

**REVISED CURRICULUM
OF
COMPUTER ENGINEERING/
COMPUTER SYSTEM ENGINEERING**

Curriculum Development Project
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Islamabad



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2002

CURRICULUM DIVISION, UGC

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PREFACE

Curriculum of a subject is said to be the throbbing pulse of a nation. By looking at the curriculum of a subject, one can judge the state of intellectual development and the state of progress of a nation. The world has turned into a global village, new ideas and information are pouring in a constant stream. It is, therefore, imperative to update our curricula by introducing the recent developments in the relevant fields of knowledge.

In exercise of the powers conferred by Sub-section (1) of section 3 of the Federal Supervision of Curricula Textbooks and Maintenance of Standards of Education Act 1976, the Federal Government vide Notification No.D773/76-JEA (Cur.), dated December 4, 1976, appointed University Grants Commission as the Competent Authority to look after the Curriculum Revision Work beyond Class XII at Bachelor level and onwards to all Degrees, Certificates and Diplomas awarded by Degree Colleges, Universities and other Institutions of higher education.

In pursuance of the above decisions and directives, the Commission is continually performing curriculum revision in collaboration with the Universities. According to the decision of the 44th Vice-Chancellors' Committee, curriculum of a subject must be reviewed after every 3 years. For the purpose, various Committees are constituted at the national level comprising senior teachers nominated by the Universities. Teachers from local degree colleges and experts from user organizations, where required, are also included in these Committees.

The National Curriculum Revision Committee on Computer Engineering/ Computer System Engineering in its meeting held in March at the U.G.C. Islamabad revised the curriculum after due consideration of the comments and suggestions received from the Universities and Colleges where the subject under consideration is taught.

The Final draft prepared by the Curriculum Revision Committee duly approved by competent authority is being circulated for implementation by the Universities.

(PROF. DR. ALTAF ALI G. SHAIKH)
ADVISER (C&T)

March, 2002

INTRODUCTION

The final meeting of National Curriculum Revision Committee in Computer Engineering/Computer System Engineering to revise and update the curriculum developed in the first meeting of the curriculum committee held from October 16-18, 2001, was held from March 13-15, 2002 at UGC Islamabad. The following attended:

1. Dr. Abdul Qadeer Rajput, Convener
Dean & Co-Director,
Institute of Information Technology,
Mehran University of Engg. & Tech.,
Jamshoro.
2. Prof. Abdul Azim Siddiqui, Member
Co-Chairman,
Department of computer &
Information System Engg,
NED University of Engg. & Tech.,
Karachi.
3. Dr. Tahir Izhar, Member
Professor,
Department of Electrical Engineering,
University of Engg. Tech.,
Lahore.
4. Mr. Nisar Ahmed Memon, Member
Department of Computer Systems Engineering
Quaid-I-Awam University of Engg. Science & Tech.,
Nawabshah – 67480, Sindh.
5. Dr. N.A. Sangi, Member
Chairman, Department of Computer Science,
Allama Iqbal Open University,
Islamabad.
6. Mr. Muhammad Erum Baig, Member
Department of Electrical Engg.
University of Engg. & Tech., Taxila.
7. Prof. Dr. Khalid Rashid, Member
Deputy Dean, FNS and Head, DCS,
International Islamic University,
Islamabad.

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| 8. | Syed Aley Imran,
Faculty Member,
Shaheed Zulfiqar Ali Bhutto Institute of
Science & Technology (SZABIST)
90 Clifton, Karachi. | Member |
| 9. | Prof. Dr. M. Ashraf Chaughtai,
Dean, OPSTeC College of Computer Science,
11-F, Model Town, Lahore. | Member |
| 10. | Hafiz Muhammad Usman,
Assistant Manager,
National Development Complex,
National Engineering Science Commission,
House No.184, Street 36,
F-10/1, Islamabad. | Member |
| 11. | Dr. Mutawarra Hussain,
Dean, Pakistan Institute of Engg. &
Applied Sciences (PIEAS)
P.O. Nilore, Islamabad. | Member |
| 12. | Prof. Dr. S. Afaq Hussain,
Faculty of Computer Science & Engg.,
Ghulam Ishaq Khan Institute of Engg.,
Science & Technology, Topi District Swabi. | Member |
| 13. | Mr. Altaf Ahmad Haqqani,
Scientific Officer, Computer Division,
Pakistan Institute of Nuclear Science & Technology,
(PINSTECH), Nilore, Islamabad. | Member |
| 14. | Miss Naseem Ahktar Bhatti,
Director, Computer Training Centre,
UGC Campus H-9, Islamabad. | Member |
| 15. | Prof. Dr. Hamid Ullah Khan Afridi,
Professor,
Centre of Computer Information Systems Engineering (CCISE),
NWFP University of Engg. & Technology,
Peshawar. | Secretary |

The meeting started with the recitation from the Holy Quran by Mr. Muhammad Erum Baig, University of Engg. & Technology, Taxila.

