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Total (A) 5 16 14 4 - 350

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### B. E. II YEAR (ELECTRONICS & COMPUTER ENGINEERING) 2015

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Joint award for III & IV Semester (Marks not counted for award of division)

| FE 237 E Co – curricular activities | ½ | 2 | 100 |
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B. E. III YEAR (ELECTRONICS & COMPUTER ENGINEERING) 2016
VI SEMESTER EXAMINATION

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Joint award for V & VI Semester (Marks not counted for award of division)
FE 337 E Co – curricular activities | ½ | 2 | 100
### B. E. IV YEAR (ELECTRONICS & COMPUTER ENGINEERING) 2017
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Total of VII Semester 5½ 23 15 16 - 600
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<td>Total (A)</td>
<td>3</td>
<td>20</td>
<td>15</td>
<td>5</td>
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<td>250</td>
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<tr>
<td>B. Practicals &amp; Sessionals</td>
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<tr>
<td>ECC</td>
<td>471 B : Embedded Systems Lab. (ECC)</td>
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<td>2</td>
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<td>50</td>
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<tr>
<td>ECC</td>
<td>472 B : Computer Networking Lab. (ECC)</td>
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<td>3</td>
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<tr>
<td>ECC</td>
<td>473 B : Multimedia Lab (ECC)</td>
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<td>3</td>
<td>-</td>
<td>75</td>
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<tr>
<td>ECC</td>
<td>474 B : Wireless and Mobile Lab (ECC)</td>
<td>½</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>50</td>
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<tr>
<td>ECC</td>
<td>475 B : Project (ECC)</td>
<td>1</td>
<td>6</td>
<td>-</td>
<td>3</td>
<td>-</td>
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<tr>
<td>Total (B)</td>
<td>1½</td>
<td>6</td>
<td>-</td>
<td>13</td>
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<tr>
<td>ECC</td>
<td>476 C : Practical Training (ECC)</td>
<td>1</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>75</td>
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<tr>
<td>ECC</td>
<td>477 C : Educational Tour (ECC)</td>
<td>¼</td>
<td>1</td>
<td>-</td>
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<tr>
<td>Total of VIII Semester</td>
<td>5 ¼</td>
<td>30</td>
<td>15</td>
<td>18</td>
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Joint Award of VII and VIII Semester (Marks not counted for award of Division)

FE 437 E : Co-curricular activities | ½ | 2 | 100
Differential Equations: Simultaneous differential equations, Total differential equation, Partial differential equation of the first order (Langrange's and Charpit's methods), Linear partial differential equations with constant coefficients.

Partial differential equations of the second order; classification, Monge's methods. Solution of Wave, Heat One dimensions and Laplace equations (two dimensional) by separation of variables method.

Complex Analysis: Analytic functions, complex integration, Cauchy's integral theorem, Cauchy's integral formula. Taylor's and Laurent's theorems. Singularities of an analytic function, Pole; Residue, Cauchy residue theorem. Use of calculus residues to evaluate integrals of the types \( \int_{-\infty}^{\infty} f(x)dx \) and \( \int_{0}^{2\pi} f(x)dx \). Conformal and bilinear transformations.

Vector Calculus: Definitions of Gradient, divergence and curl. Various identities involving them. Green, Gauss and Stoke's theorems (statement and verification only).


Statistics: Concept of probability, Binomial, Poisson and normal distributions. Coefficient of correlation and lines of regression.


Network Theorems: Superposition, Thevenin, Norton, Reciprocity. Maximum power transfer. Millman and Tellegen's Theorems and their applications to D.C. and A.C. circuits

Resonance: Resonance in series and parallel- circuits. Q-Factor, bandwidth and selectivity.

**Two Port Networks:** Different two port parameters and their inter-relations and characteristic functions, interconnection of two port networks, Brune’s test. Network configurations. Symmetrical and asymmetrical two port communication networks, Iterative, Image and characteristic impedances, Propagation, attenuation, phase and Image transfer constants. Balanced, unbalanced and reciprocal networks; T.L. lattice and bridged T network.

**Network Functions:** Generalized concept of complex frequency, Impedance and admittance functions. Exponential excitation and system functions. Driving point and transfer functions. Pole zero configuration of system functions.

