

Information Booklet for Postgraduate Studies



**Institute of Information & Communication
Technology**

**Dhaka University of Engineering &
Technology (DUET), Gazipur**

The **Institute of Information & Communication Technology (IICT)** offers Post Graduate Diploma in Information & Communication Technology abbreviated as **PG Dip. in ICT**.

◆ Academic Requirements and Regulations

1. The minimum duration of PG Dip. in ICT Program shall be three semesters and generally not more than 5 (five) Academic Years starting from the date of first registration. Each Academic Year shall consist of two semesters. The duration of a semester will be of minimum 13 (thirteen) weeks.
2. For the Degree of PG Dip. in ICT, a student must earn a minimum of 36 credit hours of which 30 credit hours shall be assigned as for course work and 6 credit hours shall be assigned for a Project.
3. From the 30 credit hours theory courses, 18 credit hours will cover for Core Courses* and rest 12 credit hours will cover the Optional Courses**.

Courses	PGD Credits
Theory Courses (10 Courses)	3 x 10 = 30
Project	6
Total Credits =	36

Syllabus for PG Dip. in ICT

Course No.	Course Title	Credit
ICT 5001	Project	6
Core Courses		
ICT 5101	ICT Fundamentals and Programming	3
ICT 5102	Data Structures and Algorithms	3
ICT 5103	Database Design and Management	3
ICT 5104	Operating Systems and Computer Architecture	3
ICT 5105	Basic Telecommunication	3
ICT 5106	Data Communications and Computer Networks	3
Optional Courses		
ICT 5201	Visual Programming	3
ICT 5202	Web Engineering	3
ICT 5203	Multimedia Design and Development	3
ICT 5204	Mobile Application Development	3
ICT 5205	Electronic Commerce	3
ICT 5301	Internet of Things	3
ICT 5302	Cyber Physical System	3
ICT 5303	Cloud Computing	3
ICT 5304	ICT Industrial Revolutions	3
ICT 5304	Artificial Intelligence	3
ICT 5401	Information System Analysis and Design	3
ICT 5402	Software Engineering	3
ICT 5403	Software Quality Assurance	3
ICT 5501	Remote Sensing and Geographical Information System	3
ICT 5502	Internet Technologies	3
ICT 5503	Mobile Communications	3

ICT 5504	Software and Database in Telecommunication	3
ICT 5505	Network Systems Design and Estimation	3
ICT 5601	Information System and Network Security	3
ICT 5602	Cyber Security	3
ICT 5701	Microprocessor and Microcontroller Architecture	3
ICT 5702	Embedded Systems Design	3
ICT 5703	Digital Signal Processing	3
ICT 5704	Satellite and Radar Communication	3
ICT 5801	ICT Ethics	3

ICT 5101 ICT Fundamentals and Programming

3 Credits

Types and generation of computer, basic organization and functional units, input, output and memory devices. Boolean algebra, De-Morgan's Theorems, logic gates, canonical forms, combinational logic circuits and sequential logic circuits. Decoders, encoders, multiplexers, demultiplexers, flip-flops, counters and registers. Discrete Mathematics logic, set theory, relations, partial ordered sets, functions, mathematical reasoning and proof techniques, propositional calculus, predicate calculus. Graph theory, graphs, paths, trees, algebraic structures, binary operations, semi-groups, rings and fields, lattices. Algorithms and flow chart. Structured programming concepts. Writing, debugging and running programs: Variables, Data Types, Operators and Expressions, Control flow, Procedures and Functions, Arrays. Introduction to java Programming, Primitive Data Types and Operations. Selection Statements. Loops, Methods. Arrays, Strings and Text I/O, Exceptions and Assertions. Objects and Classes, Inheritance and Polymorphism. Abstract Classes and Interfaces, Object-Oriented Design. Getting Started with GUI Programming, Creating User Interfaces. Event Driven Programming, Java Database Programming. Remote Method Invocation. Java Server Pages. Multithreading. Advanced Swing Models, Menus, Toolbars, Dialogs. Containers, Layout Managers, and Borders.