Dr. Altaf Ali G. Shaikh, Adviser (C&T) UGC welcomed the participants and thanked them for their interest to join the meeting for national cause in spite of their busy schedule. He appreciated the efforts of the committee in the development of first draft curriculum for B.E. B.Sc (Computer Engineering/ Computer System Engineering). He further informed the participants about the constitutional/ obligations of the Commission with respect to Act No.X of 1976 on uniformity of curricula and maintenance of Educational Standard, adopted by the Parliament. He stated that Commission has been assigned to develop and review the curricula beyond Class XII under the forementioned Act. The Adviser requested the members to accommodate the suggestions and comments made by the various institutions. The Committee appreciated the suggestions forwarded by the institutions, which were discussed in their Board of Studies. He urged that the senior and qualified members may come up with the proposal for organizing in service teachers training course to enhance the professional competency of young members of faculty. The Adviser thanked Pakistan Institute of Nuclear Science & Technology (PINSTECH), National Science & Engineering Commission (NESCOM), PIEAS, International Islamic University, Gulam Ishaq Khan Institute of Science & Technology and private educational institutions for sparing their representatives to participate in the curriculum development and hoped that they will contribute their ideas and experiences from user point of view to make the curriculum more job oriented.

Prof. Abdul Qadeer Rajput, Convener of the group thanked the participants for reposing the confidence in him and invited each of the member to comment on any aspect of the curriculum prepared in the meeting held on October 16-18, 2001 and revised in the meeting held on March 13-15, 2002 by National Curriculum Revision Committee (NCRC). The members expressed their point of view in an open and conducive atmosphere and agreed to the proposed final draft of curriculum to be referred to universities/institutions for further improvements/comments.

The NCRC discussed at length on different aspect for strengthening of Computer Engineering syllabi and recommended as under:

<p style="text-align: center;">National Curriculum Revision Committee UGC, Islamabad Courses of BE/ B.Sc. Computer Engineering / Computer Systems Engineering</p>
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It was recommended by the National Curriculum Revision Committee held at UGC Islamabad on March 13-15, 2002, that the eligibility to take admission in BE/BSc. (Computer Engineering / Computer Systems Engineering) degree programs may be revised as the combination of Physics, Chemistry and Mathematics alongwith Computer Studies at H.S.C., / F.Sc./ A level.

**NATIONAL CURRICULUM REVISION COMMITTEE
UGC, ISLAMABAD**

**COURSES OF BE/ B.SC. COMPUTER ENGINEERING / COMPUTER
SYSTEMS ENGINEERING**

First year

Semester I	Credit Hours <u>Theory + Practical</u>
GS111 Calculus and Analytical Geometry	3+0
EE112 Basic Electrical Engineering	3+1
CE113 Introduction to Computing	3+1
HS114 Communication Skills	2+0
GS115 Applied Physics	3+1
Total:	17 (14+3)
Semester II	
CE121 Programming Techniques	3+1
EE122 Analog Electronics	3+1
EE123 Engineering Drawing and Workshop	2**
GS124 Linear Algebra and Differential Equations	3+0
HS125 Islamic Studies or Ethical Behavior	2+0
XXXXX Elective-I (General)*	3**
Total:	18 (16+2)

Second year

Semester III	
CE211 Discrete Structure	3+0
EE212 Electrical Circuits	3+1
CE213 Data Structures and Algorithms	2+1
CE214 Digital Logic Design	3+1
HS215 Technical Report Writing	2+0
HS216 Pakistan Studies	2+0
Total:	18 (15+3)

Semester IV

CE221	Numerical Methods	2+1
CE222	Computer Organization	3+1
GS224	Probability and Statistics	2+0
EE223	Digital Electronics	3+1
CE225	Object Oriented Programming	3+1
XXXXX	Elective- II (General)*	2**

Total: 19 (15+4)

Third Year**Semester V**

EE311	Communication Systems	3+1
CE312	Data Base Management Systems	3+1
CE313	Software Engineering	2+1
EE314	Instrumentation and Measurements	2+1
XXXXX	Elective- III (Technical)*	3**

Total: 17 (13+4)

Semester VI

CE321	Computer Communication and Networks	3+1
EE322	Control Engineering	3+1
EE323	Microprocessor Systems	3+1
CE324	Operating Systems	3+1
XXXXX	Elective – IV (Technical)*	3**

Total: 19 (15+4)

Final Year**Semester VII**

CE411	Computer Architecture	3+1
EE412	Digital Signal Processing	3+1
XXXXX	Elective – V (Technical)*	3
XXXXX	Elective – VI (Technical)*	3
CE429	Final Year Project – I	0+2

Total: 16 (12+4)

Semester VIII

XXXXX	Elective – VII (Technical)*	3**
XXXXX	Elective – VIII (Technical)*	3**
XXXXX	Elective- IX(Technical)*	3**
CE429	Final Year Project –II	0+4

Total: 13 (9+4)

Grand Total: 137 (109+28)

