

# **BACHELOR OF SCIENCE IN COMPUTING SCIENCE AND TECHNOLOGY**

## **1.0 INTRODUCTION**

With the new advancements in the field of computers and in a time when there is a boom in the local IT industry, the University, School of Informatics and Innovative Systems (SIIS) has introduced BSc in Computer Science, a four year undergraduate program for the information engineering and IT professional industry. The school is contributing in its own inimitable way to the development of Information Technology by offering this course with the help of efficient and highly qualified teachers and through a well-equipped computer lab. The course provides rigorous foundations of the concepts of Computer Science and Information Technology. In the final year, students also get an opportunity to do project work and undertake industrial attachment training. Hence the combination of the concepts and training of software tools equip the students to adapt to ever-changing technology.

## **2.0 OBJECTIVES**

The overall objective of the programme is to produce skilled, motivated and internationally competitive graduates to work in both private and public informatics sector of the economy. The specific objectives of the programme are:

Develop graduates with the ability to apply computer science knowledge, skills, techniques and tools to create best-possible solutions to practical problems of varying complexity, in a wide range of contexts.

Facilitate the acquisition, adoption and adaptation of computer science knowledge, techniques and tools.

Develop graduates who are innovative and creative, who possess good problem-solving skills and are capable of life-long learning.

Develop all-rounded graduates with demonstrable ethical and professional behaviour, and who possess effective communication, management, entrepreneurial and interpersonal skills.

## **3.0 ADMISSION REQUIREMENTS**

Candidates must satisfy the minimum University entry requirements. In addition, they should meet the following requirements:

Have at least a mean grade of C+ in Kenya Certificate of Secondary Education (KCSE). In addition, candidates are expected to have at least a grade C or above in Mathematics, C in Physics or Physical Science

**OR**

Have two principal passes in science subject in KACE and at least a credit in pass in Mathematics.

**OR**

Have a Higher Diploma or Diploma in IT or any other related discipline from a recognized university or college.

**OR**

Have a degree from a recognized University.

#### **4.0 CREDIT TRANSFER**

Transfer of academic credits shall be accepted on individual basis for courses undertaken and successfully completed by students at accredited universities/institutions who request to transfer the same to the university, for incorporation into the degree course and final classification of the degree.

The relevant academic body as approve by the University Senate shall make official evaluation and transfer of credits.

The number of hours, content and grading of courses for which credit transfer is sought should be similar to the courses offered at the University.

Only grades of C and above will be transferred.

Only a maximum of 1/3 or equivalent of the study programme at the university can be transferred.

Such courses are to satisfy the requirements of the first and second years of study only.

#### **5.0 COURSE STRUCTURE AND DURATION**

The Degree course shall normally take four academic years covering 8 semesters.

A candidate will be deemed to have passed an academic year after successful completion of all the units offered in that year. A Diploma Certificate may be issued after a successful completion of the first two years of studies (four semesters).

Courses shall be offered in units. A course unit is defined as that part of a semester subject described by coherent syllabus and taught normally over a period of a semester. It is designated as a total of 42 hours of study in a semester. For this purpose, one 1-hour lecture is equivalent 2-hours tutorial or 3-hours practical or any combination as may be approved by the Board of the School.

Part-time students shall be allowed to take not less than 50% of the courses prescribed for the year.

All course units will be taught for a total of 42 contact hours, including examinations except industrial attachment which will take 480 hours of practical work in a relevant industry.

Students shall be required to undertake Informatics Industrial Attachment of 480 hours at the end of third year semester.

## **6.0 EXEMPTION FROM COURSES**

Student may be exempted from some courses by University on recommendation of the School Board.

## **7.0 EXAMINATIONS REGULATIONS**

University Examinations rules and regulation shall apply.

## **8.0 COURSE DISTRIBUTION**

One semester shall comprise minimum of seven (7) units and a maximum of nine (9) units.

### **FIRST SEMESTER**

CODE	TITLE	UNITS
SCS 101	Introduction to Computers	3C
SCS 102	Discrete structures	3C
SCS 103	Programming in Pascal	3C
SCS 104	Electronics	3C
SCS 105	Engineering Maths I	3C
SCS 106	Electronics I Lab	3C
SCS 107	Engineering Drawing	3C
SCS 108	Electrical Principle	3C

## SECOND SEMESTER

SCS 109	Assembly Language Programming	3C
SCS 110	Digital Electronics I	3C
SCS 111	Digital Electronics I Lab	3C
SCS 112	Desktop Publishing	3C
SCS 113	Data Communications	3C
SCS 114	Introduction to Spreadsheets & Databases	3C
SCS 115	Engineering Maths II	3C
SCS 116	Programming in C	3C

## (SECOND YEAR)

### FIRST SEMESTER

#### CORE

SCS 201	Digital Electronics II	3C
SCS 202	Object Oriented Programming in java I	3C
SCS 203	Information Systems Analysis and Design	3C
SCS 204	Operating Systems	3C
SCS 205	Computer Networks I	3C
SCS 206	Computer Networks I Lab (Cisco I)	3C
SCS 207	Web Design and Publishing	3C
SCS 208	Engineering Maths III	3C

### SECOND SEMESTER

SCS 209	Computer Arithmetic	2C
SCS 210	Project	2C
SCS 211	Visual Basic Programming	3E
SCS 212	Database Systems	3E
SCS 213	Engineering Maths IV	3C
SCS 214	Management Information System	3C

SCS 215	UNIX Operating Systems	3C
SCS 216	Computer Networks Lab II (CISCO II)	2E
SCS 217	Database Systems Lab	2C
SCS 218	Object Oriented Programming Java II	3C

### THIRD YEAR

#### FIRST SEMESTER

##### Computer Technology Option

##### CORE

SCS 301	Data Structures and Algorithms	3C
SCS 303	Computer Architecture I	3C
SCS 307	Project I	3C
SCS 311	Design of Digital Systems	2C
SCS 335	Database Administration	3C

##### ELECTIVE

SCS 304	Automata Theory	3E
SCS 305	Distributed Computing	3E
SCS 306	Internet Computing	3E
SCS 308	Object Oriented Programming in C++	3E
SCS 310	Multimedia and Graphics	3E
SCS 312	Digital Signal Processing	3E
SCS 313	Design Circuit Board Design	3E
SCS 331	Printed Circuit Board Design	3E
SCS 333	Introduction to numerical methods	3E

##### Computer Science Option

##### Core

SCS 301	Data Structures and Algorithms	3C
SCS 304	Automata Theory	3C
SCS 305	Distributed Computing	3C