ICT 5102 Data Structures and Algorithms

3 Credits

Data Structures Basics, Data structure Operations, Algorithms Complexity, Time- space tradeoff. Linked List: Representation of linked lists in Memory, Traversing a linked list, Searching a linked list, Memory allocation and Garbage collection, insertion into linked list, Deletion from a linked list, Types of linked list. Stack and Queue: Array Representation of Stack, Linked List Representation of stack, Application of stack, Queue, Array Representation of Queue, Linked List Representation of Queue. Trees: Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Sequential and Other Representations of Trees, Tree Traversal. Graphs: Matrix Representation

of Graphs, List Structures, Other Representations of Graphs, Breadth First Search, Depth First Search, Spanning Trees. Topological Sorting, Shortest-Path Algorithms, Weighted Shortest Paths, Dijkstra's Algorithm, Minimum spanning tree- Prim's Algorithm. Bubble sort, Merge sort, Selection sort, Heap sort, Insertion Sort. Sequential Searching, Binary Searching, Search Trees. Procedure and Recursion.

ICT 5103 Database Design and Management 3 Credits

Database Environment, Database Development Proc, Database Modeling, Enhanced ER Model, Relational Model and Logical Database Design, Physical Database Design, relational algebra, SQL and advanced SQL, database design and the entity-relationship model, Relational database design and normalization, application design and development, indexing, Database storage and file structure, transaction management, concurrency control recovery management, object database and database administration.

ICT 5104 Operating Systems and Computer Architecture 3 Credits

Operating system preliminaries, goals and components of operating system. Process management, process states and states transition, process control blocks, job and process scheduling, scheduling levels, objectives and criteria. CPU scheduling algorithm, process co-ordinations critical section problems, semaphores. Deadlock: prevention, avoidance, detection and recovery. Memory management, virtual memory, file system, file organization, space allocation, file access control mechanisms, Disk scheduling algorithm, parallel processing. Operating systems security. MIPS Introduction, Operations, Operands, Signed and Unsigned Assignment, Logical Operation, Instructions for Making Decisions, Supporting Procedures, Communicating with users, MIPS Addressing, Addition and Subtraction, Multiplication Assignment, Division, Floating Point, Logic Design Conventions, Building Datapath Assignment and Building, Pipelining, Exceptions, Parallelism and Advanced ILP Assignment, Memory Systems, Basics of Caches, Measuring and improving Cache Performance, Virtual Memory Assignment, Common Framework for Memory Hierarchies, Computer Systems Overview,

Connecting Processors, Memory, and I/O Devices, Interfacing IOs to the Processor, Memory, and OS.

ICT 5105 Basic Telecommunication

3 Credits

Models of telecommunication system. Analog amplitude and angle modulation, Frequency Division Multiplexing. Digitization of analog signals. Binary system. Arithmetic operations on binary numbers. Modulo 2 arithmetic. Pulse code modulation (PCM), sampling, quantization, coding. Delta and differential pulse code modulation. Synchronous and asynchronous, static and dynamic time division multiplexing. Transmission media. Optical fibres: single mode, multimode. Optical cables. Wavelength division multiplexing (WDM): Dense wavelength division multiplexing (DWDM) and Coarse wavelength division multiplexing (CWDM). Frequency bandwidth of signal in radio transmission. Nyquist theorem. Scrambling. Clock recovery. Frame and bit synchronization. Line coding and encryption in digital transmission. CDMA, OFDM. Using sine and cosine functions as orthogonal functions. Amplitude Modulation (AM), Frequency Modulation (FM), BPSK, QPSK, GMSK, OFDM. Asynchronous Transfer Mode (ATM), adaptable and flexible multiplexing. OSI model. IT networks, Ethernet (IEEE 802.3, 801.11, 802.16), LAN, MAN, WAN. Terms: HUB, Bridge, Router, MAC address, IP address.