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**ECC 203 A – Solid state Electronics Devices (ECC)**

3L, 1T

**Introduction to Solid State Devices:** Space charge region and junction capacitance. Minority carrier injection, carrier storage and transient response. Impact ionization and avalanche break-down.

Analytical theory of junction diodes, BJT, JFET, MOSFET, UJT, diffused transistors, avalanche transistors. Degenerated semi-conductors and theory of tunneling, Theory of tunnel diodes, Zener diodes, Varactor diodes, photo diodes, LEDs, photo-transistors, photo FETs and LASER. Elementary theory of composite junction. Ohmic junctions and hetero junctions.

Characteristics and small signal models of MOSFET, MISFET and MESFET; Characteristics of CMOS and BiCMOS; design of CMOS inverter: Power dissipation characterization, timing issues and noise margins; CMOS based NAND and NOR gates.

Single crystal growth, wafer preparation epitaxial growth deposition and characterization of oxide layers, masking Lithography, dopant diffusion, and ion-implantation.

Process integration, MOS based silicon microcircuits, BJT based silicon microcircuits, BiCMOS process flow.

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**ECC 204 A - Data Structure (ECC)**

3L, 1T

**Complexity Analysis:** Time and Space complexity of algorithms, asymptotic analysis, big O and other notations, importance of efficient algorithms, program performance measurement, data structure and algorithms.

**Linear Lists:** Abstract data type, sequential and linked representations, comparison of insertion, deletion and search operations for sequential and linked lists, list and chain classes, doubly linked lists, circular lists, linked lists through simulated pointers, skip lists, applications of lists in bin sort, radix sort, sparse tables.
Stacks and Queues: Abstract data types, sequential and linked implementation, exception handling in classes, representative applications such as parenthesis matching, towers of Hanoi, wire routing in a circuit, finding path in a maze, simulation of queuing systems equivalence problem.

Hashing: Search efficiency in lists and skip lists, hashing as a search structure, hash table, collision avoidance, linear open addressing, chains uses of hash tables in text compression. LZW algorithm.

Trees: Binary trees and their properties, terminology, sequential and linked implementations, tree traversal methods and algorithms, heaps as priority queues, heap implementation, insertion and deletion operations.

Heapsort, heaps in Huffman Coding. Leftist trees, tournament trees, use of winner trees in mergesort as an external sorting algorithm, bin packing.

Search Trees: Binary search trees, search efficiency, insertion and deletion operations, importance of balancing. AVL Trees, searching insertion and deletions in AVL trees, red-black trees, comparison with AVL trees, search insert and delete operations.

7. Multiway Trees: Issues in large dictionaries, m-way search trees, B-trees, search insert and delete operations, height of B-trees 2-3 trees, sets and multisets in STL.

ECC 205A – Digital Electronics - I (ECC)

Device Characteristics: Steady state and transient switching characteristics of diodes, BJTs, FETs, UJTs. Wave shaping circuits. Integrating and differentiating circuits, effects of time constant, relation of tilt time to time constants. Clipper and clamper circuits using diodes and transistors. Saturated and unsaturated transistor switches. Speed-up capacitors. Inverter circuits. Performance of pulse transformer and lumped distributed parameter electromagnetic delay lines.


Sweep Circuits: Free running and triggered modes. Theory and common circuits of voltage and current time base generators.

Sampling Gates: Theory, operation and applications of unidirectional and bi-directional sampling gates using diodes and transistors.

Ma 211 A – Special Mathematics (C,ChE,CSE,E,IT,M,Mi,PI,ECE,ECC,EEE)

(Differential Calculus: Asymptotes, curvature. Envelopes, evolutes, Concavity, Convexity and singular points, curve tracing)
Integral Calculus: Rectification and quadrate, Volumes and surfaces of Solids of revolution. Mean values of functions, differentiation under sign of integration


B. E. II YEAR (ELECTRONICS & COMPUTER ENGINEERING) 2015
IV SEMESTER EXAMINATION

Ma 251 A – Applied Engineering Mathematics - II (ECC)

2L 3 Hours, 50 Marks

Integral transforms: Laplace transform, various theorems. Inverse Laplace transform, Applications to solutions of ordinary and simultaneous differential equations. Infinite Fourier transform, various theorems and application to solution of first order partial differential equation.