SCS 307	Project I	3C
SCS 335	Database Administration	3C

ELECTIVE

SCS 302	Probability and Statistics	3E
SCS 303	Computer Architecture I	3E
SCS 306	Internet Computing	3E
SCS 308	Object Oriented Programming in C++	3E
SCS 309	Computer Aided Design	3E
SCS 310	Multimedia and Graphics	3E
SCS 332	Software Project Management	3E
SCS 333	Introduction to numerical methods	3E

2<sup>nd</sup> Semester

Computer Technology Option

CORE

SCS 317	Computer Architecture II	3C
SCC 320	Project II	2C
SCS 326	Design and analysis of Real Time Systems	3C
SCS 329	Network Administration	3C

ELECTIVE

SCS 314	Computer Graphics	3E
SCS 315	Principles of Programming Languages	3E
SCS 316	Computer and Information Systems Security	3E
SCS 318	Design and Analysis of Algorithms	3E
SCS 319	Intelligent Systems	3E
SCS 321	Logic Programming in Prolog	3E
SCS 325	Digital Communication Systems	3E
SCS 327	Digital Design with VHDL Hardware	

	Description Language	3E
SCS 328	Process Measurement and Control	3E
SCS 334	Object oriented analysis and Design with UML	
	Computer Science Option	
CORE		
SCS 315	Principles of Programming Languages	3C
SCS 318	Design and Analysis of Algorithms	3C
SCS 320	Project II	2C
SCS 329	Network Administration	3C
ELECTIVE		
SCS 314	Computer Graphics	3E
SCS 316	Computer and Information System Security	3E
SCS 317	Computer Architecture II	3E
SCS 319	Intelligent Systems	3E
SCS 321	Logic Programming Prolog	
SCS 322	Electronic Commerce	3E
SCS 323	Bioinformatics	3E
SCS 324	Statistical Analysis with SPSS	3E
SCS 330	Multimedia Web Design	3E
SCS 334	Object oriented analysis and design with UML	3E

## FOURTH YEAR

### 1<sup>st</sup> Semester

#### Computer Technology Option

##### CORE

SCS 408	Design Project I	2C
SCS 410	Microprocessor Systems	3C
SCS 411	Advanced Computer Architecture	3C
SCS 412	Computer Design Lab	2C

##### ELECTIVE

SCS 401	Compiler Construction	3E
SCS 402	Software Engineering	3E
SCS 403	Neutral Networks	3E
SCS 404	Principles of Functional Programming	3E
SCS 405	Compiler Construction Lab	3E
SCS 407	Computer Networks Lab III (CISCO III)	3E
SCS 409	IT and Society	3E
SCS 413	Optical Device and System	3E
SCS 414	Intelligent Agents	3E
SCS 415	Program Verification	3E
SCS 435	Computer Networks II	3E
SCS 418	Business Management	3E

Computer Science Option

##### CORE

SCS 401	Compiler Construction	3C
SCS 402	Software Engineering	3C
SCS 405	Compiler Construction Lab	3C
SCS 408	Design Project I	2C



## ELECTIVES

SCS 403	Neural Networks	3E
SCS 404	Principles of Functional Programming	3E
SCS 407	Computer Networks Lab II (CISCO III)	3E
SCS 409	IT and Society	3E
SCS 411	Advanced Computer Architecture	3E
SCS 414	Intelligent Agent	3E
SCS 415	Program Verification	3E
SCS 435	Computer Networks II	3E
SCS 418	Business Management	3E
SCS 436	Internal Controls and Security Issue	3E

## 2<sup>nd</sup> Semester

### Computer Technology Option

#### CORE

SCS 422	Special Topics in Computer Engineering	3C
SCS 423	Design Project II	2C
SCS 424	Microprocessor Interfacing	3C
SCS 425	Advanced Microprocessor Systems	3C

#### ELECTIVE

SCS 416	Human Computer Interaction	3E
ABS	Entrepreneurship and Small Business Management	3E
SCS 419	Project Planning and Management	3E
SCS 420	Computation Science	3E
SCS 421	Computer Networks Lab IV (CISCO IV)	3E
SCS 426	Computer Integrated Manufacturing	3E
SCS 427	Social and Professional Issues in Computing	3E
SCS 428	Data Mining	3E
SCS 429	Fibre Optics: Theory and Application	3E

SCS 430	Information Retrieval	3E
SCS 431	Pattern Recognition	3E
SCS 432	Natural Language Processing	3E
SCS 434	Introduction to Expert Systems	3E

#### Computer Science Option

##### CORE

SCS 416	Human Computer Interaction	3C
SCS 417	Special Topics in Computer Science	3C
SCS 423	Design Project II	2C

##### ELECTIVE

ABS	Entrepreneurship and Small Business Management	3E
SCS 419	Project Planning and Management	3E
SCS 420	Computational Science	3E
SCS 421	Computer Networks Lab IV (CISCO IV)	3E
SCS 426	Computer Aided Manufacturing	3E
SCS 427	Social and Professional Issues in Computing	3E
SCS 428	Data Mining	3E
SCS 433	Advanced Database Systems	3E
SCS 434	Introduction to expert Systems	3E
SCS 437	Information Systems Applications	3E

## 9.0 COURSE DESCRIPTIONS

### SCS 101: INTRODUCTION TO COMPUTERS

Historical background of computers; Components of computer systems; Basic computer organisation; Computer software; Operating systems with hands on experience with the operating system currently in use at the University; Hands on experience with a typical word processor.

### SCS 102: DISCRETE STRUCTURES

Logic, Boolean algebra and logic circuits, set theory, counting techniques, computer arithmetic, graph theory and matrix algebra with applications to computing; functions; Proof techniques.

### SCS 103: PROGRAMMING IN PASCAL

Notations and fundamental concepts; Data type and declarations; statements, expression and assignments; simple input and output; Basic control structures; procedures and functions; arrays; records; sets; Pointers: - pointer concept, programming a stack, non-linear structures, storage tailoring.

### SCS 104: ELECTRONICS

Overview of electronic applications, amplifiers and attenuators, voltage and current gain in dB; semi-conductors; intrinsic and extrinsic semi-conductors; PN junction diodes; NPN and PNP transistors; h-parameter equivalent circuits; Junction Field Effect Transistor and Metal-Oxide-Silicon Field Effect transistors; transistors equivalent circuits; alternating current (AC) and direct current (DC) loadlines; overview of opto-electronics; Diode applications; CR coupling and filtering; rectifiers; voltage stabilisation using zener diodes; clamping and wave shaping circuits.