ICT 5106 Data Communications and Computer Networks 3 Credits

Network fundamentals: Classification, Network taxonomy, Packet switching, circuit switching. Network performance: Bandwidth and propagation delay, Latency and throughput. Network models: Internet model, OSI model. Physical layer and media: Data and Signals – transmission impairment, Digital Transmission – encoding, Analog Transmission – modulation and multiplexing, Using Telephone and Cable Networks for Data Transmission. Data Link layer: Error detection and correction, Control and protocols, Point-to-point and multiple access protocols, Local area networks, connecting LANs (bridges), ATM networks. Network layer: Internet protocols, Host-to-host delivery – routing (unicast, multicast) and addressing, Link state and distance vector routing, Sub-netting and super-netting. Transport layer: End-to-end protocols –

UDP, TCP, TCP sliding window, TCP adaptive timeout interval. Congestion control and quality of service.

ICT 5201 Visual Programming

3 Credits

.NET Framework, Base Class Libraries (BCL), Common Language Run Time (CLR), Microsoft Intermediate Language (MSIL), Common Language Specification (CLS). Structure of a C# program, Compiling and Executing, Value-Type Data, Arrays, Reference-Type Data. Arrays, Command Line Argument, Multi-Dimensional Arrays. Statement Blocks, Methods. if, switch, loop, break and continue, return Statements. Structs, Interfaces, Delegates, Enumerations, Namespaces, Applications and Libraries. C# Application Startup, Member Access, Overloading, Scope, Value vs. Reference Parameters, Conversions, Exceptions. Class, Class Methods, Constructors, Access Levels, Fields, Properties, Operators, Destructors, Static Constructor. Inheritance, Base Class Modifiers, Direct Inheritance, Abstract Classes, Interfaces, Base Class Interfaces. Delegates, Events. Data Streams, Readers, Writers, File I/O. Properties, Indexers, Attributes. Windows Forms, Visual Studio and the Forms Designer, Using Controls, List Controls, Working with Dialogs, Menus, Toolbars and Status Bars, Advanced Windows Forms Topics, Using Advanced Controls. ADO.NET Architecture, Data Providers in .NET, Connection, Command, Data reader, Data Adapter, Data Set, Command Builder, Data Relations. Architecture of CLR, Components in CLR, Type Safety. Overview of Threads, Using Threads in C#, Thread Properties, Managing Threads, Interrupting and Terminating Threads, Synchronization.

ICT 5202 Web Engineering

3 Credits

Web architecture and HTTP: history and architecture of the World Wide Web, overview of the Hyper Text Transfer Protocol, other related protocols; Hyper Text Mark Language (HTML): concept of markup, overview of HTML (table, form, frame, window, link etc.); Client side scripting: variables data types, control structure, functions, Document Object Model (DOC), event handlers, properties methods, cookies; Server side scripting: concepts, variables, data types, control structure, functions, objects; Database: content generation, data exchange; Regular expressions, mails,

cookies, sessions; Middleware: object management architecture, object request brokers (CORBA, OLE/COM), services (trading, naming, event, transaction, security), interorb protocols (e.g. the Internet Interorb protocol).

ICT 5203 Multimedia Design and Development 3 Credits

Introduction to multimedia, image, sound, video formats and their different properties, compression, playing and recording techniques, merits and demerits, conversions between different formats and their combinations; Multimedia authoring, introduction to web and HTML, basic HTML tags design principles; Drawing: image properties, image manipulation, layers, colors, text, texture, brightness, contrast, filters and effects; Interactive application development using multimedia tools.