Special Functions; Solutions of Bessel and Legendre's differential equations, Bessel function and Legendre polynomial of first kind. Their generating functions, recurrence relations, orthogonality, Rodrigue's formulae, and other properties. Solution of Hypergeometric differential equation, Gauss hypergeometric function, its integral representation. Gauss summation theorem, their transformations.


ECC 252 A – Electronic Circuits (ECC)
Biasing: Biasing and stabilization techniques of BJT, JFET, MOSFET for use as amplifiers in various configurations. Small signal models for BJT, JFET and MOSFET in discrete and integrated form. Frequency dependence characterization and equivalent circuits. Miller effect.


Power Supply Circuit: Design factors and applications of various power supply filters and voltage multiplying rectifier circuits.

Regulated Power Supplies: Regulator circuits using solid state devices and monolithic ICS. Adjustable constant voltage power supplies. Adjustable constant current power supplies. Higher output power supplies with solid state pre-regulations. Protection circuits for power supplies. Rating and specifications.

Sets, sequences, empty set, power set, operations on sets, Venn diagram, ordered pair, principle of inclusion and exclusion.
Introduction to mathematical logic, statements and notations, well-formed formulas, tautologies, tautological implications, normal forms, the theory of inference for statement calculus, predicate logic.
Graph Terminology, Degrees of Nodes, Isomorphic Graphs, Dijkstra’s Shortest Path Algorithm, Planar Graphs, Eulerian Graphs, Hamiltonian Graphs, Traveling Salesman Problem.
Relations, matrix and graph representation of relation, properties of relations, partitions. Equivalence Relations, Compatiblility Relations, Composition of Binary Relations, Transitive and Symmetric closures partially ordered set lattices.
Functions, Matrix representation of functions, composition of function, inverse-function.
Algebraic Structures, General properties of algebraic systems, groupoids, semigroup, monoids group rings. Applications of algebra to control structure of a program. Homomorphism, Congruences, admissible partitions. Group and their graphs.

Arithmetic Circuits: Digital Comparators, half, and full adders; parallel and serial binary adders, half and full binary subtractors. BCD adders and subtracters. Binary multipliers and divider circuits


Semi-conductor memories: Random and sequential access memories. RAM, ROM, PROM, EPROM, EEPROM, EAPROM, EPLA, GALs. MOS and CMOS memories
Importance of programming languages, brief history, features of good programming language. Translators, Syntax, semantics, virtual computers. Binding and binding time.

Elementary and structured data types, their specification and implementation. Type checking and type conversion, vectors arrays, records, character string, variable size data structures. Sets, input and output files.

Evolution of the concept of data type, abstraction, encapsulation and information hiding, subprograms, type definition and abstract data types.

Implicit and explicit sequence control, sequence control within expression and between statements. Subprogram sequence control, Recursive subprograms. Exception and exception handlers, Coroutines and scheduled subprograms. Task and concurrency, exceptions.

Names and referencing environments, Static, dynamic and block structure, Local data and local referencing environments.

Dynamic and static scope of shared data, Block structure, parameters and their transmission. Tasks and shared data. Storage requirement for major run-time elements. Program and system controlled storage management. Static and stack-based storage management. Fixed size and variable-size heap storage management.

**ECC 262 B - Logic design Simulation and testing (ECC)**

3P

**Sequential Logic:** Storage devices and sequential sub-systems. Introduction to synchronous and asynchronous sequential systems. Mealy and Moore circuits. Cost vs. speed.


**Ma 261 A – Special Mathematics (C,ChE,CSE,E,IT,M,Mi,PI,ECE,ECC,EEE)**

(Common for Diploma passed candidates of all branches)