### SCS 105: ENGINEERING MATHS I

Basic mathematical concepts (elementary set operations, De-Morgan's law, relations, real number system, sequences, limits); Functions of a single variable, differentiation; Integration; Infinite series.

### SCS 106: ELECTRONICS I LAB

Students shall have laboratory experience in building and testing linear circuits involving diodes, BJTs, and FETs. Topics shall include: operation of electronic laboratory equipment like multimeters, oscilloscopes, signal generators etc; RC low pass filters; diode characteristics; rectifier circuits and voltage doublers; BJT characteristic and biasing; common-emitter amplifier; switching and saturation; MOSEFET amplifier.

### SCS 107: ENGINEERING COMMUNICATIONS

Introduction to drawing design and production. Drawing instruments and their correct use; types of lines – titling; Free-hand sketching of three orthographic views of simple shaped objects. Introduction to third angle projection (first angle mentioned). Three principal views of objectives. Synthesis of three views into an isometric view. Introduction to correct dimensioning procedure; Concept of sectioning and its use. Electrical symbols (graphics and letters) according to IEEE & IEC. Schematic drawings, installation drawing and construction drawings.

Case studies of schematic for transmission/distribution, electrical utilization in buildings, electrical/electronic control drawings, Electronic/Instrumentation, circuit board/PCB layout.

### CSC 108: ELECTRICAL PRINCIPLES

Electrical quantities; definitions and laws; circuit elements circuit laws; network theorems; non-linear networks; signal waveforms; steady state a.c. circuit; RL, RC and RLC circuits; magnetic circuits and transformers; measurements instruments and techniques.

### CSC 109: ASSEMBLY LANGUAGE PROGRAMMING

Machine organisation; CPU architecture; Fundamentals of Machine language and addressing; Assembly language programming using the instruction set of a typical microprocessor.

### CSC 110: DIGITAL ELECTRONICS I LAB

Number and Coding Systems; Boolean algebra; combinational logic analysis and design; bistables, counters; Registers (SIPO, PISO, PIPO, SISO); logic circuit families; displays; pulse sources (monostable, stable).

### SCS 111: DIGITAL ELECTRONICS I LAB

Students shall have laboratory experience in building and testing linear circuits involving diodes, BJTs, and FETs. Topics shall include: combinational circuits; Flip-Flops and counters; Register circuits; bistable and waveform generators.

### SCS 112: DESKTOP PUBLISHING

Basic concepts of Desktop Publishing Packages; Creating and publications: the Toolbox, working with pallets and setting preferences; Formatting text; Working with graphs and managing windows; constructing a publication and using the dictionary; Indexing: Creating table of contents; Colour Management System (CMS).

### SCS 113: DATA COMMUNICATIONS

Data signals (timing, codes); simple data communications: simplex, duplex, semi-duplex; telephone lines; modulation techniques; transmission line theory; modems, multiplexers and concentrators, circuit switching, message switching; packet switching; peripheral and data communication equipment.

### SCS 114: INTRODUCTION TO SPREADSHEETS AND DATABASES

Database Types: Advantages and disadvantages; field types creating and modifying fields in database. Data entry and validation checks. Importing and exporting tables. Data handling: Add, view, edit, sort or filter data in a database creating and using view files. SQL and query files; creating, saving, modifying query files. Forms: Creation and Application. Data entry and viewing through forms: Form within a form. Reports: Creating, customizing and printing of reports and mailing labels (mailing lists). Designing and Running of Macros.

Data and Worksheet formatting and appearance modification. Opening, creating, saving, deleting contents of a worksheet. Sorting, filtering; totals and subtotals: Data validation in a spreadsheet. Move, copy and paste commands. Find, replace and Go to commands in a worksheet. Creating and using a formula in a worksheet. Getting external data into and out of a worksheet. Running a web, database query. Window handling facilities in a worksheet. Statistics: Finding using spreadsheet or statistical package mean, median, mode, of data.

#### SCS 115: ENGINEERING MATHS II

Ordinary Differential Equations (First order differential equation, second order and higher equations with constant coefficient, applications); Complex numbers (Geometry of the complex plane, elementary functions, roots of complex number, De-Moivre's theorem); Vector algebra; Matrices and Linear (Elementary matrix operations, different types of matrices, inverse, determinants, solution of simultaneous linear equations, eigenvalues).

#### SCS 116: PROGRAMMING IN C

Introduction; basic data types and operations; statements and control flow; functions and program structure; basic input/output; strings; the C preprocessor; pointers; memory allocation; reading the command line.

#### SCS 201: DIGITAL ELECTRONICS II

Pre: SCS 110

Multiplexers, Demultiplexers, coders/decoders, error detection, design of logic circuits using multiplexers, programmable logic arrays; programmable logic sequencers; analogue-to-digital conversion; digital-to-analogue conversion; computer memories: Static RAMs, Dynamic RAMS, memory maps, interfacing different types of memories.

## SCS 202: OBJECT-ORIENTED PROGRAMMING IN JAVA I

Pre: SCS 116 or SCS 103

Introduction to Java; primitive data types; variables and the assignment operator; expressions and arithmetic operations; Input/Output; Floating point input; if statement; logical operators; Loop control statements (do-while, for, while, switch); file I/O; arrays (one-dimensional, two-dimensional); objects and classes; inheritance, encapsulation, and polymorphism.

## SCS 203: INFORMATION SYSTEMS ANALYSIS AND DESIGN

Pre: SCS 101

System concept and definition; types of systems; systems analysis and design concepts; approaches to systems analysis; structured systems analysis and design; computer-aided system tools; System Development life cycle; fact-finding techniques; systems survey and investigations; economic feasibility; cost/benefit and capital investment analysis; estimation of cost; economics of information; valuation of benefits; the feasibility report.

## SCS 204: OPERATING SYSTEMS

Pre: SCS 101

Operating System Principles; multitasking systems; control and co-ordination of tasks; synchronization, mutual exclusion, sharing; memory management, virtual memory segmentation, paging, protection, file systems; resource management; evaluation and prediction of performance; design and operating systems in high level languages.

