	Option – I		3	0	3.00
9	Option – I Laboratory		0	3/2	0.75
10.	Option – II		3	0	3.00
Total			15	9	18.00

Contact Hours: 15T + 9S =24 hrs/week

No. of Theory Courses: 5

Total credits: 18.00

No. of Lab / Sessional courses: 5

\* Credit Transferred to 2<sup>nd</sup> Semester

## List of Optional Courses:

**Option – I** (One Subject should be selected from the following courses):

<i>Sl. No.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Theory hrs/week</i>	<i>Sessional hrs/week</i>	<i>Credits</i>
1.	CSE-4511	Computational Geometry	3	0	3.00
2.	CSE-4512	Computational Geometry Sessional	0	3/2	0.75
3.	CSE-4815	VLSI Design	3	0	3.00
4.	CSE-4816	VLSI Design Sessional	0	3/2	0.75
5.	CSE-4711	Simulation & Modeling	3	0	3.00
6.	CSE-4712	Simulation & Modeling Sessional	0	3/2	0.75
7.	CSE-4311	Geographical Information System	3	0	3.00
8.	CSE-4312	Geographical Information System Sessional	0	3/2	0.75

**Option-II** (One Subject should be selected from the following courses):

<i>Sl. No.</i>	<i>Course No.</i>	<i>Course Title</i>	<i>Theory hrs/week</i>	<i>Sessional hrs/week</i>	<i>Credits</i>
1.	CSE-4513	Graph Theory & Algorithm	3	0	3.00
2.	CSE-4817	Digital Signal Processing	3	0	3.00
3.	CSE-4611	Human Computer Interaction	3	0	3.00
4.	CSE-4613	Pattern Recognition	3	0	3.00



## Detailed Syllabus

### **CSE-4000      Project and Thesis**

**3 Hours/ week**

**1.50 Credits**

Study of problems in the field of Computer Science and Engineering

### **CSE-4811      Digital Systems Design**

**3 Hours/ week**

**3.00 Credits**

Design using MSI and LSI components, design of memory subsystem using SRAM and DRAM, design of various components of a computer: ALU memory and control unit – hardware and micro-programmed control unit, microprocessor based design. Computer bus design using special purpose controls.

### **CSE-4812      Digital Systems Design Sessional**

**3/2 Hours/ week**

**0.75 Credits**

Sessional based on digital systems design (CSE-4811).

### **CSE-4813      Peripherals & Interfacing**

**3 Hours/week**

**3.00 Credits**

Interrupts, address space partitioning, AD and DA converters and some related chips. Interfacing ICs of I/O devices I/O ports, programmable peripheral interface, DMA controller, interrupt controller, communication interface, interval time, etc. IEEE 488 and other buses, interfacing with microcomputer. Interfacing I/O devices –floppy disk, hard disk, tape, CD-ROM & other optical memory, keyboard, mouse, monitor, plotter, scanner, etc. Microprocessor in scientific instruments and other applications- display, protective relays, measurements of electrical quantities, temperature monitoring system, water level indicator, motor speed controller, traffic light controller etc. Microprocessor based interface design.

## **CSE-4814      Peripherals & Interfacing Sessional**

**3/2 Hours/week**

**0.75 Credits**

Sessional based on peripherals & interfacing (CSE-4813).

## **CSE-4411      Computer Networks**

**3 Hours/week**

**3.00 Credits**

Networks types, topology, OSI layers, protocol hierarchies, data link control, HDLC, DLL in Internet, DLL of ATM. LAN Protocols, standard IEEE 802.\*, switch and hubs, bridges, FDDI, Fast Ethernet, routing algorithm, congestion control, internetworking, WAN, fragmentation, firewalls, IPV4, IPV6, ARP, RARP, mobile IP. Network layer of ATM, transport protocols; transmission control protocol, connection management, transmission policy, congestion control timer management, UDP, AAL of ATM, network security cryptography, DES, IDEA, public key algorithm, authentication, digital signatures, Gigabit Ethernet, DNS, email and its privacy SNMP, HTTP, MIME, WWW.