2L

**Statics:** Composition and resolution of coplanar forces. Moments. Equilibrium of coplanar forces acting at a point, Equilibrium of three forces acting on a rigid body. Resultant and equilibrium of coplanar forces acting on a rigid body friction. Common catenary.
Dynamics: Composition and resolution of velocities and accelerations. Relative velocity. Rectilinear motion, linear constant acceleration. Vertical motion under gravity. Rectilinear motion under variable laws and also in resisting medium. Kinematics of uni-planer motion
Crystal Growth : Czochralski and Bridgman growth, wafer preparation and specifications.
Epitaxial Growth : Thermodynamics of vapour phase growth, selective growth, MOCVD, Molecular beam epitaxy technology gas source MBE and chemical beam epitaxy.
Oxidation : Deal – Grave model, linear and parabolic rate coefficients, oxide characterization, types of oxidation and their kinematics, oxidation induced stacking faults, oxidation systems.
Etching : Wet etching, basic regimes of plasma etching, reactive ion etching and its damages, lift – off, and sputter etching.
Lithography : Optical, electron, X-ray and ion-beam, contact/ proximity and projection printers, advanced mask concepts, alignment.
Metallization : Applications and choices, physical vapor deposition, patterning, problem areas, multilevel metallization.
VLSI Process Integration : NMOS and CMOS IC technology, MOS Memory IC Technology, bipolar IC fabrication.
Assembly Technique and packaging : Package types, packaging design consideration, VLSI assembly technologies.
Yield and Reliability : Yield loss in VLSI, yield loss modeling, reliability requirements, accelerated testing, BIST.
Applications – CMOS inverter, combinational & sequential logic, Arithmetic Building blocks - Adder, multiplier, shifters; Memory and Array Structure: Core, ROM, RAM, peripheral circuitry, memory reliability and yield, SRAM and DRAM design, flash memory.

Operators and expressions: Operators, association and precedence rules of operators, expressions using unary, binary and ternary operators.
Statements: declarations as statements, selection statements, iteration statements, goto statement, break statement return statement, try – catch block.
Functions: void functions, functions with return value, call by value and call by reference parameter passing, default parameters, recursive functions, inline functions.
Classes: classes, object friend functions, classes within a class, local classes, global classes constructors, destructors.
Derived classes: single and multiple derivation of classes, multilevel and hybrid derivation of classes, constructors, destructors.
Polymorphism: Function and operator overloading, virtual functions.
Streams: input and output of built –in data types, manipulators.
File streams : opening a file, accessing a file, closing a file.
Exceptions: catching exceptions, rethrowing the exception, standard exceptions.
Templates: defining a template, template instantiation, function templates, class templates.
Elementary case study of an object-oriented database in C++.

**ECC 303 A – Design of Databases (ECC)**

3L, 1T

Introduction to database systems. A historical perspective, file systems v/s DBMS, advantages of a DBMS, data abstraction, models, instances and schemes. Data independence, data definition and manipulation languages. Database manager, administration, and users. Overall system structure.


Structure of relational database. The relational algebra. The tuple and domain relational calculus. Modification of databases and views.


Data storage: Physical storage media, files organization, organisation of records into blocks, sequential files, mapping relational data to files data dictionary storage, buffer management.

Basic concept of indexing and hashing, properties of indexes, index specification in SQL, B* – Tree and B – Tree index files. Hash base indexing, static hash functions, dynamic hash function.

Introduction to object-oriented model: object structure, class hierarchy, multiple inheritance, object identity, object containment, physical organization, object-oriented queries, scheme modification. Comparison between RDBMS and ODBMS, crash recovery, failure classification, storage hierarchy.

Transaction model, log-based recovery, Buffer Management, check points, shadow paging, failure with loss of non-volatile storage, stable storage implementation, concurrency control schedule. Testing for serializability, lock-based protocols, Time stamp based protocols, validation techniques.

**ECC 304 A – Analog Communication Engineering (ECC)**

3L, 1T

Introduction to analog techniques for electrical communication. Concept of baseband and carrier transmission. Elementary study of AM, DSBSC SSB, FM and PM.


**ECC 305 A - Radiation & Wave Propagation (ECC)**

3L, 1T

Transmission Lines: Type of transmission lines, General transmission line equations. Line constants and equivalent circuits. Infinite line, Lines with reflections.


Radio Wave Propagation: Mechanism of radio wave propagation. Reflection, refraction interference and diffraction of radio waves. Theory of ground wave, space wave and sky wave propagation. Effect of conductivity, dielectric constant, curvature and surface imperfections of earth on wave propagation, Duct propagation and tropospheric scattering.


Antennas: Quarter wave and half wave antennas. C-impedance, mutual impedance and directional characteristics of antennas. Antennas patterns. Effective length and effective area of antennas, Antennas gain efficiency, beamwidth and polarization. Antenna temperature.

**ECC 306 A - Computer organization (ECC)**

2L, 1T

Elements of Computer Organization


Secondary Memories: Magnetic memories core, tape, disk and floppy disc, introduction to magnetic bubble and CCD memories.