## SCS 205: COMPUTER NETWORKS I

Pre: SCS 113

Introduction to Computer networks and the Internet: OSI reference model, peer-to-peer and server-based networking, types of computer networks, error detection and correction; Ethernet technology and applications: Ethernet performance, Ethernet switching, spanning tree protocol and VLANs, ATM LANs; MAN technologies: fibre FDDI, SDH, SONET; TCP/IP protocol; stop-n-wait, Go-back-n protocols; Connection-oriented and connectionless protocol mechanisms and protocol efficiency; IP and Domain Name Service (DNS); ICMP, IPV4 and IPV6; WAN

technologies: X25, DSL, ISDN, and cable modems; Introduction to routing in the Internet; Internet telephony: VOIP and protocols: SIP and H323.

#### SCS 206: COMPUTER NETWORKS I LAB

Pre: SCS 113

Introduction to networking; networking fundamentals; networking media; cable testing; OSI model; Local Area Networks (LANs) and Wide Area Networks (WANs); cabling LANs and WANs; Ethernet fundamentals; Ethernet Technologies; Ethernet switching; TCP/IP protocols and IP addressing; Routing fundamentals and subnets; TCP/IP transport and application layers.

#### SCS 207: WEB DESIGN AND PUBLISHING

Pre: SCS 101

Internet and the World Wide Web (WWW); Browsing and searching techniques; The internet as a research tool; search engines; Introduction to Hypertext Markup Languages (HTTP); web design, hosting and development; Intranet concept; evolution, benefits and challenges.

#### SCS 208: ENGINEERING MATHS III

Pre: SCS 115

Vector calculus: Vector calculus and application, Gradient, divergence and art of vectors, Green's theorem, stokes theorem, Gause (divergence) theorem and other related theorems.

Fourier Series: Trigonometric Series and Fourier Series; Fourier cosine and Fourier sine; Change of period. Complex form of Fourier Series; Application of Fourier Series to frequency response. Describe Fourier Transform, Fast Fourier Transform.

Systems of O.D.E: Linear systems; Homogeneous linear systems with constant coefficient; Non-homogeneous systems with constant coefficients; Application to electrical networks.

Numerical Methods; Finite difference; Interpolation of Polynomials, Newton methods; Numerical differentiation and integration.

#### SCS 209: COMPUTER ARITHMETIC



Pre: SCS 201

Arithmetic circuits: - binary addition, carry propagation, carry look-head, binary subtraction, multiplication methods, binary dividers, square root extractors.

### SCS 210: PROJECT

Under the guidance of a faculty supervisor, teams of three or four students are formed early in the semester to tackle a specific design problem. By the end of the semester, a written report must be prepared. The report should include, but not limited to: -

Background Theory

Design procedure

Circuit Diagram and Parts Lists (if appropriate),

Test Results

Discussion of results

Conclusion

### SCS 211: VISUAL BASIC PROGRAMMING

Pre: SCS 101

Introduction; controls; properties and events; variables; conditions and looping; arrays; menu design; file handling; modules; random access.

## SCS 212: DATABASE SYSTEMS

Pre: SCS 203

Database systems; Data modeling and relational model; Database query languages; Relational database design; Transaction processing; Distributed databases; Physical database design.

## SCS 213: ENGINEERING MATHS IV

Pre: SCS 208

Special Functions: Series solution of some related and order O.D.E.; Bessel, Legendre Gamma and Beta functions; Laplace transform; Properties of Laplace, **commutation** theorem, applications of Laplace transform to linear O.D.E.

## SCS 214: MANAGEMENT INFORMATION SYSTEMS

Pre: SCS 101

Introduction to Management Information Systems, hardware and software issues; managing information resources; Computer-Based Information Systems (CBIS); Accounting information systems; application software packages, Database management systems, ethical and security issues, systems analysis and design.

## SCS 215: UNIX OPERATING SYSTEM

Pre: SCS 101

History of Unix; Unix structure; system resources and printing; shell; Text processing. File management and program development. AWK and shell programming; editors.

## SCS 216: COMPUTER NETWORKS LAB II (CISCO II)

Pre: SCS 206

WANs and routers; configuration of a router; learning about other devices; managing CISCO IOS software; routing and routing protocols; TCP/IP suite errors and control messages; basic router troubleshooting; intermediate TCP/IP; Access Control Lists (ACLs); routing case studies.

## SCS 217: DATABASE SYSTEMS LAB

Pre: SCS 203

Database Engine: Oracle

Selecting data from Oracle; Single row functions; Advanced data selection; multiple row functions; data modeling; creating database objects; altering database objects; database sequences; introduction to PL/SQL; conditional control; database interaction; loops; PL/SQL exceptions; memory structures; background processes; disk utilization.

### SCS 218: OBJECT-ORIENTED PROGRAMMING IN JAVA II

Pre: SCS 202

Applets; Threads; Exceptions: Graphical User Interface (GUI) design-complete discussion of GUI design using AWT and JFC Swing components; Database connectivity; Servlets; Remote method invocation.

### SCS 301: DATA STRUCTURES AND ALGORITHMS

Pre: SCS 102

Complexity of algorithms: worst case, average case and amortized complexity; Algorithm analysis; Algorithm Design Paradigms; Greedy algorithms, Dynamic programming, Divide-and-conquer; Lists: stacks, queues, implementation, garbage collection; Dictionaries; Hash tables, Binary search trees, AVL trees, Red-Black trees, Splay trees, Skip-lists, B-Trees; Priority queues, Graphs: Shortest path algorithms, minimal spanning tree algorithms, depth-first and breadth first search; Sorting: Advanced sorting methods and their analysis, lower bound on complexity, order statistics.

### SCS 301: PROBABILITY AND STATISTICS

Pre: SCS 213

Discrete and continuous random variables, probability distributions, sums and functions for random variables, the law of large numbers, the central limit theorem. Sample mean and variance, estimating distribution, correlation, regression and hypothesis testing. Application to include failure analysis, process control communication systems and speech recognition.

### SCS 303: COMPUTER ARCHITECTURE I

Pre: SCS 101, SCS 109

Basic concepts of computer architecture and organisation; computer evolution; design methodology; performance evaluation; CPU architecture, Interrupts and DMA; I/O processors.

#### SCS 304: AUTOMATA THEORY

Pre: SCS 102

Deterministic finite automata (DFA); NFAs; Equivalence of DFAs and NFAs; Regular expression; Push-down automata (PDAs); Relationship of PDAs and context-free grammars; Properties of context-free grammars; Turing machine; No-deterministic Turing machines; sets and Languages; Chomsky hierarchy.