ICT 5204 Mobile Application Development 3 Credits

HTML/HTML5: Used Editor, HTML elements, attributes, comments, heading paragraph, lists, head, Images, Table, form details, layout, Iframe, text field, dropdown list, color, color names, Color values, link, formatting, Div etc. HTML5 introduction, elements, canvas, Video, Audio, Input types, form attributes etc. CSS/CSS3: CSS Syntax, selector, unit, tables, Box model, border, outline, margin, padding, dimension, display, positing, floating, align, pseudo-elements & class, Image gallery, opacity, css ID & class, styling Background, Texts, fonts, links, Lists, Object positioning, CSS3 borders, text effects, 2D & 3D transformations, animations. JavaScript/JQuery: Statement of Javascript, comments, variables, data types, objects & events, functions, operators, comparison, conditional statement, error handling, input validation, array, strings, date & time, DOM (Documents object model), Object-based features, Different builtin objects etc. How jQuery Works, the jQuery ready Function, What are jQuery Selectors?, Selectors Overview, Basics & Hierarchy, Basic, Content, Visibility, Attribute & Child Filters, Forms & Form Filters, jQuery DOM Traversal & Manipulation, jQuery Event Model, Handling Events with jQuery, Ajax introduction, jQuery Ajax Functions etc.

ICT 5205 Electronic Commerce

3 Credits

Introduction to Internet Business, Infrastructure The Internet and Technology, Overview of electronic commerce, business models; Ecommerce channels: portals, auctions, communities, marketplace; Managing the marketplace: Demographics and advertising; Customer relationship management, web services for B2B and B2C e-commerce, electronic payment systems; Network security, cryptography, digital certificates; Markup for e-commerce: ebXML, M-commerce, Lcommerce, wireless and U-commerce, digital money and electronic banking; Ethical, legal, and regulatory environment: Intellectual property, copyright, trademark, patents, Social Networking, Communities, & Actions.

ICT 5301 Internet of Things

3 Credits

Internet in general and Internet of Things: layers, protocols, packets, services, performance parameters of a packet network as well as applications such as web, Peer-to-peer, sensor networks, and multimedia. IoT definitions: overview, applications, potential & challenges, and architecture. IoT Protocols: HTTP, CoAP, MQTT, AMQP, 6LoWPAN. IoT Data and the IoT Cloud Infrastructure. Performance and Security in IoT. IoT examples: Case studies, e.g. sensor body-area-network and control of a smart home.

ICT 5302 Cyber Physical System

3 Credits

Introduction to cyber-physical systems, CPS Principles, Models of physical systems, Models of cyber components, Cyber-physical systems models as interconnections, CPS Workload Modeling, Specification and critical properties of CPSs, Safety in CPS, Complex Systems Approaches to CPS. Discrete systems, Continuous and Hybrid Dynamics, Fractional Order Derivatives and Integrals, Information cellular processing, Control algorithms and embedded Software, Scheduling of Control Tasks Over Shared Wireless Channels, Sensing and fusion, Automotive Sensing and Intelligent Transportation, Wearable Sensing and Body-Area Sensor Network, Sensors and Actuators, Networked control systems, Molecular communication, Value added network, Controllability and Observability of Complex Networks. Internet of things (IoT), Internet of Service (IoS), Introduction to Industry 4.0, Big Data Issues, Introduction to hybrid

systems, Real-Time Operating Systems, Holistic System Design, Controller design and synthesis, Multi Agent System, Real-Time Tools and Analysis, Inference Techniques, Embedded system design, feedback control.

ICT 6303 Cloud Computing

3 Credits

Definition and evolution of Cloud Computing, Enabling Technologies, Service and Deployment Models, Popular Cloud Stacks and Use Cases, Benefits, Risks, and Challenges of Cloud Computing, Economic Models and SLAs, Topics in Cloud Security. Cloud Infrastructure: Historical Perspective of Data Centers. Datacenter Components: IT Equipment and Facilities. Design Considerations: Requirements, Power, Efficiency, & Redundancy, Power Calculations, PUE and Challenges in Cloud Data Centers, Cloud Management and Cloud Software Deployment Considerations. Virtualization: Virtualization (CPU, Memory, I/O). Case Study: Amazon EC2, Software Defined Networks (SDN), Software Defined Storage (SDS). Cloud Storage: Introduction to Storage, Systems Cloud Storage Concepts Distributed File Systems (HDFS, Ceph FS), Cloud Databases (HBase, MongoDB, Cassandra, DynamoDB), Cloud Object Storage (Amazon S3, OpenStack Swift, Ceph). Programming Models: Distributed Programming for the Cloud, Data-Parallel Analytics with Hadoop MapReduce (YARN), Iterative Data-Parallel Analytics with Apache Spark, Graph-Parallel Analytics with GraphLab 2.0.