Communication of I/O with CPU and memory: Speed mismatch of I/O v/s memory and CPU. Communication methods for I/O to CPU and Memory: Polling, interrupt, DMA and I/O channel.
ECC 351 A - Business Information Systems (ECC)
3 Hours, 50 Marks

Introductory concepts: Data and information – creation and qualities; Systems and Business Information Systems – resources, categories; E-business.
Business Automation Hardware – Input and output techniques for business such as Bar-codes, OMR, Printers and storage devices.
Characteristics categories and design of Business Automation Software – graphics, spreadsheets, database, multimedia and web based software.
Information Security – Control over information systems, malware, encryption, decryption, protection of business information.

ECC 352A – Computer Graphics & Devices (ECC)
3 Hours, 75 Marks

Introduction to computer graphics. Application areas, Display devices, raster scan, random scan, color monitor, display file, frame buffer.
Windows, multiple windowing, view-port, viewing transformation. Clipping algorithm for point, line using Sutherland and Cohen, polygon, text clipping. Segment and segment operation.
Interactive graphics, user dialogue, Input modes, Interactive picture construction technique.
Concept of 3-D, representation of 3-D object, 3-D transformation, translation, rotation, reflection, scaling. Parallel, perspective, isometric projections.
Basic illumination models, halftone, dithering, color model RGB & CMY.
Design and operation of devices such as mouse, tablet, joystick, touch screen, laser and inkjet printers, plotters, LCD and CRT monitors, 3-D display techniques.

ECC 353 A – Power & Industrial Electronics (ECC)
3 Hours, 50 Marks

Power electronics devices: Characteristics and operation of SCR, PUT, SUS, SBS, SCS, TRIAC, DIAC, IGBT, GTO, MCA and light activated thyristors. Ratings and rating extension by series/parallel operation.

**Electrical Drives**: Performance characteristics of series, shunt and compound d.c. motors. Motor starters. Characteristics of single and three phase induction motors, Universal motor, Amplidyne and selsyns.

**AC and DC Motor Speed Control**: Philosophy of speed control, open and closed control and single and three phase AC, DC and universal motors using thyristors. PWM inverter technique and introduction to variable frequency drive.


**Programmable Logic Controllers (PLC)**: Advantages of PLC, CPU configurations, Digital and analog inputs and outputs, ladder circuits and process flow diagram. Console and operator panel.

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**ECC 354 A - Digital Communication System (ECC)**

3L, 1T  
3 Hours, 75 Marks


Introduction to techniques ASK, FSK, PSK, BPSK, QPSK and simple QAM.


Study of components of digital communication system. Concept TDM, synchronous and asynchronous transmission. Introduction to bit, word and frame synchronization.

Noise: Various noise sources in amplifier ASK, FSK BPSK, and simple QAM and communication systems, Comparison of various electronic devices for noise performance, Signal to noise ratio and noise figure. Equivalent noise bandwidth. Noise temperature, Effect of cascading, statistical properties of noise Representation of white and band pass noise in communication systems.


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**ECC 355 A - Microprocessor & Microcomputer (ECC)**

3L, 1T  
3 Hours, 50 Marks
Microprocessor Architecture: Architecture of 8-bit 8085, Z80, 6800 microprocessors; their instruction sets and addressing modes. Assembly language programming of Intel's 8085 Microprocessor. Introduction to assemblers.

Microprocessor Interfacing: Interfacing of address, data and control buses Memory and I/O devices, Interrupt and DMA for 8085 microprocessor.


ECC 356 A - Engineering management and Economics (ECC)

2L, 1T

Principle and Techniques of Management: Management function. Theories of management and their application to Indian condition. Responsibility, authority, leadership, motivation, co-ordination and co-operation, change agent, Importance of organization charts and their application to Electronic Industries.


Marketing Management: Concept of Marketing and its various components.


Forms of Business: Proprietorship, partnership, joint stock companies joint sectors and co-operative movements.

Cost Accountancy: Various types of costs, profit/volume ratio, Break even analysis and marginal costing.


Nature and Scope of Economics: Basic concept of managerial economics. Supply and demand, free competition, monopoly and oligopoly.