#### SCS 305: DISTRIBUTED COMPUTING

Pre: SCS 204, SCS 205

Basic of Networking, Distributed Systems Models and Architectures, Client-Server Computing, and Remote Procedure Calls. Concurrent Processes and distributed Programming, Interprocess Communicational, Logical and Physical Clocks, Global State, Termination, and Distributed Deadlock Detection, Distributed Mutual Exclusion, Leader Election, Exact and Approximate Agreement, Distributed Scheduling and Load Balancing, Distributed File Systems, and Distributed Shared Memory, Security and Fault-Tolerance. Case studies Distributed operating Systems.

#### SCS 306: INTERNET COMPUTING

History and evolution of the internet, basic tools of internet access, emails, ftp, Telnet, news, anarchic, WWW, Basic internet protocols, TCP/IP SMTP, ftp, http, routers, algorithms and protocols for routing, Internet programming, Unix systems calls, socket programming, languages for internet, HTML, XML, JavaScript, Perl, applications, network information discovery and retrieval, web servers, robots and search engines, Security issues, firewalls, encryption and protocols problems with the Internet, technical issues, Future of the Internet, NGI, Internet-II, IP 6 etc.

#### SCS 307: PROJECT I

The first half of a two semester project is devoted to the creative portion of the design project and its logistics. Under the guidance of a faculty supervisor, teams of three or four students are

formed early in the semester to attack a specific design problem. By the end of the semester, a written project proposal must be prepared. The report should include, but not limited to:

Background Theory

Design procedure

Circuit Diagram and Parts Lists (if appropriate)

### SCS 308: OBJECT ORIENTED PROGRAMMING IN C++

Pre: SCS 103 or SCS 116

Introduction to c++; Compound types; control loops; pointers; functions; encapsulation; Inheritance; Multiple inheritance; virtual function.

### SCS 309: COMPUTER AIDED DESIGN

Pre: SCS 107

Introduction to autocad: X-Y coordinate system, inputting points, basic terminology, drawing and modifying commands, dimensioning and text; project planning with autocad; 2D drawing with autocad; 3D drawing with autocad.

### SCS 310: MULTI-MEDIA AND GRAPHICS

Pre: SCS 207

Fundamentals of design and visualization; creating illustrations; Image creation: creating, editing, and optimizing graphics for commercial designs; 2D animations; 3D graphics; Multimedia authoring.

### SCS 311: DESIGN OF DIGITAL SYSTEMS

Pre: SCS 201

Combinational circuit design and implementation (using SSI gates, functional block approach, memory approach, Programmable Logic Array approach, microcomputer approach); Fundamentals of sequential circuits (the general scheme, the binary cell, Flip-flops, clocking, Timing); Designing with clocked circuit (state diagrams and other techniques); Design of Asynchronous circuits.

### SCS 312: DIGITAL SIGNAL PROCESSING

Pre: SCS 213

Digital signals (time-domain, frequency-domain, the Z-transform), Analogue and Digital-to-analogue conversion; Linear shift-invariant discrete systems (difference equation, the impulse response, causality, stability, transmission function, the system function); Digital filters (non-recursive digital filters, recursive digital filters, finite impulse response filters (FIR), infinite impulse response (IIR) filters, digital oscillators); sampling rate and its effects; Design of digital filters (Design of FIR and IIR filters, Relation between analogue and digital systems, mapping of differential equations, impulse invariant transformation, the bilinear transformation, wave digital filters); Effects of finite word length on digital signal processing.

### SCS 313: DESIGN OF VLSI CMOS DIGITAL CIRCUITS

Pre: SCS 201:

Introduction to CMOS IC design process; The Well; The Metal Layers; Active and Poly Layers; The MOSFET; The BSIMSPICE model; CMOS Passive Elements; Design Verification; The Digital Model; CMOS Inverter; Static Logic Gates; The TG and Flip-Flops; Dynamic Logic Gates; VLSI Layout; BiCMOS Logic Gates; Memory circuits; Special-Purpose Digital Circuits (The Schmitt Trigger, Multivibrator circuits, Voltage Generators).

### SCS 314: COMPUTER GRAPHICS

Pre: SCS 101:

Conceptual framework for interactive graphics, Basic raster graphics algorithms, geometrical transformation, viewing in 3D, Object hierarchy, Graphics hardware, Input devices, interaction techniques and interactions tasks. User interface software, Graphic standards, Open GL, Realistic image synthesis; curves and surfaces, colour illumination and shading, hidden surface elimination, volume graphics, image basic rendering, non-photo realistic rendering, animation.

### SCS 315: PRINCIPLES OF PROGRAMMING LANGUAGES

Pre: SCS 103 OR SCS 116 OR SCS 218

History and overview of programming languages; Virtual machines; Introduction to Language translation; Language translation systems; Type systems; Models of execution; Declaration,

modularity, and storage management; Programming language semantics; Functional programming paradigms; Object-oriented programming paradigms; Language based constructs for parallelism.

#### SCS 316: COMPUTER AND INFORMATION SYSTEM SECURITY

Pre: SCS 205

Elementary number theory, Finite fields, Arithmetic and algebraic algorithms, Secret key and public key cryptography, Pseudorandom bit generators, Block and stream ciphers, Hash functions and message digests, Public key encryption, Probabilistic encryption, Authentication, Digital signatures, Zero knowledge interactive protocols, Elliptic curve cryptosystem, Formal verification, Cryptoanalysis, Hard problems; Internet security protocols; IPSEC, TSL, Firewalls and virtual private networks, Web security policies and issues.

#### SCS 317: COMPUTER ARCHITECTURE II

Pre: SCS 303

Theoretical aspects of parallel and pipeline computation; Flynn's taxonomy: SISD, SIMD, MIMD, MISD; Speedup; Load balancing; Operating System; Shared and private memory process; time and processor bound on classes of computation; Pipeline and vector machines; Parallel processing; Amdal's law, Flynn's taxonomy, Case study of a typical current architecture.

## SCS 318: DESIGN AND ANALYSIS OF ALGORITHMS

Pre: SCS 301

Review of data structures and models of computation, Basic paradigms eg, greedy algorithms, divide and conquer strategies, dynamic programming, Graph algorithms, Algorithms for sorting searching, order statistics String matching, Sequence comparisons Geometric algorithms, Probability algorithms. The classes and NP and the notion of NP-completeness.

## SCS 319: INTELLIGENT SYSTEMS

Pre: SCS 301

Advanced machine learning; Robotics; knowledge-based Systems; Genetic Algorithms: Brief History of evolutionary Computation, Theoretical foundation of Genetic Algorithms, Implementing a genetic algorithm, Application of genetic algorithm, Genetic programming.