## **CSE-4412      Computer Networks Sessional**

**3/2 Hours/week**

**0.75 Credits**

Sessional based on computer networks (CSE-4411).

**Option I: (One subject with sessional should be taken)**

## **CSE-4511      Computational Geometry**

**3 Hours/week**

**3.00 Credits**

Searching and geometric data structures, balanced binary search trees, priority-search trees, range searching, interval trees, segment trees, algorithms and complexity of fundamental geometric objects: polygon triangulation and art gallery theorem, polygon partitioning, convex-hulls in 2-and 3-dimension, dynamic convex-hulls, geometric intersection, line segment intersection and the plane-sweep algorithm, intersection of polygons, proximity, voronoi



diagrams, delunay triangulations, closest and furthest pair, visualization, hidden surface removal and binary space partition (BSP) trees, graph drawings, drawings of rooted trees (layering, radial drawing, HV-drawings, recursive winding), drawings of planar graphs (straight-line drawings, orthogonal drawing, visibility drawings), survey of recent developments in computational geometry.

### **CSE-4512      Computational Geometry Sessional**

**3/2 Hours/week**

**0.75 Credits**

Sessional based on Computational Geometry (CSE-4511).

### **CSE-4815      VLSI    Design**

**3 Hours/week**

**3.00 Credits.**

Introduction to MOS technology, MOS devices and basic circuits, basic electrical properties of MOS circuit. Fabrication and design rules, design processes, logic circuit design, system considerations. Architecture and implementations of PLDs: PLA, PAL, GAL and FPGA.

Introduction SPICE or VHDL. Introduction to fault tolerant system & architecture. Fault detection & location in combinational and sequential circuits. Fault test generation for combinational and sequential circuit, digital simulation as a diagnostic tool. Automatic test pattern generator. Fault modeling automatic test equipment. Faults in memory, memory test pattern and reliability. Performance monitoring, self checking circuit. Burst error correction and triple modular redundancy, maintenance processors.

### **CSE-4816      VLSI    Design Sessional**

**3/2 Hours/week**

**0.75 Credits**

Sessional based on VLSI Design (CSE-4815).

## **CSE-4711      Simulation & Modeling**

**3 Hours/ week**

**3.00 Credits**

**Simulation modeling basics:** systems, models and simulation; Classification of simulation models; Steps in a simulation study; Concepts in discrete-event simulation: event-scheduling vs. process-interaction approaches, time-advance mechanism, organization of a discrete-event simulation model; Continuous simulation models; Combined discrete-continuous models; Monte Carlo simulation; Simulation of queuing systems.

**Building valid and credible simulation models:** validation principles and techniques, statistical procedures for comparing real-world observations and simulated outputs, input modeling; Generating random numbers and random variants; Output analysis. Simulation languages; Analysis and modeling of some practical systems. Introduction to the development of simulation packages.

## **CSE-4712      Simulation & Modeling Sessional**

**3/2 Hours/week**

**0.75 Credits**

Sessional based on Simulation & Modeling (CSE-4711).

## **CSE-4311      Geographical Information System**

**3 Hours/week**

**3.00 Credits**

Fundamentals of GIS, Spatial data, spatial data modeling, Database management, Data input and editing, Data analysis, Analytical modeling in GIS, The development of computer methods for handling spatial data, Data quality issues, GIS project design and management, The Future of GIS.

## **CSE-4312      Geographical Information System Sessional**

**3/2 Hours/week**

**0.75 Credits**

Sessional based on Geographical Information System (CSE- 4311).



**Option-II: (One Subject should be taken)**

**CSE-4513 Graph Theory & Algorithm**

**3 Hours/week**

**3.00 Credits**

Structure and basic definition in graph theory, methodology, proofs, basic properties of graphs; graphs operations and their symbolic designation. Orientation of graphs, associated matrices and their relationship. Groups, automorphism graphs, symmetric graphs, graph enumeration, graph coloring, five color problem, four color conjecture, Heawood map coloring theorem, critical graphs, homomorphism. Graph algorithms, ordered trees, Hoffman tree, Catalan numbers, maxflow problem and solutions, maximum matching in bipartite graphs, Zero-one net flow, NP-complete problems, Euler and Hamiltonian paths and circuits.