B. E. IV YEAR (ELECTRONICS & COMPUTER ENGINEERING) 2017

VII SEMESTER EXAMINATION

ECC 401 A - VLSI Design Techniques (ECC)

3L, 1T

Introduction: Layout and design rules, materials for VLSI fabrication basic algorithmic concepts for physical design, physical design processes and complexities.


Floor- planning: Hierarchical design, wirelength estimation, slicing, and non-slicing floorplan, polar graph representation, operator concept, Stockmeyer Algorithm for floorplanning mixed integer linear program.
Placement: Design types: ASICs SoC, microprocessor RLM; Placement techniques: Simulated annealing, partition-based, analytical, and Hall’s quadratic; Timing and congestion considerations.
Routing: Detailed global and specialized routing channel ordering, channel routing problems ad constraint graphs routing algorithms, Yoshimura and Kuh’s method, zone scanning and net merging, boundary terminal problem, minimum density spanning forest problem, topological routing, cluster graph representation.
Sequential Logic Optimization and Cell Binding: State based optimization, state minimization, algorithms; Library Binding and its algorithms, concurrent binding.

**ECC 402 A – Design of Operating System (ECC)**

3L, 1T

Introduction to operating system, operating system functions, batch processing systems, multiprogramming systems, time sharing systems, real time operating systems.

Process management, process concept, process scheduling, operation on processes, cooperating processes interprocess communication.

CPU scheduling, scheduling algorithms first come first served, shortest job first, priority based, round robin, multilevel queue multilevel feedback queue.

Process synchronization, critical section problem, semaphores, monitor. Deadlocks, prevention, deadlock avoidance, deadlock detection.

Memory management, contiguous allocation, paging, segmentation, virtual memory, demand paging, page replacement, page replacement algorithms first in first out algorithms, optimal algorithm, least recently used algorithm.

File concepts, directory structure, file protection, allocation of disk space.

I/O systems, I/O hardware polling, interrupts, direct memory access. Disk scheduling, disk scheduling algorithms first come first served algorithms, shortest seek time first algorithm, SCAN algorithm, C-SCAN algorithm, C-LOOK algorithm.

Protection and security in an operating system, access matrix capabilities.

**ECC 403A - Advance Communication systems (ECC)**

3L, 1T

ECC 403A - Advance Communication systems (ECC)
Line-of-Sight and Troposcatter Communication: Principle of working and essential features of microwave LOS and troposcatter communication
Propagation study and performance requirements. Diversity techniques.

**ECC 404 A – Advance Computer Technology (ECC)**

3L, 1T

3 Hours, 75 Marks

Introduction to parallel processing and trends: parallelism in uni-processor system, parallel computer structure, architectural classification schemes for parallel computers, multiplicity of instruction data streams, serial versus parallel computers, parallelism versus pipelining.

Memory system: Hierarchical, associative and cache memory structures, virtual memory system, memory allocation and management.

Principles of pipelining: pipelining principles and classifications, general pipelines and reservation tables, interleaved memory organization, instruction pre-fetch and branch handling, data buffering and busing structures, internal forwarding and register tagging, hazard detection and resolution, job sequencing and collision prevention.

Structure for array processors: SIMD computer organization, masking and data routing mechanism Inter PE communication, introduction to associative array processing.

Multiprocessor architecture: Loosely and tightly coupled multiprocessors, processor characteristics for multiprocessing, interconnection networks, cache coherence protocols.

Introduction to advanced processors: Data flow computers, the VLIW architecture, fault tolerant architecture and study of TANDEM HIMALAYAN K2 system architecture.
B. E. IV YEAR (ELECTRONICS & COMPUTER ENGINEERING) 2017
VIII SEMESTER EXAMINATION

ECC 451 A – Real Time and Embedded systems (ECC)
3 Hours, 50 Marks

Introduction to embedded systems and their basics, Multitasking. Use of programming languages, Real time kernel, size of embedded programs.

Data Representation Fixed Precision Binary members, binary representation of Integers and Real numbers, ASCII and BCD.

Hardware requirements and time constraints, reliability and cost, design decisions.

Selection of microprocessor / Microcontroller for embedded systems, computing the size of memory required RAM and ROM.

S/W tools for embedded system development: Mixing C and assembly, C – Run time environment, Use of cross compilers, use of tools sets in Embedded Linux, GNU Tool chain for cross compiling.