* More elective courses could be added by the University

** The credit hours can be split according to the requirement of the University

Optional Course**Electives (General)**

Applied Chemistry	Theory + Practical
Engineering Economics	Theory
Finance and Accounting	Theory
Industrial Management	Theory
Thermodynamics	Theory
Biological Principles	Theory

Electives (Technical)

Electrical Machines	Theory + Practical
Mechanical Engineering	Theory + Practical
Management Information Systems	Theory
Systems Programming	Theory + Practical
Modeling and Simulation	Theory + Practical
Parallel Processing	Theory + Practical
Computer Graphics	Theory + Practical
Compiler Design	Theory + Practical
Microwave and Optical Communication	Theory + Practical
Artificial Neural Networks	Theory + Practical
Information Theory	Theory
Fault Diagnosis and Tolerant Systems	Theory + Practical
Operation Research	Theory
Robotics	Theory + Practical
Theory of Automata	Theory
VLSI System Designs	Theory + Practical
Object Oriented Design	Theory + Practical
Microprocessors and Microcontrollers Applications	Theory + Practical
Digital Image Processing	Theory + Practical

Note:

The numbering of the courses is just a guideline. The Universities can opt their own numbering system. The first to letters of the proposed course number indicate the department, first digit represents year, second digit represent the term and the third number is for the course number.

Course codes

CE - Computer Engineering

EE - Electronic Engineering

HS - Human Sciences

GS- General Science

FIRST YEAR**GS111 CALCULUS AND ANALYTICAL GEOMETRY****Infinite Series**

Applications of simple convergence tests such as comparison, root, ratio, Raabe's and Gauss's tests on the behavior of series.

Vector Calculus:

Differentiation of vectors, gradient, divergence and curl, Laplacian and spherical harmonics, vector integration, theorems of Gauss, Green and Stokes, simple applications.

Advanced Calculus:

Taylor's theorem for functions of two variables with proof. Maxima and minima of functions of two variables. Lagrange's methods of multipliers. Double integration, change of order, conversion to polar form, application in finding areas, volumes, centroids, center of pressure, movement of inertia and principal axes, theorems of Pappus and Guldinus, surface area and volumes of revolution.

EE 112 BASIC ELECTRICAL ENGINEERING

Basic Circuit Elements and Concepts: Inductance, capacitance, fundamental circuit laws, electric charge, electric current, potential difference and voltage, electric power and energy, introduction to node voltage and loop current methods.

Steady State A.C. Circuits: Current and voltage values for sinusoidal signal waveforms, phasor methods and their applications to simple A.C. circuits, Power and reactive power, maximum power conditions.

Magnetic Circuits and Transformers: Magnetic effects of electric current, magnetic circuit concepts, magnetically induced voltages, self and mutual inductance, introduction to transformers.

Electro-mechanical Energy Conversion: Basic principles, AC/DC generators and motors, losses and efficiency.

LAB: Laboratory work will be based on the contents of the course.

CE 113 INTRODUCTION TO COMPUTING

History, classification, basic components, CPU, memory, peripheral devices, storage media & devices, physical & logical storage, data organization, file storage, programs & software, system software, application software, operating systems, programming languages, compilation & interpretation, problem specification, algorithms, flow chart, pseudo code, basic programming techniques, data types & declaration, header file & linkage, variables & constants, arrays, input/output, termination, remark, control structures, branching, conditional structures, repetition and loops, basic library functions.

LAB: Laboratory work will be based on the contents of the course.

HS114 COMMUNICATION SKILLS

View language as knowledge base process, language for describing objects and procedures, difference between noise and information; importance of effective communication in business, elements of communication written job presentation, business reports, writing better computer documents and presentation, presentation tools, classroom practice.

GS 115 APPLIED PHYSICS

Electric fields and potentials magnetic fields and forces, electromagnetic induction, solid state physics, conductors, semiconductors, n-type and p-type semiconductor materials, PN junction, diode characteristics, rectifiers, clippers and clampers, physical operation and construction of bipolar junction transistor (BJT) characteristics of BJT, physical construction and operation of JFET and MOSFETs , basic amplifier configurations, introduction to four layer devices.

LAB: Laboratory work will be based on the contents of the course.

HS125 ISLAMIC STUDIES/ETHICAL BEHAVIOR

ISLAMIC STUDIES

Fundamental of Islam, Tauheed:

Arguments for the oneness of God, impact of *Tauheed* on human life. Place of man in the universe, purpose of creation, textual study of *Surah al-Rehman* and *Surah al-Furqan*, Prophethood, need for prophet, characteristics of a prophet, finality of prophethood, *seerat* life of the prophet as embodiment of Islamic ideology, faith in the hereafter *aakhirat*, effects of the belief on worldly life.

Ibadah:

Concept of *Ibadah*, major *Ibadah*, *Salat*, *Saom*, *Zakat*, *Hajj* and *Jihad*.

Basic Sources of Shariah:

The Holy Quran: Its revelation and compilation, The authenticity of the text.
Hadith: Its need, authenticity and importance. Consensus (*Ijma*), analogy (*Qiyas*).

Sources of Knowledge:

Islamic approach to institution, Reason and experience. Revelation Wahi as as source of knowledge.