## SCS 320: PROJECT II

Pre: SCS 307

The design in part I must be constructed (or implemented) and evaluated. A written and oral presentation of the design and its validation by demonstration must be given by the teams.

## SCS 321: LOGIC PROGRAMMING IN PROLOG

Pre: SCS 103 OR 116

Propositional logic, predicate logic, resolution, programming in logic, prolog syntax, element of prolog, reading prolog, prolog queries, satisfying queries, goals, backtracking, complex types, unification, simple examples, determinacy, singleton variables, the anonymous variable, unification and the anonymous variable, appending and generating lists, definite clause grammars, dcg notation, “executing” dcgs, generating sentences, dcg-prolog interface, dcg implementation, terminal symbol in dcg rules, attribute dcgs, parsing.

## SCS 322: ELECTRONIC COMMERCE

Pre: SCS 306

E-commerce evolution, benefits and shortcomings; Business to business commerce. Business to consumer commerce. Building blocks of electronic commerce. Applications. Internet and



networking technologies, Internet languages, Internet and network protocols. Electronic payment systems. Security of transactions, Review of cryptographic tools, secure financial transactions, payment protocols and standards, Smart card, e-cash technologies, Authentication, signatures, observers, Anonymity, privacy, traceability. Key certification, management and escrow, technologies for building e-commerce applications, distributed objects, object quest brokers, and object oriented application frameworks. Some applications: supply chain management, internet auctions and remote banking.

### SCS 323: BIOINFORMATICS

### SCS 324a: STATISTICAL ANALYSIS WITH SPSS

Introduction; File management; types of files, creating new files, opening saved files, saving files, printing; Editing: cut and paste, copy and paste, editing options; Data manipulation: variable definition, inserting variables, inserting cases, variable transformation; Statistics: summarize, custom tables, comparing means, general linear model, correlation and regression, data reduction, reliability analysis, non-parametric tests; Graphs: Bar charts, line graphs, pie charts, box-plots, error bars, scatter plots, histograms, p-p plot, time series.

### SCS 325: DIGITAL COMMUNICATION SYSTEM

Pre: SCS 113

Quantization; digital coding of analogue: PCM, DPCM, DM; baseband transmission; digital modulation schemes: ASK, FSK, PSK, MSK, QAM; pulse shaping; intersymbol interference; partial response; voice-band and wide-band modems; digital cable systems; regenerative repeater; clock recovery and jitter, multipath fading; digital radio design; optimal receiver design; MAP receiver, probability of error.

### SCS 326: DESIGN AND ANALYSIS OF REAL-TIME SYSTEMS

Pre: SCS 103 or SCS 116, SCS 109, SCS 209

Basic Real-Time concepts; Review of Computer Hardware; Language issues; Language Features, Survey of Commonly Used Programming Languages, Code Generation, Schedulability Analysis; The Software Life Cycle; Real-Time Specification and Design Techniques; Real-Time Kernels: Inter-Task Communication and Synchronization; Real-Time Memory Management;

System Performance Analysis and Optimization, Queuing Models; Reliability, Testing and Fault Tolerance; Multiprocessing Systems; Hardware/Software Integration; Real-Time Application.

### SCS 327: DIGITAL DESIGN WITH VHDL H/W DESCRIPTION LANGUAGE

Pre: SCS 303, SCS 311

Introduction to VHDL basic elements; VHDL simulation concepts; VHDL concurrent statements with examples and applications; VHDL subprograms, packages, libraries, and design units; Writing VHDL for synthesis; Writing VHDL for finite state machines; Design case study.

### SCS 328: PROCESS MEASUREMENT AND CONTROL

Pre: SCS 201

Basic principles of process measurement and control systems, Transducers (temperature, pressure flow, level), Signal conditioning circuits, process load characteristics, Control modes (2 position, proportional, PID, time and current positioning systems), Geometric and motion sensors, Process analytical instruments (pH and conductivity, process chromatographs), operator interfaces, Distributed control systems (DCS) and programmable logic controllers (PLCs) Industrial control networks, SCADA telemetering system.

### SCS 329: NETWORKING ADMINISTRATION

Pre: SCS 205

Popular network operating systems (windows, Unix, Netware); Configuring networks, including DNS, DHCP, routing; user management and access control; file systems, including striped and fault-tolerant file systems; sharing file systems via the network; disk configuration and administration, back-up, and restore; managing printers and printer pools; managing processes; performance optimization and capacity planning; remote network access; web server installation and configuration; system management tools; troubleshooting and maintenance; supporting Microsoft Windows Enterprise Technologies; design, implement and support a Windows operating system in a multi-domain enterprise environment; internetworking with Microsoft TCP/IP on Microsoft Windows: set up, configure, use and support of TCP/IP.

### SCS 330: MULTI-MEDIA WEB DESIGN

Pre: SCS 207, SCS 310

Mark-up languages; designing and developing effective web interface; usability issues; incorporating graphics, audio, and animation into websites; web scripting and development using contemporary multimedia development tools.

### SCS 331: PRINTED CIRCUIT BOARD DESIGN

Pre: SCS 201

Introduction to the design of printed circuit boards and packaging with emphasis with the design, simulation, analysis and packaging of circuits. CAD programs will be used for the design and layout of circuit boards.

### SCS 332: SOFTWARE PROJECT MANAGEMENT

Pre: SCS 203

Software development life cycle; resourcing, scheduling and estimating techniques for software project management; project management organizational concerns, including economic analysis, human resources, proposal development, risk management, software implementation, and technology-strategic alignment.

### SCS 333: INTRODUCTION TO NUMERICAL METHODS

Pre: SCS 213

Error analysis and computer arithmetic; numerical methods for solving linear systems; Gaussian elimination; LU decomposition; numeric solution of non-linear equations; fixed point iterations; rate of convergence; interpolations and approximations; Lagrange polynomials; divided differences; discrete least squares approximation; Legendre polynomials; numerical integration: Newton-Cotes formulas, Romberg integration; Emphasis will be on development of efficient algorithms.

### SCS 334: OBJECT ORIENTED ANALYSIS AND DESIGN WITH UML

Pre: SCS 203

Object technology terminology; analysis using class diagrams and use case diagrams; design using statecharts and interaction diagrams; case study involving design and analysis of a real life system.

### SCS 335: DATABASE ADMINISTRATION

Introduction; SQL server installation; creating database; monitoring and managing database size; backing up and restoring databases; recovering the master database; managing and optimizing disk space; maintaining a warm standby server; configuring SQL mail; setting up jobs and defining alerts; implementing login, database and object security; monitoring the SQL server; managing transactional applications.