Introduction to real – time computing: Characteristics of real – time system & tasks, performance measurement of real – time systems, estimation of program runtime.

Real – time system design: hardware requirements, systems development cycle, data – transfer techniques, synchronous and asynchronous data – transfer techniques, standard interfaces.

Real – time communication, fault – tolerance techniques, cause of failure, fault types, fault detection, redundancy, integrated failure handling.

ECC 452 A - Computer Communication and Data Networks (ECC)
3 Hours, 50 Marks


Introduction to network security.


Basics of Internet: Evolution; dialup, XDSL, ADSL, cable modem and other access methods. IP address and domain name system, TCP/IP, Internet applications and www.

ECC 453 A – Multimedia Technology (ECC)
3 Hours, 50 Marks

3L, 1T
Introduction to multimedia and its applications, Characteristics of Text, Sound, Image, Animation, Video.
Multimedia Hardware: SCSI, MCI, Memory and storage devices, Output Hardware, Communication devices.

Introduction to Multimedia Systems: Architecture and components, multimedia distributed processing model, synchronization, orchestration and quality of service architecture.
Audio and Speech: Data acquisition, sampling and quantization, human speech production mechanism, digital model of speech production, analysis and synthesis psycho-acoustics, low bit rate speech compression, MPEG audio compression.
Images and Video: Image acquisition and representation, composite video signal, NTSC, PAL and SECAM video standards; Bilevel image compression standards, JPEG and MPEG.
Multimedia communication: Fundamentals of data communication and networking, bandwidth requirements of different media; real time constraints: Audio latency, video data rate; Multimedia over LAN and Internet, multimedia conferencing.
Multimedia Information Systems: Operating system support for continuous media applications, limitations of OS, new OS support, Media stream protocol, file system support for continuous media, data models for multimedia and hypermedia information, content based retrieval of unstructured data.

ECC 454 - Mobile Communication and computing (ECC)
3L, 1T
3 Hours, 50 Marks

Concept of mobile telecommunications. Mobile radio network issues, cell size coding, modulation and diversity Base station subsystems. Access methods. Location strategies for personal communications services. Cell design principles.

Elements of Radio Paging and microcellular radio communication: Fixed and dynamic channel assignment, Allocation of spectrum and channels, Concepts of hexagon cells, mobile identification system and registration of mobile, call procedure. Concepts of GSM and CDMA radio system architecture, roaming, digital speech and channel coding.

Mobility computing: Issues, challenges, and benefits;
Network Programming: Process communication techniques, remote login, ftp, socket programming, RPC, RMI, Client – server programming.
Process Migration: Steps, advantages, application taxonomy, alternatives, case study of DEMOS/MP.

Mobile Computing: Physical mobility, challenges, limits and connectivity, mobile IP and cellular IP in mobile computing, case study of CODA.
Wireless LANs: Introduction to IEEE 802.11, Bluetooth and IrDA technologies and standards.
Handheld Devices and OS: Palm, HP; PalmOS, WindowCE, Windows Mobile. Conceptual study Mobile Internet and WAP, gateways, Mobile agents: Aglets, Tcl, PMADE.
LIST OF ELECTIVES

**ECC 421 A - Robotic & Computer Vision (ECC)**

3 Hours, 75 Marks

Definition, structure and application areas of Robotics; Introduction to the range of robots currently in use.
Direct kinematics of the robot arm, link description and its connection; Frame assignment; Concept of actuator space, joint space and Cartesian space;
Inverse kinematics, algebraic solution, geometric solution; Solvability considerations and examples.
Manipulator dynamics, basic equations, Newton- Euler dynamic formulation; Lagrange formulation of the manipulator dynamics; Simulation.
Controller design, linear and non-linear control approaches, special considerations like coupling, time variation and model uncertainty; Computed
torque, variable structure and adaptive control techniques.
Digital image fundamentals, digitization and 2-D parameters, types of operation; Basic tools: Convolution, Fourier transforms and statistical
approaches.
Image analysis and processing. Basic enhancement and restoration techniques, unsharp masking, noise suppression, distortion suppression,
segmentation, thresholding, edge finding, binary mathematical morphology, grey – value mathematical morphology.

**ECC 422 A - Digital Signal Processing (ECC)**

3 Hours, 50 Marks

– time filter structures. Z – Transform system representation solution of linear constant co-efficient difference equations. Digital filters design by
transformation from analog filters. Simple realization of IIR and FIR filters DFT and FFT.