Moral and social philosophy of Islam:

The concept of good and evil, Akhlaq-e-Hasna with special reference to surah Al-Hujrat. Professional Ethics Kasb-e-Halal.

Islamic Political Principles:

Salient features of the Islamic state, Madina character, Responsibilities of the Head of the state, Rights and Duties of citizens.

Economics order of Islam:

Right to property, System of Taxation, Distribution of Wealth Zakat and Ushar, Interest Free Economy Shirakat and Muzarabat.

Islam as Living Force:

Application of Islamic Teaching to Socio-Economic Development in the 20th Century

ETHICAL BEHAVIOUR

Nature, Scope and methods of Ethics, Ethics and Religion, Ethical teachings of world religious. Basic moral concepts, Rights and wrong, Good and evil, An outline of Ethical systems in philosophy, Heonism, Utilitarianism, Rationalism and Kant. Self Realization Theories, Intuitionism, Islamic moral theory: Ethics of Quran and its philosophical basis. Ethical precepts from Quran and hadith and promotion of moral values in society.

CE 121 PROGRAMMING TECHNIQUES

Problem solving using pseudo codes, algorithm & flow charts, programming principles, types of programming languages, programming language syntax and semantics, basics of c/c++ programming language, decision making structures, functions, parameter passing, pointers, structures & union, graphic functions, advanced input/output concepts, scoping, dynamic memory allocation, file handling.

LAB: Laboratory work will be based on the contents of the course.

EE 122 ANALOG ELECTRONICS

BJT biasing, bias stability, design and analysis of common emitter, common collector and common base amplifiers, FET biasing, design of common source, common drain and common gate amplifiers, h-parameters, multistage amplifiers, feedback and frequency response, classes of amplifiers, power amplifiers, differential amplifiers, operational amplifiers, dc and ac analysis of op-amps, various applications of op-amplifiers. linear voltage regulators.

LAB: Laboratory work will be based on the contents of the course.

EE 123 ENGINEERING DRAWING AND WORKSHOP

Dimensions and projection, preparation of assembly drawing, introduction to auto CAD, electric and electronic circuits drawings using schematic and PCB CAD, PCB making, Modeling simulation of electrical and electronic circuits. Machine shop, computer shop and electric shop, electric wiring (domestic and industrial), calculation of wire sizes, protection. (Students should be oriented with various workshop tools and their practical utilization).

LAB: Laboratory work will be based on the contents of the course.

GS124 LINEAR ALGEBRA AND DIFFERENTIAL EQUATIONS

Matrices: algebra, solution of systems of linear equations by Cramer's rule and by matrix inversion, eigenvalues, eigenvectors. Integration: by substitution, by parts. Definite integrals, applications, plane areas, length of an arc, surface areas and volumes of solids of revolution, moments and centroids of plane areas, moment of inertia of plane areas, theorem of Pappas. Partial differentiation: functions of two or more variables, partial derivatives, higher order partial derivatives, total differentials and their applications to small errors, differentiation of implicit functions, chain rule, maxima and minima of a function of two variables, Taylor's and Maclaurin's series. Differential equations: solution of linear ordinary differential equations of first and second order solution of systems of linear ODEs

SECOND YEAR

GS 211 DISCRETE STRUCTURES

Boolean algebra, functions with applications in coding theory; set theory with application in grammar and languages, basic logic, introduction to group theory, analysis and complexity of algorithms, graph theory, proof techniques, basics of counting, discrete probability, propositional calculus, mathematical induction, recurrence relation, loop invariants, relations, introduction to combinatorics, inclusion-exclusion principle and binomial methods, counting and partitions, pigeon hole principle, algebraic structures, group and semi-groups.

EE 212 ELECTRICAL CIRCUITS

Elementary Transient Analysis: Differential and integral forms of circuit equations, consideration of initial conditions, first and second order circuits, solution of first and second order differential equations.

Sinusoidal State Analysis: Network response to sinusoidal driving functions, complex impedance and admittance functions, development of concept of phasors, power consideration, complex power, maximum power transfer, tuned circuits, series and parallel RC tuned circuits, quality factor.

Exponential Excitation and the Transformed Network: Representation of excitation by exponential functions, single element response, forced response with exponential excitation, introduction to the transformed network, driving point impedance and admittance.

Two Port Networks: One port and two port networks, two port parameters, admittance parameters, impedance parameters, hybrid parameters, transmission parameters, series/parallel/cascaded interconnection of two port networks.

LAB: Laboratory work will be based on the contents of the course.

CE213 DATA STRUCTURES & ALGORITHMS

Fundamental data structures, data types, abstract data types, user defined data types, algorithms and their complexity, time-space trade off, arrays, records and pointers, matrices, linked lists, circular lists, two way lists, sequential (array) and linked implementation of stacks and queues, polish notation, recursion, towers of Hanoi, recursive implementation of stacks & queues, dequeues, priority queues, tree, binary tree, binary search tree, traversals, threaded trees, heap, general trees, graphs, depth-first/breadth first traversal, adjacency matrix, shortest distance algorithms, sorting (insertion sort, selection sort, merge sort, radix sort), hashing, searching: (linear search, binary search, depth first /breadth first search).