### SCS 401: COMPILER CONSTRUCTION

Pre: SCS 304

Compiler structures. Lexical analysis. Syntax analysis, grammars, description of programming languages. Automatically constructed recognized error and error recovery. Semantic analysis. Semantic languages. Semantic processes. Intermediate languages. Optimisation techniques and extendible compiler.

## SCS 402: SOFTWARE ENGINEERING

Software process and metrics, software requirements and specifications; software design and implementation, verification and validation, software tools and equipment, software project methodology, software testing, maintenance, modification and portability.

## SCS 403: NEURAL NETWORKS

Pre: SCS 319

Supervised learning, linear discriminant functions, unsupervised learning, perception learning algorithm, the multilayer perceptron, radial-based function sets, Kohonen's self-organizing networks, Hopfield networks, the Boltzmann machine, adaptive resonance theory, associative memory, support-vector machines, applications to speech and image understanding.

## SCS 404: PRINCIPLES OF FUNCTIONAL PROGRAMMING

Pre: SCS 103 or SCS 116

Introduction to lambda calculus: syntax and semantics, notational conventions, free and bound variables, conversion rules, equality of lambda expressions, extensions, substitution; representing things in lambda calculus: truth values and conditionals, pairs and tuples, numbers, definition by recursion, functions with several arguments, mutual recursion, representing recursive functions, extending the lambda calculus, theorems about the lambda calculus, call by value and Y; combinators; combinatory reduction, functional completeness, reduction machines, Curry's theorem, Turner's algorithms; theorem of monads; case of a typical functional language e.g. ML, HASKELL, OCAML.

## SCS 405: COMPILER CONSTRUCTION LAB

Pre: SCS 401

Students working in small groups, will use one of the publicly available compiler construction tools to write a compiler for a small toy language or a subset of a large commercial language.

## SCS 407: COMPUTER NETWORKS LAB III (CISCO III)

Pre: SCS 216

Introduction to classes routing; single areas OSPF; switches and switch configuration; spanning tree protocols; virtual LANS; virtual trunking protocols; case study; switching basic and routing.

## SCS 408: DESIGN PROJECT I

Under the guidance of a faculty advisor, the student shall attack a specific design problem. The project shall normally extend over a period of two semesters.

By the end of the first semester, a written project proposal and an oral presentation must be prepared. The report should include the following sections: -

Introduction

Specifications

Background theory

Design procedure

Parts list (where appropriate)

Budget

An oral design review before the students peers is required as well as a written status report. In the second semester, the prototype of the first semester's design (if the project was hardware) must be constructed (or implemented) and evaluated. A written and oral presentation of the prototype's design and its validation by demonstration is given by the student, the report should consist of the following sections: -

Test and measurement techniques

Results

Discussion of results

Conclusion and recommendation for future work

## SCS 409: IT AND SOCIETY

Pre: SCS 101

History of computing, social context of computing, methods and tools of analysis, professional and ethical responsibilities, the electronic community, the changing nature of technological risks, the information economy, risks and liabilities of safety-critical systems, intellectual property,

privacy and civil liberties, pornography and censorship, social implications of the internet, computer crime, economic issues in computing, philosophical foundations of ethics.

#### SCS 410: MICROPROCESSOR SYSTEMS

Pre: SCS 109, SCS 311

The microprocessor, memory devices; structure of microprocessor-based systems; programming and instruction sets; addressing modes; arithmetic, logic and shift instructions, branch conditions and instructions; indexed addressing; the stack; sub routines; software development techniques.

#### SCS 411: ADVANCED COMPUTER ARCHITECTURE:

Pre: SCS 317

Theoretical aspects of parallel and pipeline computations; Flynn's taxonomy: SISD, SIMD, MIMD, MISD; speedup; load balancing; Operating Systems; Shared and private memory process; Time and processor bounds on classes of computation; Pipeline and vector machines; Parallel processing: Amdal's law, Flynn's taxonomy; Case study of a typical current architecture.

#### SCS 412: COMPUTER DESIGN LAB

Pre: SCS 311

Students will design and fabricate a complete microprocessor system consisting of: CPU, data and address buffers, ROM, RAM, serial and parallel interface device, basic display devices.

#### SCS 413: OPTICAL DEVICES AND SYSTEM

Pre: SCS 108

Fundamental of geometric and physical optics: lenses, interference, diffraction; Lasers, Detectors, Holograms, acousto-optic and electro-optic devices, Application areas of optical devices.

#### SCS 414: INTELLIGENT AGENTS

Pre: SCS 319

Concepts of Agency and Intelligent Agents, Action of Agents, Percepts to Actions, Structure of Intelligent Agents, Agent Environments, Communicating, Perceiving, and Acting, Concepts of

Distributed AI, Cooperation, and Negotiation Applications: Web-based Agents, Database Applications.; Agent Programming.

#### SCS 415: PROGRAM VERIFICATION

Pre: SCS 301

Formal methods for computation such as Turing machines, Markov algorithms; Recursive functions; RAM program; Flowchart schemata; Program verification; Formal semantics of program and data structures; Applications to automatic programming.

#### SCS 416: HUMAN COMPUTER INTERACTION

Principles of HCL, Modelling the user, Interaction, Window Management System Design, Help System, Evaluation Techniques, Computer Supported Collaborative work.

#### SCS 417: SPECIAL TOPICS IN COMPUTER SCIENCE

Lectures and discussion on topics of current interest in computer science.

#### ABS 424: ENTREPRENEURSHIP AND SMALL BUSINESS MANAGEMENT

(offered by Department of Economics and Business studies)

#### SCS 419: PROJECT PLANNING AND MANAGEMENT

Introduction to project management, Selection of a team and a project, Project management and problem solving techniques to include the design, construction, test, analysis and documentation of the senior project. Lecture and lab combination. Laboratory activities to include goal preparation, research, reporting, team meeting, design reviews and demonstrations.

#### SCS 420: COMPUTATIONAL SCIENCE

Pre: SCS 317, SCS 411

Numerical analysis; Scientific visualization; Architecture for Scientific Computing: Vector architecture and pipelining, MIMD machines, Distributed systems and network-of-workstations, Networks, Timing, measurement, and terminology (MFLOPS etc) Benchmarks and elementary performance measurements; Programming for Parallel Architectures: Review of Parallel



programming techniques, Parallel algorithms for scientific computation, Effects of array element and loop ordering; Example Languages; Applications; Simulation, Molecular Dynamics, Fluid Dynamics, Celestial Mechanics, Optimisation; Structural Analysis, Geology, Computerized Tomography, Military and Defence Applications.