**CSE-4817 Digital Signal Processing**

**3 Hours/week**

**3.00 Credits**

Classification of signals and systems, signal representation, discrete and analog signals.

**Z-transform:** Z-transformation, inverse Z-transformation, Theorems and proposition, system function. Discrete Fourier Transform (DFT), Discrete Fourier Series (DFS), properties of DFS, Discrete Fourier Transformation (DFT), Properties and application of DFT. Digital Filter design Technique, differential and difference equations, digital transfer functions, frequency response. Digital filter realization scheme, Finite Impulse Response (FIR), Infinite Impulse Response (IIR), filter design. Application of Digital Signal Processing (DSP), image processing, radar systems, Telecommunications etc.

**Introduction and image processing and computer vision:** representation of image, a basic image processing system, relationship to human visual system, computer vision applications, signal processing and pattern recognition. Discrete Fourier transform: one dimensional Fourier transform, properties of DFT, Fast Fourier Transform (FFT) algorithms, two dimensional FFT, two dimensional filtering using FFT, properties of digital images, two

dimensional infinite, impulse response filters. Two dimensional system, two dimensional signals, frequency response of 2-D LSI systems,  $z$ -transform, FIR filters, software implementation of 2-D FIR filters, techniques of image acquisition: CCD cameras, scanners, image devices, frames grabbers, gray levels, coding of color pictures, binary patterns. Use of stereo cameras and structured lighting for recognition of 3-D objects., use of range data for determination of depth, motion estimation, development of rule based systems for image segmentation. Image enhancement: histograms equalization and modification, edge enhancement and detection, region growing techniques for image segmentation textures, line tracing. Hough transform for detection of lines and circles, recognition of 2-D objects. Image restoration and data compression: PSFs for different forms of blurs estimating extent of blur and procedure for restoration through local operators. Document image processing, data compression, coding and decoding of digital image.

## **CSE-4611      Human Computer Interaction**

**3 Hours/week**

**3.00 Credits**

Foundations, the human input output channels, human memory. Thinking, reasoning and problem solving, individual differences, psychology and the design of interactive system.

The computer, text entry device, output devices, memory, paper, printing and scanning processes. The interaction: models of interaction, frameworks and HCI, ergonomics, interaction styles, the context of the interaction. Design practice: paradigms for interaction, principles to support usability, using design rules, usability engineering, interactive design and prototyping. Modules of the user in design: cognitive models, goal and task hierarchies, linguistic models. The challenges of display based systems, cognitive architecture. Task analysis: task decomposition, knowledge based analysis, E-R based technique, sources information and data collection, uses of task analysis. Dialogue notations and design: dialogue notation and textual dialogue notations, dialogue semantics, dialogue analysis and design: models of the system, standards formalisms, interaction models. Status Event analysis: implementation support; evaluation technique, help and documentation: requirements of user support, intelligent help systems. Groupware: groupware



systems, meeting and decision support systems framework for groupware. CSCW issues and theory : face to face communication, conversation. Multi-sensory systems: usable sensory inputs, speech in the interface, handwriting recognition, text hypertext and hypermedia; gesture recognition, computer vision, application of multimedia systems.

**CSE-4613      Pattern Recognition**

**3 Hours/week**

**3.00 Credits**

**Pattern recognition:** introduction, importance. Statistical and neural pattern recognition: Bayesian classifier, Bayes decision theory, discriminant functions and decision surfaces, Bayesian classifier for normal distributions, linear classifiers, discriminant functions and decision hyperplanes, perceptron algorithm, least squares methods, nonlinear classifiers, two and three layer perceptrons, back propagation algorithm, template matching, optimal path searching techniques, dynamic programming methods, correlation methods, context dependent classification, observable and hidden Markov models, Viterbi algorithm.