**ECC 423 A - Microwave Engineering (ECC)**

3 Hours, 75 Marks

Wave Guides : Theory of wave propagation in rectangular wave guides, cut off frequency. Dominant and higher modes. Generation of different modes
and suppression of unwanted modes. Field distribution. SWR and impedance relations in wave guides. Coupling between coaxial lines and wave guides.
Wave guide stub-matching.
Resonators: Theory and application of cavity resonators. Coupling to cavity, Q of cavity resonators.
Microwave Components: Attenuators, phase shifters, directional couplers, tees, isolators, circulators, tunings screws, coupling probe, loops, mixers and
detectors. Use of scattering parameters.
Microwave Generators and Amplifiers: Theory of velocity modulation. Theory of operation and characteristics of two cavity and multicavity klystron,
amplifier and oscillators. Reflex klystron O and M type travelling wave tube and backward wave oscillators – principle of operation . Construction, type
and application of Magnetrons.

**ECC 424 A - Telematics (ECC)**

3L, 1T  


**ECC 425 A - Medical Electronics (ECC)**

3L, 1T  


**ECC 426 A - Software Engineering (ECC)**

3L, 1T  
Introduction, software characteristics and software crisis. The software engineering approach; software process & process maturity. Various software development models. Software life cycle concept.

The software project management concepts and team organization. Software process and project metrics. Software measurement. Metrics for software quality and its integration with the software process.
Software scope/project estimation the COCOMO model and the Function Point approach.
Software quality assurance. Software reviews, cost impact and software defects. Formal Technical Reviews, software reliability.
Software design and software engineering, software architecture. Effective modular design functional independence, cohesion and coupling concepts.
Component level/procedural design.
Software testing techniques and strategies.

**ECC 427 A – Client – Server Technology (ECC)**
3 Hours, 75 Marks

Introduction Client/Server architecture. Benefits, application, centralize multiuser, Distributed single user Architecture, distributed computing environment.
Approach to Distribution: Distributed models, multi tiered environment, cooperative processing, application components, and distribution points. Presentation distribution, distributed processing, distributed function and transaction processing, data distribution.
Client technologies: Function, Application and tools, operating system, hardware plate forms, database access, interprocess communication tools.
Server technologies: Function, server operating system, hardware plate forms, data access, distributed data access, database engines.
System networks architectures: Components, layers, peer-to-peer communication between SNA layers.
Data Management: Distributed data management, method of the distribution, distributed data access. Database transaction management.
Distributed DBMS: Architecture, storing data in a distributed DBMS, distributed catalog, management, distributed query processing, Update distributed data. Introduction to distributed transactions, distributed concurrency control, and distributed recovery.

**ECC 428 A – Object Oriented Software Engineering (ECC)**
3 Hours, 50 Marks

Object – oriented analysis: Domain analysis, the OOA process, the object – relationship model.
Design for object – oriented systems. The system design process.
Object – oriented testing – testing OOA and OOD models. The object – oriented testing strategies. Inter class testing.
ECC 429 A – Information theory and coding (ECC)

3L, 1T

Uncertainty, information, measure of information, average information entropy, property of entropy, information rate. Discrete memoryless source. Source coding theorem.

Discrete memoryless channel, self and Mutual information, properties, channel capacity, channel coding theorem Shannon Hartley theorem, Information capacity theorem.

Data compaction, prefix coding, Huffman coding, Lempal – Ziv coding, Compression of information.

Type of errors, codes error control coding, linear block code, error detection and correction codes, syndrome decoding, cyclic codes, hamming code, BCH, convolution codes, encoders and decoders performance of codes.

ECC 430 A - Systems Software (ECC)

3L, 1T

Introduction to system software, machine architecture, machine level representation of programs, assembly language programming and optimizing program performance.

Assemblers, basic function, machine dependent and independent assembler features, assembler design options.

Two – pass, one – pass and multi- pass assembler design

Macro-processors, basic functions, machine independent features nested definitions and calls, design options.

General purpose macro – processor design, macro – processing within language translators.

Loaders and linkers, basic functions, machine dependent and independent features, linkers, loaders and editors, design options.

Relocating loaders and dynamic linking loader designs.