#### SCS 421: COMPUTER NETWORKS LAB IV

Pre: SCS 407

Scaling IP addresses; WAN technologies; PPP; ISDN and DDR; frame relay; introduction to network administration; case study: WANs

#### SCS 422: SPECIAL TOPICS IN COMPUTER ENGINEERING

Lectures and discussions on topics of current interest in computer engineering

#### SCS 423: DESIGN PROJECT II

Pre: SCS 408

Continuation of SCS 408: Design Project I

#### SCS 424: MICROPROCESSOR INTERFACING:

Pre: SCS 410

Basic input/output; Interfacing the peripheral analogue circuitry; operating systems; programming techniques; process control with microcomputers; microcomputers from communications.

## SCS 425: ADVANCED MICROPROCESSOR SYSTEMS

Pre: SCS 410

Architecture of microprocessor-based systems: microcontrollers; parallel I/O ports; Interrupts; A/D and D/A converters; programmable timers; handshaking and serial communications.

## SCS 426: COMPUTER INTEGRATED MANUFACTURING

Pre: SCS 402

Building blocks of manufacturing enterprises, factory floor product development and supply chains, Modern manufacturing plants, architecture, integration, shop floor control, inventory management, production scheduling MRP II, and ERP, performance measures, cycle time quality and flexibility, performance models, Markov chains, queuing networks, stochastic petri nets and simulation. Object oriented modeling and business objects.

## SCS 427: SOCIAL AND PROFESSIONAL ISSUES IN COMPUTING

History of computing, social context of computing, methods and tools of analysis, professional and ethical responsibilities, risks and liabilities of safety-critical systems, intellectual property, privacy and civil liberties, social implications of the internet, computer crime, economic issues in computing, philosophical foundations of ethics.

## SCS 428: DATA MINING

Pre: SCS 319

Introduction to data mining and knowledge discovery. Role of logic probability in data mining. Foundations of pattern clustering: Theorem of the ugly duckling, abstraction and similarity. Foundation of pattern clustering: Clustering paradigms. Clustering for data mining. Inductive logic programming and knowledge discovery. Integrating inductive and deductive reasoning for data mining. Data mining using neural networks and genetic algorithms. Fast discovery of association rules. Discovery of frequent episodes in event sequences. Application of data mining to pattern classification.

## SCS 429: FIBRE OPTICS: THEORY AND APPLICATIONS

Pre: SCS 413

Introduction to fibre optics; Dielectric wave guides and optical fibres; Light emitting diodes, Laser Diodes, Photodetectors (p-I-n) and a.p.d.), optical fibre communication systems.

#### SCS 430: INFORMATION RETRIEVAL

Pre: 319, SCS 414

Introduction to Information Retrieval Systems. Representation and Storage of Information: Boolean Representation, the Vector Space Model, Knowledge-based schemes, Genetic Algorithms and Association Rules for Document Representation. Document Processing: Classification of Document, Ranking and indexing schemes using probabilistic, Fuzzy-set theoretic, and knowledge-based techniques. Query-Document Similarity Computation: Conventional Matching Schemes, Conceptual Cohesiveness, Relevance Feedback and Interactive Query Modification Techniques. Performance Evaluation Information Retrieval Systems, Application to Internet Search: web mining and Information Filtering.

#### SCS 431: PATTERN RECOGNITION

Pre: SCS 319

Bayes Decision Theory, Supervised Classification and Unsupervised classification, Parametric schemes, Maximum-Likelihood approach and Bayesian learning, Non-Parametric Schemes, Parzen windows and K-nn schemes, Nearest Neighbour classification. Knowledge-based classification, Clustering schemes, knowledge-based clustering. Applications to Optical character Recognition Problem and 3-D object recognition problem.

#### SCS 432: NATURAL LANGUAGE PROCESSING

Pre: SCS 319

Computational models and methods for understanding written text. Introduction to syntactic analysis, semantic analysis, discourse analysis, knowledge structure and memory organization. A variety of approaches are covered, including conceptual dependency theory, connectionist methods and statistical techniques. Applications include story understanding, fact extraction and information retrieval.

#### SCS 434: INTRODUCTION TO EXPERT SYSTEMS

Pre: SCS 319

Basic concepts and techniques; knowledge representation in inferencing; building a small expert system; knowledge engineering and large system development; survey of tools and expert systems; the expert system market.

## SCS 435: COMPUTER NETWORKS II

Pre: SCS 205:

Review of Network reference models: OSI and TCP/IP; Network software and hardware; sliding window protocols; the Datalink layer and high speed LANs and WANs; the Gigabit Ethernet architecture; 802.11 wireless LAN architecture; WAN protocols: PPP, ATM Frame relays, and HDLC; Broadband wireless and Bluetooth technologies; VLANs and multiprotocol layer switching; the Network layer and Network service model; internal and external routing protocols; dijkstra and Bellman Ford algorithms; Multicast and broadcast routing protocols; Virtual Private Networks; Transport Layer protocols: TCP and UDP; Congestion control and performance issues; Application Layer and Client Server model; persistent and non-persistent connections; Web caching; Web service and name spaces; Multimedia networking: streaming audio and video, JPEG and MPEG compression; Real-time protocols: RTD, RTCP, SIP. And H323.

## SCS 436: INTERNAL CONTROLS AND SECURITY ISSUES

Controls on data and information: input controls, processing controls, output controls; internal security; protection against fraud; computer crimes; computer viruses; security measures; Information system audit.

### SCS 437: INFORMATION APPLICATION

Decision making process; Human Information Processing System; Decision Support Systems; knowledge-based systems; artificial intelligence; Expert systems; executive support systems; manufacturing information systems; financial information system.

### SCS 499: INDUSTRIAL ATTACHMENT

Students shall be attached to various industries, Government departments and non-Government Organizations in the country where they will participate in different types of activities including software/hardware development and software/hardware maintenance. Where appropriate, students shall be assigned a specific task to accomplish. Students will maintain a diary/logbook/journal of daily activities. This will be compiled in a final report based on their attachment experience. Final assessment will be based on reports from the supervisor, student's written report and accomplishment of tasks and will be graded as follows: -

Written Report	40%
Dairy/Logbook/Journal	10%
Report from Supervisor	50%