LAB: Laboratory work will be based on the contents of the course.

CE 214 DIGITAL LOGIC DESIGN

Review of Number systems: Base-N number system, signed, unsigned integers and their arithmetic functions

Switching functions: Theorems and postulates of Boolean algebra, sum of products and product of sum representation of logic functions, simplification of switching functions using graphical and tabular methods.

Combinational Logic Circuits: Implementation of switching functions and design of arithmetic and logic circuits, adders and subtractors, encoders and decoders and their implementation using basic and universal logic gates and modules i.e., multiplexers, ROM, PAL and PLA

Sequential Logic Circuits: Basic components of sequential circuit design; flip-flops and latches. Design and analysis of algorithmic and finite state machines, synchronous and asynchronous sequential machines.

Basic Microprocessor Design Conventions: Register transfer, busing and sequencing of control. Introduction to a hardware description language for control programs.

LAB: Laboratory work will be concentrating on the implementation of the concepts of logic design using both hardware experiments and hardware description languages i.e., Verilog and/or VHDL

HS215 TECHNICAL REPORT WRITING

Business English:

Writing formal & business letters, writing formal memos, drafting notices and minutes of meetings, drafting tender notices, theoretical knowledge, & comprehension of contracts & agreements, preparing proposals and technical reports, conducting & writing a project report on a mini research (sessional work)

Engineering Ethics:

Introduction, business laws, code of conduct.

HS216 PAKISTAN STUDIES

Land of Pakistan: Land and people-strategic importance, natural resources. A brief historical background of creation of Pakistan, government and politics in Pakistan, languages and cultures of Pakistan.

CE 221 NUMERICAL METHODS

Error and computer arithmetic, root finding for non-linear equation interpolation and polynomial approximation, solution of system of linear equations, numerical differentiation and integration and numerical solution of ordinary differential equations.

LAB: Laboratory work will be based on the contents of the course.

CE 222 COMPUTER ORGANIZATION

Basic Building Blocks: Introduction to the central processing unit (CPU), input output devices and memory units. Bus architecture and distinction between internal and external buses.

CPU Architecture: Arithmetic and logic unit (ALU), Registers and register transfer logic (RTL), control signals.

Introduction to Microprocessors: Introduction and history of 8-bits, 16-bits and 32-bits microprocessors, CPU Architecture.

Memories: Categorization of memories based on different attributes such as location, media, accessing and read/write techniques. Semiconductor and magnetic memories and their addressing techniques including sequential access and random access. Design of read/write RAM (SRAM and DRAM) address decoding and address mapping concepts.

Input and Output Devices: Standard and auxiliary input and output devices and their interfacing chips such as Programmable Peripheral Interface (PPI), Universal Asynchronous Receiver and Transmitter (UART), Universal Synchronous Asynchronous Receiver and Transmitter (USART), programmable interrupt controller (PIC), direct memory access (DMA) controller.

EE 223 DIGITAL ELECTRONICS

BJT and FET switch design, switching speed, mono-stable, astable and bistable multivibrators and schmitt trigger circuits using discrete components and operational amplifier, study of IC timers, digital logic families (DTL, TTL, ECL, CMOS). Oscillators circuits and their stability, switch-mode power supplies. Introduction to VLSI designing techniques using Verilog hardware descriptive language (HDL).

LAB: Laboratory work will be based on the contents of the course.

GS224 PROBABILITY AND STATISTICS

Basic concepts of statistics; sample space, events, classical and axiomatic definition of probability. conditional probability and Bayes theorem, binomial, Poisson and normal distribution, moment generation function, central limit theorem, sampling theory, estimation methods, points and interval estimation, estimating proportions and difference of two proportions, test of hypothesis, type

I and type II errors, one and two tails tests, linear regression correlation and regression analysis.

CE 225 OBJECT ORIENTED PROGRAMMING

Procedural versus object oriented programming languages, object oriented design strategy and problem solving, objects & classes, member functions, public and private members, dynamic memory management, constructors and destructors, templates, object encapsulation, derived classes, class hierarchies, inheritance and polymorphism, operator overloading, stream class, practical design through OOP

LAB: Laboratory work will be based on the contents of the course.

THIRD YEAR

EE 311 COMMUNICATION SYSTEMS

Signal analysis and spectra, fourier series, fourier transform and convolution. introduction to analogue and digital signals and their importance in computer engineering, introduction to modulation, amplitude modulation, frequency and phase modulation, transmission media, concept of demodulation, use of modems in transmission and reception of analogue and digital data, introduction to frequency division multiplexing on – off keying, frequency shift keying, phase shift keying.

Nyquist criterion for sampling, sampling theorem, introduction to time-division multiplexing (TDM), frequency division multiplexing (FDM), analogue to digital conversion, pulse code modulation (PCM), delta modulation, adaptive delta modulation, companding, quantization, noise and companding in PCM, u-law and a-law companding, bit-interleaved multiplexer and bit stuffing, frame loss and acquisition, random signal analysis, probability model and noise theory.