ICT 5304 ICT Industrial Revolutions

3 Credits

Introduction to Industry 4.0: Various Industrial Revolutions, Digitalization and the Networked Economy, Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0, Comparison of Industry 4.0 Factory and Today's Factory. Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation. Road to Industry 4.0: Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services, Smart Manufacturing, Smart Logistics, Smart Cities. Related Disciplines, System, Technologies for enabling Industry 4.0: Cyber physical Systems, Robotic Automation and Collaborative Robots, Support System for Industry 4.0, Mobile Computing, Cyber Security. Role of data, information, knowledge and collaboration in future organizations: Resource-based view of a firm,

Data as a new resource for organizations, Harnessing and sharing knowledge in organizations, Cloud Computing Basics, Cloud Computing and Industry 4.0. Business issues in Industry 4.0: Opportunities and Challenges, Future of Works and Skills for Workers in the Industry 4.0 Era, Strategies for competing in an Industry 4.0 world.

ICT 5305 Artificial Intelligence

3 Credits

Introduction to artificial intelligence, History of AI, Proposing and evaluating AI applications. Problem spaces and search, Knowledge and rationality, Heuristic search strategies, Search and optimization (gradient descent), Adversarial search, Planning and scheduling. Logic and inference, Ontologies, Bayesian reasoning, Temporal reasoning. Machine learning, Supervised vs. unsupervised learning, Regression - linear, logistic, ridge. Classification - decision trees, SVM, random forests. Dimensionality reduction: PCA, Clustering - k-means, hierarchical clustering, Semi-supervised methods, Reinforcement learning, Choosing among machine learning techniques. Neural networks and backpropagation, Convolutional neural networks, Recurrent neural networks and LSTMs. Introduction to natural language understanding, Sentiment analysis, Application of deep learning to NLP. Speech recognition, Hidden Markov Models, Chatbots, Natural language generation ◦ Speech synthesis. Introduction to robotics, Sensing, Manipulation, Human-robot interaction. Navigation and path planning, Learning and robotics: Reinforcement learning.

ICT 5401 Information System Analysis and Design 3 Credits

System Life Cycle, The survey phase. Information gathering and interviewing, Requirements Models: data flow diagrams (DFD). Events and Data Stores, SallyCaseProject (regrouping of processes), Progress report specification. Entity Relationship Diagram. Data dictionary, Process specification. Trends in development, Project Planning & Management, progress report. Designing the System and User Interfaces, Drawing ERD with Visible Analyst. Class diagram. Activity diagrams, system sequence diagrams; State transition diagrams; Structured design with Structure Chart; Qualities of a good design: programming simplicity & coupling; Qualities of a good design. Design Principles, Use Case Realizations.

ICT 5402 Software Engineering

3 Credits

Introduction, software life-cycle models, software requirements specification, formal requirements specification and verification - axiomatic and algebraic specifications, function-oriented software design, object-oriented design, UML, design patterns, user interface design, coding and unit testing, integration and systems testing, debugging techniques, software quality - SEI CMM and ISO-9001. Software reliability and fault-tolerance, software project planning, monitoring, and control, software maintenance, computer-aided software engineering (CASE), software reuse, component-based software development, extreme programming.