LAB: Laboratory work will be based on the contents of the course.

CE 312 DATABASE MANAGEMENT SYSTEMS

User interface, data independence, user view, three data models (relational, hierarchical, network, object oriented), conceptual, logical and physical database design and evaluation, normalization, query languages, query optimization, security, integrity and concurrency protocols, introduction to SQL and its application to RDBMS. database design, model building, data table, forms & reports. database administration.

LAB: Laboratory work will be based on the contents of the course.

CE 313 SOFTWARE ENGINEERING

Software life cycle, software requirement definition and specification, software design, object oriented and function oriented design, user interface design, program design techniques, Jackson structured programming, software testing and maintenance, software project management, project estimation, planning, risk identification, scheduling. project design using rational Rose, CASE. CASE tools.

LAB: Laboratory work will be based on the contents of the course.

EE 314 INSTRUMENTATION & MEASUREMENTS

Introduction to Various Systems of Units: SI system of units, dimensional analysis, measurement of resistance, inductance and capacitance dc and ac bridge and measuring techniques.

Magnetic Measurements: Measurement of field strength, flux, permeability, determination of B-H curve and hysteresis loops.

Measurement of Non-electrical Quantities: Measurement of temperature, pressure, strain, thermal conductivity, motion, speed and vibrations, thermal and nuclear radiation.

Electromechanical Instruments: Classification, primary and secondary instruments, indicating, recording and integrating instruments.

Measuring Instruments: Ammeters and voltmeters classification, types, errors and extension of range, instrument transformers, power and energy meters, types of watt meters, calibration, energy meters, KVA and KVAR meters. electronic instruments, digital AVO meters, counters and digital frequency meter, oscilloscopes principle of operation, application, storage oscilloscopes, logic analyzer, spectrum analyzer.

DACs/ADCs: DACs performance specifications, D/A conversion techniques and circuits – R – 2R ladder, weighted – register, switched current source, switched capacitor and comparative analysis, ADCs characteristics, ADCs – counter, integrator, successive approximation, and plash type and comparative analysis, sample and hold circuits.

Transducers: Transducers and the principle of transduction, self-generating and non-self generating transducers.

LAB: Laboratory work will be based on the contents of the course.

CE 321 COMPUTER COMMUNICATION AND NETWORKS

Communication concept and terminology, transmission impairments, transmission media (guided and unguided), synchronization code, modulation techniques, error detection, HDLC protocol, multiplexing (FDM and simple TDM), digital carrier systems (ISDN and SONET/SDH), asymmetric digital subscriber line (ADSL), circuit switching, packet switching, routing algorithms, X-

25, ATM and frame relay, cellular digital packet data and Global System for Mobile Communication (GSM), network types, network topologies, ISO-OSI model, TCP/IP introduction, LAN Systems (Ethernet, token ring, FDDI), LAN devices (repeaters, hubs, bridges, switches), principles of internetworking, wireless internetworking, IP multicasting, routing protocols, connection oriented protocol,, network security requirements, public encryption and digital signatures, network management protocol, e-mail protocols, hyper text transfer protocol, DNS(domain name system) introduction to VoIP.

EE322 CONTROL ENGINEERING

Examples of electrical, mechanical and biological control systems. Open and closed-loop control mathematical models, block diagrams, second order systems, step and impulse response, performance criteria, steady state error. sensitivity, S-plane system stability, analysis and design with the root locus method, frequency domain analysis: Bode plots, Nyquist criterion, gain and phase margins, Nichols charts. The state-space method: state equations, flow graphs, stability, compensation techniques, sampled-data systems: Z-transform, stability.

EE 323 MICROPROCESSOR SYSTEMS

Architecture and Instruction set: Basic architecture of microprocessors, programming model; Registers, ALU and flags, instruction decoding, data addressing modes, basic arithmetic and logic operations, program addressing modes, string data transfers, special instructions

Assembly Language Programming: Introduction to debug, assembly language structure, assembler directives, macro operations, libraries and external procedures, disk and file management, linking with high level languages, floating point number processing.

Memory and IO Interfacing: Clock generator, demultiplexing and buffering of the external buses, EPROM and RAM Interfacing, IO Interfacing, parallel port and serial port, keyboard and display controller, timer operations

Interrupts Structure: Hardware and software interrupts, Timed functions, Event Driven Applications, Terminate and Stay Resident (TSR) programs

Serial data communication: Interfacing techniques of serial data communication using UART, USART, MODEMS and standard of RS-232, RS-422, RS-485, RS-449 etc.

LAB: Laboratory work will be based hardware system design using microprocessors and peripherals

CE 324 OPERATING SYSTEMS

Overview and history, operating system concepts, DOS, WINDOW NT, UNIX/LINUX, processes and threads, process scheduling, device and file management, memory management, concurrency and deadlocks, Windows systems administration, Unix system administration and shell programming, virtual memory, multiprocessor and real time scheduling, file sharing, servers, distributed processing, process migration.

LAB: Laboratory work will be based on the contents of the course.

FINAL YEAR

CE411 COMPUTER ARCHITECTURE

Advanced CPU Architecture: Hierarchical levels of computer architecture control and data path design, Instruction set architectures, memory systems. I/O systems, superscalar and vector processors of RISC and CISC architecture, single cycle and multiple cycle and pipelined architecture.

Parallel and Distributed Processing: Performance evaluation, support for programming languages and operating systems.

Memory Management: Internal memories; DRAM and static cache memory mapping, replacement algorithm, writing policies, memory paging, pipelining, timing and sequence generation, external memories; storage media, RAID levels, Bus architecture: EISA, PCI, SCSI, USB, Firewire and etc..

EE 412 DIGITAL SIGNAL PROCESSING

Fundamentals; theory and application; discrete time signals, the Z-transform; input output relationship; discrete time networks; discrete fourier transform; basic programming considerations; digital filters; IIR filters; FIR filter design techniques, filter design by modeling; quantization effects; signal processing algorithms, DSP system design DSP chips; digital filters implementations Filter and system examples.

LAB: Laboratory work will be based on the contents of the course.

ELECTIVE COURSES

MICROPROCESSORS AND MICROCONTROLLER APPLICATIONS

Microcontrollers: Stand alone applications of microcontrollers. Minimum component design. programming of microcontrollers, multiple microcontroller based applications..

Microprocessor based Data Acquisition and Control: Interfacing A/D and D/A converters, Industrial applications of microprocessors, System designing

Multiple processors based Systems and Numeric processor: Bus arbitration, 80x87 Family of Numeric Processors, floating point operation, introduction to parallel processing

Interfacing Microprocessors: interfacing of 80286, 80386SX and 80386DX, 80486 and Pentium microprocessors, protected and virtual mode, advanced instruction set.

LAB: Laboratory work will be based on the course contents.

DIGITAL IMAGE PROCESSING

Image acquisition techniques, digitization, acquisition flaws, image storage, compression techniques, image transformation (translation, scaling, rotation, stereo, 3D modeling, discrete time description of signals, fast fourier transform, image enhancement, image histogram, contrast enhancement, histogram manipulation, thresholding, binarization, Grey scale & colour images, smoothing, sharpening, edge detection, morphological operators, (erosion, dilation, opening, closing) medial axis transform, skeletonization, thinning.

LAB: Laboratory work will be based on the contents of the course.

VLSI SYSTEMS DESIGN

Fabrication of VLSI devices: Concepts and techniques used in the fabrication of VLSI integrated circuits, basic semiconductor and MOSFET theory, Integrated circuit fabrication, Integrated circuit layout, NMOS & CMOS logic design, simulation of circuit, analog circuit design, memory and processor design, testing of VLSI system architecture.

VLSI Designing Using Hardware Description Languages: Programming in Verilog and VHDL, netlisting, simulation and testing.

SYSTEMS PROGRAMMING

Study of various utilities of operating systems in DOS, Windows and UNIX, System calls, interrupt handling, inter-process communication, device handling through various ports, network handling, device drivers.

LAB: Laboratory work will be based on the contents of the course.

ELECTRICAL MACHINES

Three Phase Circuits: Three phase voltages, currents and power, star and delta connected circuits, analysis of balanced three phase circuits, line diagram, power and power factor, measurement in 3-phase circuits.

Transformer: Basic principles, single and 3-phase transformer, construction, general transformer equation, voltage and current relations in transformer, ratio of transformation, loading a transformer equivalent circuits of a transformer, OC and SC tests, regulations and methods of calculation of regulation, efficiency and calculation of efficiency, auto transformer, 3-phase transformer.

Direct Current Machines: Electric circuit aspects of DC machine, magnetic circuit aspects, types of DC generator and its performance, types of motors and WS performance, motor speed control, transient and dynamics response, transfer functions and frequency response.

Alternating Current Machines: Rotating magnetic field, induction motor characteristics and performance, synchronous motors, induction motor and its speed control, elementary AC two-phase control motors, constructional features of fractional horse power AC motors.

Signal Machines: AC commutator motors, stepper motors, Characteristics and applications.

LAB: Laboratory work will be based on the contents of the course.

ARTIFICIAL NEURAL NETWORKS

Introduction to neural networks, basic building blocks of neural networks, Hebb network, perception networks, Adeline networks, Hetro associative memory neural networks, auto associative nets, recurrent net, Hop field net, bi-directional associative memory (BAM) maxnet, hamming net, kohonen self organizing maps, learning vector quantization (LVQ), adoptive resonance theory (ART), back propagation net.

LAB: Laboratory work will be based on the contents of the course.

COMPUTER GRAPHICS

Introduction to computer graphics; fundamentals of input and display devices; geometrical transformations; homogeneous co-ordinates; representing curves and surfaces; solid modeling; 2D transformations, translation, rotation, scaling, shear etc; clipping, windowing techniques; modeling hierarchies; 3D transformations; viewing in 3D; planar projections, 3D curves and surfaces; perspective viewing; 3D clipping; geometric algorithms for graphics problems, with applications to ray tracing, hidden surface elimination, etc.