ICT 5403 Software Quality Assurance

3 Credits

Definition of Software Quality, Quality Dimensions, The SQ Dilemma, Achieving Software Quality. Software Defects, Defect amplification and removal, Review Metrics and their use, Informal Reviews, Formal technical reviews, Review reporting and record keeping. Elements of SQA, SQA Task, Goals and Metrics, Formal Approaches to SQA, Statistical SQA, Software Reliability, The ISO 9000 Quality Standards, The SQA Plan. The Strategic Approach for Software Testing, Verification and Validation, Organizing for Software Testing, Criteria for Completing of Testing, Strategic Issues. Testing Strategies for Conventional Softwares: Unit Testing, Integration Testing, Strategies for OOS, Testing in OO context, Integration Testing in OO context, Strategies for Web Apps., Validation Testing, Alpha and Beta Testing. System Testing: Recovery Testing, Security Testing, Stress Testing, Performance Testing, Deployment Testing, The Art of Debugging. Testing Conventional Applications: White box testing, Basis Path Testing, Central Structure Testing, Black box Testing, Model Based Testing, Testing Client Server Architectures, Testing for Real Time Systems, Patterns for Software Testing. Testing Object Oriented Applications: Testing OOA and OOD

Models, Object Oriented Testing Strategies, Testing methods applicable at Classes, Interclass Test case Design, Test Derived from Behavior Models. Testing Web Applications: Dimensions of Quality, Content Testing, User Interface Testing, Component Level Testing, Navigation Testing, Configuration Testing, Security Testing, Performance Testing.

ICT 5501 Remote Sensing and Geographical 3 Credits Information System

Remote Sensing (RS) Technologies: Basic Technology Requirement, Aerial Photography, Satellite Image, Microwave Remote Sensing, Electro-optical Remote Sensing, Wireless Sensor Network Based Remote Sensing. Introduction to Geographical Information Systems (GIS) and Remote Sensing (RS) Concepts; Basic Principles and Techniques used in GIS and RS; Practice Applications and their Evolutions using GIS and RS; Global Positioning System (GPS). Fundamentals of GIS, Basic Hardware, Software and Data Requirements for GIS; Evolution of GIS Technology, Key Areas of Application of GIS; Spatial Data and Modeling & Analysis, Issues in the Management of GIS, Organizational Role of GIS, and Emerging trends in GIS Development and Future Usage.

ICT 5502 Internet Technologies 3 Credits

Introduction to the Internet: Introduction to XML, XHTML, XSL, integrating JavaScript and XSL; Internet Address, sockets; Application specific protocols and services: authentication, domain name services (DNS), electronic mail, world wide web, web caching, network management, internet control message protocol (ICMP), file transfer protocol (FTP), secured remote access; Voice over IP and its protocols, Next generation of internet, Revolutionary application of internet.

ICT 5503 Mobile Communications 3 Credits

Introduction to Personal Communications Services (PCS): PCS Architecture, Mobility management, Networks signaling. Global System for Mobile Communication (GSM) system overview: GSM Architecture, Mobility management, Network signaling, Performance Analysis: Admission control and handoffs. 2.5/3G Mobile Wireless systems: packet switched Data Introduction, 3G CDMA cellular standards, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G. 2.5/3G TDMA: General Packet Radio Services (GRPS) and EDGE. Access Scheduling techniques in cellular systems: Slotted Aloha access, integrated access: voice and data, scheduling in packet based

cellular systems. Mobile Data Communication: WLANs (Wireless LANs) IEEE 802.11 standard, Mobile IP. Wireless Application Protocol (WAP): The Mobile Internet standard, WAP Gateway and Protocols, wireless markup Languages (WML). Wireless Local Loop (WLL): Introduction to WLL Architecture, wireless Local Loop Technologies. Global Mobile Satellite Systems; case studies of the IRIDIUM and GLOBALSTAR systems.

ICT 5504 Software and Database in Telecommunication 3 Credits

Introduction to hardware and software evolution; Software components: database, distributed database, real-time software, mapping of software components etc; Constraints on the software components: real-time behavior, service continuity, hardware limitations, software and hardware integration and dimensioning etc; Telecommunication software development: examples of life cycles; Methods and tools for: requirement capture, analysis, specification, architecture, design and development; Interfaces definition: problem overview, transparency of distribution; System tests; Database in telecommunication systems, database environment, relational and object databases; Database planning, design and administration; Database trends in telecommunication: real-time database, multimedia database, WWW servers and database, 3D image handling in database, multimedia and existing RDBMS.

ICT 5505 Network Systems Design and Analysis 3 Credits

Computer network, purposes of a network, elements of communication and types of networks. Types of transmission media, functions of a network interface card. Characteristics of the mesh, bus, ring, star, and hybrid topologies, channel access method, advantages and disadvantages of contention, polling, token passing, and demand priority channel access methods. Ethernet architectures, features of a token ring network, how a wireless LAN functions, guidelines for designing a network. OSI reference model, functions of TCP/IP, functions of client and server network software. Features of a NetWare 6 server, Create and modify a new user account using NetWare 6, Explain the features of Linux, Use Linux to set file permissions. Proactive steps to be taken to keep a network server in operation, server performance monitoring, SNMP and network monitoring, features of

common network troubleshooting tools. WAN definition, different WAN technologies.

ICT 5601 Information System and Network Security 3 Credits

Fundamentals of cryptography, security for communication protocols, security for operating systems and mobile programs, and security for electronic commerce, passwords and offline attacks, DES, RSA, DSA, SHA, SSL, CBC, IPsec, SET, DDOS attacks, biometric authentication, PKI smart cards, S/MIME, privacy on the Web, viruses, security models, wireless security, and sandboxing.

ICT 5602 Cyber Security 3 Credits

Introduction to cyber security, Interrelated components of the computing environment, Models of Cyber security (the CIA triad, the star model, the Parkerianhexad), Cyber vulnerabilities, and consequences, Cyber threatstypes of attacker, Motives-what drives an attacker, Means, Cyber attack, Methods, Classification of cyber attack & attack vectors, Risks of conducting a cyber-attack. Cybercrime, Cyber harassment, Cyber warfare, Cyber surveillance, Difficulties in cyber security, State of security today. Principles of risk, Types of risk, Risk strategies, Risk Management Framework (RMF), Disaster recovery plan and procedures, Challenges of disaster recovery plan, traditional disaster recovery. National ICT Act & Policy, National Information security policy guideline, government and private sector role's in securing cyberspace, International laws in securing cyberspace.

ICT 5701 Microprocessor and Microcontroller 3 Credits Architecture

Arithmetic Circuits, ALU, Number Systems. Instruction Data Set. Assembly Language, Machine Language, Programming, Addressing Modes. 8086 architecture- functional diagram, Register organization, memory segmentation, programming model, Memory addresses, physical memory organization, Signal descriptions of 8086-common function signals, timing diagrams, Interrupts of 8086. Instruction set and assembly language programming of 8086: Instruction formats. Addressing modes,

instruction set, assembler directives. Macros, Simple programs involving logical, branch and call instructions. Sorting, evaluating arithmetic expressions, string manipulations. I/O Interface: 8255 PPI, various modes of operation and interfacing to 8086, interfacing of key board, display. Stepper motor interfacing, D/A & A/D converter. Interfacing With advanced devices: Memory interfacing to 8086, Interrupts of 8086, Vector interrupt table, Interrupt service routine, Serial communication standards, serial data transfer schemes, 8251 USART architecture and Interfacing. Introduction to microcontrollers: overview of 8051 microcontroller, Architecture, I/O ports, Memory organization, addressing modes and instruction set of 8051, Simple programs. UNIT-V 8051 Real Time Control: Programming Timer interrupts, programming external hardware interrupts, Programming the serial communication interrupts, Programming 8051 timers and counters.