LAB: Laboratory work will be based on the contents of the course.

THEORY OF AUTOMATA

Regular languages, regular expressions, finite state machine, deterministic and non-deterministic finite state machines, pushdown automata, context free grammar, Turing machines.

BIOLOGICAL PRINCIPLES

An introduction to the basic principles of modern biology including biomacromolecules, bioenergetics, cell structure, genetics, homeostasis, evolution and ecological relationships.

MANAGEMENT INFORMATION SYSTEMS

Introduction to Management Information System: The emergence of management information systems, MIS and its subsystems, data versus information, information resource management, operational efficiency, goals of information systems, components of computer based systems, programmers, users, and system analysis, key issues in MIS.

People, Organization and its Behaviour: Physical and psychological factors, worker skills and abilities, MIS personnel, organizational characteristics, MIS management, information system personnel, DBAs, power and corporate culture, inter group conflict, intragroup dynamics.

Systems and Models: Components of a system, general versus specific models, levels of models, types of model, a general model of the organization and its external environment, strategic planning models.

Building Management Information System:

Analysis Requirements: The traditional SDLC approach, the current SSDC approach, structured system analysis and design methodologies.

Information system Tools: Traditional tools (system flowchart, flow process chart, data flow diagram), structured system analysis and design tools (HIPO, DFD, WARNIER-ORR diagram) and programming tools.

Initiation of MIS Project: Guidelines for MIS project (introductory investigation organization of MIS scope and schedule of MIS using Gantt's chart, Pert/Time network chart).

Systems Design of New Management Information Systems: Overview of system design characteristics of well-designed MIS, ways of systems design, other design consideration, design of MIS output, common types of MIS outputs design principles output, design of MIS data files, introduction to MIS data files, common methods of MIS data file organizations, types of data file storage, incorporate MIS design principles for data files, design of MIS inputs common methods of MIS inputs, MIS design principles.

Design of MIS Controls: Introduction to design of MIS controls, internal controls, incorporate MIS design principles-controls, MIS questionnaire for evaluating systems controls.

Equipment Selection and System Implementation: Equipment selection and specification, key factors in evaluating equipment vendors, MIS implementation, representative MIS implementation problems, operational review of MIS.

BUSINESS COMMUNICATION AND ETHICS

Business English:

Writing formal and business letters, writing formal memos, drafting notices and minutes of meetings, drafting tender notices, theoretical knowledge and comprehension of contracts and agreements, preparing proposals and technical reports, conducting and writing a project report on a mini research (sessional work).

Engineering Ethics:

Introduction: Objective of the course, definition of (a) a code (b) ethics, defining needs for a code of ethics.

Need for a Code of Ethics:

For who and why, review of code of ethics of international engineering and other bodies, review of code of ethics other professional bodies of Pakistan.

Comparing/Contrasting:

Review of PECs' code of ethics, code of conduct, comparison between PECs' codes and those of similar international bodies.

MODELING AND SIMULATION

Performance Modeling and Evaluation; Bench marking, performance evaluation of high parallel systems architecture. application of performance evaluation.

measurement techniques. hardware monitoring. software monitoring. hybrid monitoring.

Fundamentals Of Queuing Models; Structure and performance parameters. operational analysis of queuing models. general features of queuing models. birth and death processes. m/m/i and m/g/1 systems. dependability modeling, analysis of reliable, available and high assurance systems. fault-tolerant techniques. software reliability modeling.

Petri Net-Based Performance Modeling; Classical Petri nets. discrete, timed Petri nets. generalized stochastic Petri nets. Modeling of multiprocessors systems.

RECOMMENDATIONS

1. Credit hours for a four years BE/BSs (CE) (Comp. Sys.Engg), will be 130 to 140 credits. The universities may get approval of their respective bodies.
2. The curriculum is a recommendations and should be complied in broader sense. Some new courses may be added in elective courses.
3. There should be a separate meeting to develop the curriculum for BE/BSc Software Engineering, and ME/M.Sc specialization in Computer system Engineering, Software Engineering and Computer Engineering . It is also recommended that in this meeting both Computer Engineering and Computer Science professionals shall be jointly involved.
4. It is further recommended that Pakistan Engineering Council shall also review regularly its requirements for Bachelors degree since Computer Science in Engineering field has now diversified. For example, biological and genetic engineering fields require sizable computing skills. The biology may be added in basic applied subjects in early semesters.
5. The Ministry of Science and Technology project to connect all universities through high spread Internet shall be expedited so that professionals and students could have known with faculty of other institutions.
6. It is also recommended that UGC and Ministry of Science and Technology may develop an online library for share by students and universities. So that latest Research and Text materials may be assigned by all universities.
7. National Book Foundation may be requested to make effort to reproduce latest books as per demand of the country.
8. Training of faculty members to reach latest course may be arranged.