ICT 5702 Embedded Systems Design

3 Credits

Core of the embedded system, Memory, Sensors and Actuators, Commutation interface, Embedded firmware, Other system components. Characteristics and quality attribution of Embedded Systems. Computational models in embedded design, Introduction to Unified modeling language, Hardware software trade-off. Embedded firmware design approaches, Embedded firmware development language. Real-time operating system (RTOS) based embedded system design: Operating system basics, Types of OS, Tasks, Process and threads, Multiprocessing and multitasking, Task scheduling, Threads, Processing and scheduling: Putting them altogether, Task communication, task synchronization, Device drivers, How to choose an RTOS. The Integrated development environment (IDE), Types of files generated on cross compilation, Disassembler/Decompilers, Emulators and debugging, Target hardware debugging, Boundary scan. Processor trends in embedded system, Embedded OS trends, development language trends, Open standards, Frameworks and alliances, Bottlenecks.

ICT 5703 Digital Signal Processing

3 Credits

Introduction to discrete linear systems: Discrete time signals, Special sequences, Shift invariance, Stability and causality, Impulse response, Difference equations. Discrete-Time Fourier Transform and Linear Time Invariant Systems: Transform definitions, Theorems, Frequency response of linear time invariant systems, Phase and group delays. The Z transform: Z-transforms by summation of left, right, and two-sided sequences, Regions of convergence and Z-transform properties, Inverse Z-transform. Properties of digital filters: Averaging filter, Recursive smoother, Firstorder notch filter, Second-order unity gain resonator, All-pass filters, Comb filters, Equalization filters, Group delay, linear phase, all-pass, minimum phase. Fourier transforms, sampling: Fourier transform review, Sampling continuous-time signals: the sampling theorem, Aliasing, Resampling digital signals, A/D conversion and quantization, D/A conversion, Polyphase decomposition, Polyphase DFT filterbanks, Bandpass sampling. Discrete Fourier transform: Definition of DFT and relation to Z-transform, Properties of the DFT, Linear and periodic convolution using the DFT, Zero padding, spectral leakage, resolution and windowing in the DFT. fast Fourier transform: Decimation in time FFT, Decimation in frequency FFT. Finite impulse response (FIR) filters: Window design techniques, Kaiser window design technique, Equiripple approximations. Infinite impulse response (IIR) filters: Bilinear transform method. IIR - Direct, parallel and cascaded realizations, FIR – Direct and cascaded realizations. Coefficient quantization effects in digital filters.

ICT 5704 Satellite and Radar Communication 3 Credits

Orbital aspects of Satellite Communication: Introduction to geosynchronous and geostationary satellites, Kepler's laws, Locating the satellite with respect to the earth, sub-satellite point, look angles, mechanics of launching a synchronous satellite, Orbital effects, Indian scenario in communication satellites. Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Space craft antennas, multiple access techniques, comparison of FDMA, TDMA, CDMA. Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of down link and

uplink, design of satellite links for specified C/N, satellite data communication protocols. Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar, Prediction of range performance, minimum detectable signal, receiver noise, probability density function, SNR, Integration of radar pulses, radar cross-section of targets, PRF and range ambiguities, transmitter power, system losses. Doppler effect, CW radar, FM CW radar, multiple frequency CW radar. MTI radar, delay line canceller, range gated MTI radar, blind speeds, staggered PRF, limitations to the performance of MTI radar, non-coherent MTI radar. Tracking radar: sequential lobing, conical scan, monopulse: amplitude comparison and phase comparison methods, Radar antennas. Radar displays. Duplexer. **Bangabandhu Satellite-1:** Evaluation History, Spacecraft Properties, Orbital Position, Transponders, Platform.

ICT 5801 ICT Ethics

3 Credits

Ethics & Info Technology, Ethics in the Field, Ethical Theories, Privacy & Surveillance, Internet of Things, Intellectual Property, Controlling Content, Love & Sex, War & Play, Human & Non-Human, Money & eWaste, Hacking & Fake News, Info Justice, Professional Ethics.